Legislative Council Panel on Transport
Subcommittee on Matters Relating to Railways

Recent Railway Incidents involving MTR Rail Cracks

The Subcommittee on Matters Relating to Railways under the Legislative Council Panel on Transport requested the Administration to provide information on the two recent railway incidents involving cracks on the Tung Chung Line and the Tsuen Wan Line of the MTR Corporation Limited (MTRCL) on 19 January 2011 and 10 February 2011 respectively. The Administration's views on the handling of the incidents by MTRCL and the follow-up actions taken with MTRCL are set out in this paper.

The incidents

Tung Chung Line Incident on 19 January 2011

2. In the morning of 19 January 2011, a breakage was identified by MTRCL at a rail section near Sunny Bay Station of the Tung Chung Line. Emergency repair work was subsequently completed with application of steel plates to the incident rail for reinforcement. The incident rail was replaced after the traffic hours of the day.

Tsuen Wan Line Incident on 10 February 2011

3. In the morning of 10 February 2011, a breakage was identified by MTRCL at a rail of the Tsuen Wan Line near Admiralty Station. MTRCL carried out emergency repair work with application of steel plates to the incident rail section. The incident rail was replaced after the traffic hours of the day.

Impact on Passengers

4. For the Tung Chung Line incident, about 6,000 passengers experienced longer journey time from Tsing Yi to Tung Chung/AsiaWorld-Expo Stations. About 5,000 passengers were on the Tung Chung Line and about 1,000 passengers on the Airport Express Line. Also, due to lower service frequency during the incident period, passengers on both directions of the Tung Chung Line and Airport

Express Line experienced longer waiting time. As for the Tsuen Wan Line incident, about 19,400 passengers experienced longer journey time from Admiralty Station to Tsim Sha Tsui Station. Along the Tsuen Wan Line, passengers experienced waiting time longer than normal during the morning peak hours on that day.

5. In both of the Tung Chung Line and Tsuen Wan Line incidents, MTRCL informed passengers in a timely manner of the service disruptions, including the cause of incident, train service adjustments and approximate extra travelling time, through public announcements and notices at stations along the two lines and neighbouring railway lines interchanging with them.

Track Maintenance Regime

6. MTRCL adopts a risk-based maintenance regime for track maintenance including visual inspection by patrolling and ultrasonic inspection by ultrasonic testing vehicle (UTV). The frequency of track inspection by these methods is set out in **Annex 1**.

7. MTRCL's track maintenance frequency is higher than that of major international counterparts, like RailTrack in the UK (which calls for weekly visual inspection by patrolling and 6-monthly ultrasonic inspection on rail track for tunnels) and the International Union of Railways (which specifies ultrasonic inspection for every 12 million tonnes of traffic which is equivalent to once every 3.8 months if applied to the Tsuen Wan Line traffic loading).

8. MTRCL's track preventive maintenance inspection frequency is determined by the utilization and loading of the track. Visual inspections are conducted once every 72 hours to 2 times per week for the MTR heavy rail lines. UTV inspections are conducted once every 2 to 6 weeks. MTRCL also employs test equipment such as portable ultrasonic crack detector for the track patrol team, UTV as well as dye penetration checks.

9. Corrective maintenance will be carried out for defects and irregularities found during inspections to ensure safe and reliable service. The section with cracks, if found, will be immediately replaced during the night shift if time permits. Otherwise, the cracked rail section would be temporarily secured by steel plates to ensure safe operation of trains followed by replacement of the cracked rail section after service.

Monitoring of Railway Safety

10. EMSD monitors the safety of the railway systems and ensures that the railway corporation has fully complied with all safety requirements in the design, construction, operation and maintenance of the railway systems. Currently, the design standards and safety management system of MTRCL are compatible with international standards. In respect of the safety of operating railways, EMSD regularly conducts inspections and checks to validate if MTRCL has followed their scheduled railway system maintenance works as planned to ensure railway safety. In addition, MTRCL has to notify EMSD of incidents involving railway safety in accordance with the established mechanism and to submit investigation reports. For railway safety incidents, EMSD scrutinises and reviews MTRCL's investigation reports with a view to ascertaining the causes, and monitors whether the incidents have become a trend. EMSD also liaises with MTRCL to ensure satisfactory rectification as well as implementation of improvement measures as appropriate. In view of the recent spate of incidents, the Administration has asked MTRCL to review its railway system maintenance, and to implement appropriate measures to ensure safety of the railway system.

11. MTRCL has to make notifications to the Government for accidents and occurrences specified in the legislation. Past breakage incidents since 2008 are summarised in **Annex 2**. MTRCL has notified EMSD in accordance with the established mechanism. Among these incidents, the causes of 11 incidents have been ascertained and the relevant correction and improvement works completed. Investigation is in progress for the remaining 3 incidents.

12. It is MTRCL’s standing practice to send these rail sections for laboratory testing. The two incident rails concerned have been sent by MTRCL for laboratory analysis in the City University of Hong Kong and a laboratory in USA to ascertain the exact cause(s) of these failures. Thereafter MTRCL will report to EMSD. EMSD has also engaged a material science expert to oversee the laboratory analysis process to ensure the examination process and methodologies are appropriate.

Follow-up Actions

13. Railways are normally installed in open space and tunnels. Due to natural corrosion and temperature variation, together with repeated stresses resulting from heavy train traffic, development of cracks/breakages in metal track rails is a natural phenomenon. This is a

common challenge faced by the railway industry worldwide. Most important of all is to have a comprehensive and effective maintenance regime, and to monitor the integrity of rails as appropriate. When a rail breakage is detected, temporary repair such as application of steel plates to reinforce the rail section will be implemented immediately. Together with close monitoring and the lowering of train speed as appropriate, train operations safety will not be compromised. For both incidents, EMSD has conducted inspection on the incident rails and the rail replacement works immediately after traffic hours on the day. EMSD also instructed MTRCL to check all operating rails that were manufactured by the manufacturer of both incident rails. EMSD will follow up with MTRCL on the laboratory testing results and the determination of the root cause of the incidents.

Transport and Housing Bureau
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Annex 1

Frequency of Track Inspection

Line	Track Inspection Frequency	
	Visual Inspection by Patrolling	Ultrasonic Testing Vehicle (UTV) Inspection
Kwun Tong Line	72 hours	2 weeks
Tsuen Wan Line	72 hours	2 weeks
Island Line	72 hours	4 weeks
Tseung Kwan O Line	72 hours	4 weeks
Tung Chung Line / Airport Express Line / Disneyland Resort Line	72 hours (Disney Resort Line: 48 hours)	4 weeks
East Rail Line	72 hours (Lok Ma Chau: 2 times per week)	3 weeks (Lok Ma Chau: 6 weeks)
Ma On Shan Line	2 times per week	6 weeks
West Rail Line	2 times per week	6 weeks
Light Rail	2 times per week	3 months

Annex 2

Case Summary of Reported Rail Breakage Occurrences since 2008

Item	Date	Line	Location	Width of Gap and Manufacturer	Cause / Action Taken
1	19/1/2008	East Rail Line	North of Mong Kok East Station	5 mm gap (rail crossing weld) (Manufacturer: Balfour Beatty)	The cause was attributable to manufacturing flaws. All Balfour Beatty crossings were subsequently removed from system by July 2008.
2	19/3/2008	East Rail Line	South of Fanling Station	9 mm gap (plain rail weld) (Manufacturer: Panzhihua)	Un-molten welding material was found in the joint. This lot of welding material was disposed of.
3	12/1/2009	Light Rail	Tuen Mun Ferry Pier Terminus	2 mm gap (switch rail weld) (Manufacturer: Kihn)	The cause was due to excessive impurities introduced in the welding process by the manufacturer. The incident rail was replaced.
4	18/11/2009	East Rail Line	North of Tai Wai Station	9mm gap (stock rail) (Manufacturer: Balfour Beatty/ Tata Group)	Impurities found and the incident rail was replaced.
5	24/11/2009	East Rail Line	Hung Hom Freight Terminal (Non-passenger Area)	Insignificant gap (plain rail) (Manufacturer: Chinese Mainland)	The cause was due to corrosion at the rail foot section. The incident rail was replaced.
6	25/1/2010	East Rail Line	North of Sheung Shui Station	5 mm gap (rail crossing weld) (Manufacturer: Edgar Allen)	This was a manufacturing defect. All Edgar Allen crossings of the same batch were subsequently removed from system by April 2010.

Item	Date	Line	Location	Width of Gap and Manufacturer	Cause / Action Taken
7	13/2/2010	East Rail Line	North of Sheung Shui Station	6 mm gap (rail crossing weld) (Manufacturer: Edgar Allen)	Same batch of Edgar Allen crossing as in the 25 Jan 2010 incident. All Edgar Allen crossings of the same batch were subsequently removed from system by April 2010.
8	10/3/2010	Kwun Tong Line	Between Kwun Tong Station and Lam Tin Station	2 mm gap (plain rail weld) (Manufacturer: Tata Group)	Sub-standard workmanship on site leading to moisture contamination during joint formation. Improvement measure by temperature crayon to ensure sufficient pre-heat temperature of welding crucible was introduced in May 2010. This section was re-welded.
9	15/7/2010	Tsuen Wan Line	Between Kwai Fong Station and Kwai Hing Station	insignificant gap (plain rail weld) (Manufacturer: Tata Group)	Test result revealed that brittle material (evidence of rapid cooling) was formed during the welding process. This section was re-welded.
10	24/7/2010	Kwun Tong Line	Between Kowloon Bay and Ngau Tau Kok Station	Insignificant gap (switch rail) (Manufacturer: Balfour Beatty/ Tata Group)	Test result revealed that this was a fatigue failure due to stress concentration caused by design deficiency. The incident rail was replaced.
11	1/11/2010	Tsuen Wan Line	Between Central Station and Admiralty Station	insignificant gap (plain rail weld) (Manufacturer: Tata Group)	Test result revealed that brittle material was formed during the welding process. This section was re-welded.
12	13/1/2011	East Rail Line	North of Fo Tan Station	3 mm gap (plain rail) (Manufacturer: BaoGong)	The incident rail section was sent for laboratory analysis to ascertain the exact cause(s) of failure. Findings are not yet available. The incident rail was replaced.

Item	Date	Line	Location	Width of Gap and Manufacturer	Cause / Action Taken
13	19/1/2011	Airport Express Line / Tung Chung Line	Near Sunny Bay Station	5 mm gap (plain rail) (Manufacturer: Tata Group)	The incident rail section was sent for laboratory analysis to ascertain the exact cause(s) of failure. Findings are not yet available. The incident rail was replaced.
14	10/2/2011	Tsuen Wan Line	Near Admiralty Station	1 mm gap (plain rail weld) (Manufacturer: Tata Group)	The incident rail section was sent for laboratory analysis to ascertain the exact cause(s) of failure. Findings are not yet available. The incident rail was replaced.