

**Legislative Council Panel on Transport
Subcommittee on matters relating to railways**

Review of West Rail incidents

Purpose

This paper sets out Kowloon-Canton Railway Corporation (“KCRC”)’s planned improvement measures to improve the reliability of West Rail (“WR”) and the Government’s assessment of the WR incidents that happened in recent months including the train service disruption and train collision incidents that occurred on 21 July 2005.

2. Information on the causes of the WR incidents and the planned improvement measures, as provided by KCRC, is set out at *Annex*.

Government’s assessment

Overview of WR performance

3. The Government has conducted an analysis by looking at the number of WR incidents in 2004 and 2005 (up to 11 September) causing a delay of eight minutes or more (the threshold for KCRC to report incidents to Transport Department (“TD”).

4. The number of WR incidents in 2004 and 2005 is as follows-

Number of WR incidents causing a delay of eight minutes or more

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2004	3	3	1	1	2	3	1	2	2	4	2	0	24
2005	1	1	3	0	0	3	3	5	0*	N.A.	N.A.	N.A.	16

* (up to 11 September 2005)

5. The causes of the WR incidents are categorized as follows -

	2004		2005 (up to 11 September)	
	No. of Incidents	Percentage	No. of Incidents	Percentage
Signalling system	21	87.5 %	13	81.25 %
Train components, e.g. train-borne computer failure	3	12.5 %	0	0 %
Traction Circuit	0	0 %	1	6.25 %
Interruption by external objects	0	0 %	2	12.5 %
Miscellaneous	0	0 %	0	0 %
Total	24	100%	16	100%

6. The delay in journey time caused by those incidents are as follows -

Delay in journey time (min)	No. of WR incidents in 2004	No of WR incidents in 2005 (Up to 11 September)
8-15	16	8
16-19	3	4
20-29	3	2
30-39	2	1
40-49	0	1
Total	24	16

7. We note that -
- (a) the number of WR incidents that happened between January and 11 September 2005 is 16, which is slightly below the 18 incidents that happened during the same period last year;
 - (b) however, the number of incidents that happened between June and September 2005 is 11, which is higher than the 8 incidents that happened during the same period last year. Incidents that happened between June and September 2005 are mostly related to signalling problems;
 - (c) since the commissioning of WR, more than 80% of the railway incidents have been caused by signalling problems;
 - (d) in terms of delay in journey time, the majority of the incidents that happened in 2004 and 2005 (24 out of 40 incidents, or 60%) have caused delay in journey time ranging from 8 to 15 minutes whilst the number of incidents resulting in delay in journey time of over 20 minutes is 5 in 2004 and 4 in 2005; and
 - (e) the incident duration for WR is relatively longer; on average, each WR incident in 2005 lasts for about 80 minutes whereas each East Rail incident lasts for about 30 minutes.

8. Generally speaking, it is noted that the majority of WR incidents are related to the signalling system. These signalling system problems are mainly related to the impact of the Axle Counter Blocks (“ACBs”) that count the number of axles of the train wheels that cross the detector to ensure that the trains are running safely on the tracks. As regards the possible impact of lightning on the reliability of WR, we note that between June and August 2005, the number of days with thunderstorm warning issued is higher than that for the same period in 2004. During that period, there were 4 incidents which might be due to the impact of lightning causing damage to the electronic equipment of the signalling system by the upsurge in voltage passing through.

9. We note that it usually takes a longer period to recover the service disruption for WR. This is partly because the distance between WR stations is longer than for the other railway lines. Longer station separation would require additional time for railway staff to travel to the incident location to diagnose and rectify the problems. This is particularly so for the case of signalling problems that occurred inside the Tai Lam Tunnel.

10. The ensuing paragraphs set out the Government's assessment on the train service disruption and trains collision incidents that happened on 21 July 2005.

Service disruption incident on 21 July 2005

11. Due to signalling system failure, there was a service disruption which lasted for about 4.5 hours between 5:34 a.m. and 10:15 a.m. According to information provided by KCRC, during the affected period, the journey time was delayed by 15 to 40 minutes and the headway was extended from around 3.5 minutes to a range of about 5 to 10 minutes. At around 5:30 a.m. on the day of incident, KCRC notified TD in accordance with the agreed notification mechanism, and at the same time informed the public and passengers of the incident through the media and public announcements in stations and inside train compartments. KCRC also continually disseminated information on the latest situation of the service disruption.

12. Investigation findings by the Hong Kong Railway Inspectorate ("HKRI") and TD on the service disruption on 21 July 2005 are set out as follows -

- (a) the service disruption on 21 July 2005 was caused by the disturbance of ACBs as a result of intermittent failure of a signalling component inside the Tai Lam Tunnel;
- (b) the intensive lightning that occurred on the evening of 20 July 2005 had induced disturbances to the ACBs and tripping of traction power to WR which had led to two intermittent service disruptions that evening. With immediate repair

measures, both incidents ended after about one hour and service resumed normal afterwards. After close of WR service on 20 July, as a follow-up rectification measure, KCRC replaced the relevant parts of the signalling system. However, the system failed to operate normally after the replacement. The problems could not be resolved throughout the early hours of 21 July 2005 and hence led to the service delay on the morning of 21 July 2005. KCRC finally replaced the memory modules of the ACBs and the whole service resumed normal at about 10:15 a.m.; and

- (c) on information dissemination to passengers, KCRC did notify passengers and the public of the incident at around 5:30 a.m. including information on the extension of journey time and increased headway. However, the information on extension of journey time was revised from 15 minutes to 20 minutes, and subsequently to 30/40 minutes as the incident continued. It is noted that there were complaints from passengers that the information disseminated by KCRC on the extent of delay was not accurate or updated.

Trains collision incident on 21 July 2005 inside the Pat Heung Depot

13. Upon learning about the train collision incident inside the Pat Heung Depot (“the Depot”) on the evening of 26 July 2005, the Government took the initiative to contact KCRC to enquire about it and informed the Corporation that we would be sending the railway inspectorate to carry out an investigation. Railway inspectorate staff went to the Depot on the morning of the following day (27 July) to conduct a site investigation to understand the causes of the incident and examine the conditions of the damaged trains.

14. The findings of our investigation are set out below -

- (a) the lower part of the front carriage of the train was damaged while the driving cabinet remained intact with no noticeable damages. There was no casualty or injury involved in the incident;

- (b) train operation records revealed that at the time of the incident, the train was operated manually at a slow speed according to the train driving procedures, i.e. at a speed below 25 km per hour. At the moment before the collision, the train was operating at a speed of 13 km per hour and the train driver did not apply the brake, causing the train to collide with a stationary train in front. The train driver only applied the brake a second after the collision;
- (c) the incident took place on the track within the Depot's premises, which is separated from the main service line used for the carriage of passengers or goods; and
- (d) the incident occurred at the Depot's parking area instead of the Depot entrance / exit, and hence it did not affect the dispatch of other trains for WR service in the morning of 21 July. The incident caused no damage to the signalling systems. There was also no capacity problem arising from the train collision since there were sufficient spare trains in the Depot for normal passenger service.

15. Based on the above findings, we are of the view that the train collision incident did not impact on normal service of the railway and that it was not the cause of the WR service disruption on the morning of 21 July.

Government's assessment of the planned improvement measures by KCRC

(i) train service disruption incident

16. For the train service disruption incident referred to in paragraphs 11 and 12 above, we have demanded KCRC to take effective measures to enhance the reliability of WR service. We note that KCRC gave an account of the causes of the recent spate of WR incidents and the proposed improvement measures on 24 August 2005, the details of which are set out in paragraphs 7, 8, 16 and 17 of the Annex.

17. The Government considers that those measures are in the right direction and could help enhance the reliability of railways including reducing the impact of ACBs on the signalling system, and expedite recovery of service. In addition, we are of the view that KCRC should, in particular, improve on the following aspects -

- (a) apart from studying the impact of lightning on the signalling system, the Corporation should pay attention to other important aspects of railway reliability, e.g. maintenance and staff training. This could help reduce the failure of the signalling systems and other railway equipment, and minimise chances of incidents due to human errors;
- (b) noting that it has taken almost 5 hours for KCRC to rectify the service disruption on 21 July 2005, the Corporation should implement measures to expedite service recovery;
- (c) on information dissemination, the Government considers that it is important for the railway operator concerned to be responsive and sensitive to the affected passengers' feelings by providing timely and adequate information to them. KCRC should ensure a more accurate assessment of the extent of delay and improve the existing information dissemination arrangements for passengers and the public; and
- (d) to minimise inconvenience to passengers during serious service disruption, the Corporation should, depending on the merits of each case, be more flexible in deploying standby emergency buses so that the affected passengers could make their own choice of alternative transport. In such circumstances, the Corporation should provide information on the respective expected journey time via the emergency buses and the railway to enable passengers to plan ahead for their journeys.

(ii) *train collision incident inside the Pat Heung Depot*

18. As regards the train collision incident inside the Pat Heung

Depot referred to in paragraphs 13 and 14 above, apart from demanding KCRC to take immediate follow-up actions to avoid recurrence of similar incidents, we have reviewed the train operation inside the Pat Heung Depot and other KCRC depots. The observations are set out below-

- (a) all train movements inside the depots are managed by central and co-ordinated control with the support of signalling systems. Ground signalling men are used to control the movements of only a few tracks which are unsignalled;
- (b) there is speed restriction on the signalling system inside the depots, and trains could not be driven at a speed exceeding 25km per hour. This could ensure the depot train drivers are given sufficient response time to react to emergency and to brake the trains properly; and
- (c) the depot train drivers are selected from the experienced train drivers on mainline operation. A train driver selected as depot train driver is required to attend 5-week additional training which includes 2 weeks of classroom training and 3 weeks of on-the-job training. Depot train drivers are required to attend refresher training annually and acquire a certificate on their competence every 3 years.

19. Based on the above findings, we consider that in general the train operations in the depots of KCRC are properly controlled and the depot train drivers are adequately trained for carrying out their duties. That said, to avoid recurrence of the train collision incident, we have asked KCRC to implement the following enhancement measures-

- (a) introducing procedures that require train drivers to stop the train 20m in front of the designated stop mark in depots when trains are moving in manual mode without Automatic Train Protection (“ATP”) protection. Afterwards, the train should move at a lower speed limit not exceeding 10km/h to the stop mark. This could slow down the train speed and minimise the possibility of failure to apply brakes by the drivers;

- (b) studying the feasibility of installing sensor device / parking alarm to guard against driver's carelessness when the train is moving in manual mode without ATP protection inside the depot; and
- (c) adding more prominent signs at suitable locations inside the depot to remind drivers for critical actions, e.g. slowing down or stopping the trains.

20. The damage to the trains involved in the train collision was mainly on the outer protection of the train front. The damaged trains are being repaired. HKRI will inspect the repaired trains before they are put into service again.

21. As regards the railway incident notification arrangements, the general principle of the provisions relating to notifiable incidents under the KCRC Ordinance is to protect the safety of persons (including passengers, railway staff or any other persons) in railway operations. KCRC shall notify Government of all incidents that have implications for the safety of persons. In addition, for incidents which are not safety-critical but have led to service disruption for eight minutes or more, KCRC is required to notify the Transport Department under the agreed mechanism. The existing notification, therefore, covers incidents relating to safety of persons and service reliability. On top of this, we have been impressing upon KCRC to take a proactive approach in notifying Government of any other incidents which may raise public concerns. In the light of the train collision incident on 21 July 2005, we have reminded KCRC again that it should enhance its awareness in notifying Government of railway incidents under the established mechanism and informing the public and passengers so as to enhance the transparency of railway operation.

22. The Corporation should also review its internal communication procedures on railway incidents so that the senior management could be kept informed of important issues relating to the train operations and consider the appropriate follow-up actions.

Conclusion

23. We note that KCRC has pledged to make further efforts to enhance the reliability of WR as well as to improve its handling of railway incidents including incident recovery and information dissemination. Government will continue to closely monitor KCRC's implementation of the improvement measures.

ETWB

September 2005

**Information Provided by KCRC on
West Rail Trains Collision Incident and Signalling Failures**

Purpose

This Annex is prepared by KCRC to inform Members about the Corporation's findings on the collision incident of two West Rail trains at Pat Heung Maintenance Centre (PMC), the investigation results of West Rail service delay due to signalling failures, and the improvement measures implemented and to be implemented.

West Rail Trains Collision Incident

2. At 5:04 a.m. on 21 July 2005, a driver who was performing shunting duties at West Rail Pat Heung Maintenance Centre (PMC) failed to apply the brake of the train in time. The train collided with another stationary train on the track. The front driving cab covers and couplers of both trains were damaged.

3. After the incident, both trains remained stationary on the track and there was no injury in the incident. Investigation revealed that the train was being shunted manually and the train driver moved the train at a low speed according to the driving procedure. The driving record also showed that the speed of the train was 13 km/h before the collision. During the incident, the equipment and components of the train, including the braking system, were functioning normally.

4. Staff from Electrical Engineering, Permanent Way and Signalling Maintenance Sections conducted subsequent inspections and confirmed that the overhead line equipment, railway track and train-borne signalling equipment were not damaged and could operate properly. Since the incident took place in the berth area inside the maintenance centre and not at its entrance and exit, the deployment of trains to mainline services was not obstructed. PMC staff re-arranged the train departure schedule before the commencement of service that day and the incident had no impact on mainline operation.

5. The driver concerned has joined the Corporation for more than

three years and his main duty is to carry out shunting of trains inside PMC. He is not required to operate passenger trains. According to the alcohol test, the driver was not under the influence of alcohol or drugs before the incident. Besides, he had sufficient rest before carrying out his duties that day. The incident happened because the concerned driver did not apply the brake to stop the train at the appropriate position.

6. The driver concerned was suspended from driving duties immediately after the incident. KCRC has arranged a detailed medical assessment for the driver to determine whether he is suitable for resumption of driving duties. The results are still pending.

Improvement Measures

7. Immediate Follow Up/Improvement Measures

- The car-builder was arranged to conduct thorough inspection of damages, to carry out assessment of the integrity of the car structure, and to repair the damages for re-commissioning of the damaged units.
- The current roster arrangement of the maintenance centre drivers was reviewed. It was confirmed that drivers had sufficient rest in between driving assignments. The Corporation had also revisited the driving assignments and workload and confirmed that there was no fatigue caused by the nature of the job or too much workload.
- The Corporation will arrange refresher courses for train drivers to enhance their alertness and improve driving skills.
- All manual train driving activities inside PMC will be carried out by two drivers. If this cannot be arranged, a qualified shunter will be assigned at the stopping location to display hand signals to the driver.
- A yellow line is painted 20 m in front of every stopping point. All train drivers operating trains manually have to stop at the yellow line, and then move to the final stopping mark at a speed of 5 kph.

8. Long-term Improvement Measures

- The Corporation is studying the feasibility of installing a warning device to alert drivers to brake the train at the right time.
- The Corporation is reviewing the effectiveness of the yellow line. If proved effective, more markings with higher visibility will be installed.
- Human factor studies will be conducted, which cover areas such as fatigue, training, medical fitness, workload, equipment design, environmental considerations, etc.

Signalling Incidents

9. At 8:50 p.m. on 20 July 2005, a signalling system failure inside Tai Tam Tunnel affected train services between Tuen Mun and Nam Cheong. The journey time was extended by 5 to 7 minutes and train frequency was maintained at 6 to 7 minutes. Normal services resumed at 9:45 p.m.

10. At 10:27 p.m. on the same day, the signalling equipment was disturbed at north of Tai Lam Tunnel and the section between Tin Shui Wai and Siu Hong Stations. The traction power supply also tripped on the northbound track between Tai Lam Tunnel and Tin Shui Wai. The travelling time was extended by 20 to 30 minutes with the headway maintained at 6 to 10 minutes. The failure was fixed at 11:52 p.m.

11. At 5:34 a.m. on 21 July 2005, the signalling system at north of Tai Tam Tunnel failed. The journey time was extended by 15 to 40 minutes and the service frequency was maintained at 5 to 10 minutes. KCRC carried out urgent repairs and replaced computer components. Normal southbound and northbound services were resumed at 9:41 a.m. and 10:15 a.m. respectively.

12. The investigation revealed that the incident was caused by the damage of some computer components of the signalling system at north of Tai Lam Tunnel due to adverse weather and frequent lightning strikes happened on 20 July. KCRC had replaced the damaged components. The signalling incidents had not affected passenger safety.

Detailed Investigations and Analysis

13. Between January and end August 2005, the number of West Rail incidents causing a service delay for 8 minutes or more was 16, in which 13 were signalling incidents including two incidents with causes confirmed to be related to the inclement weather or lightning storms. Of these 13 signalling incidents, 9 were related to the problems with the axle counters of the signalling system. KCRC has conducted detailed analysis into each incident and confirmed that most of the incidents were due to the damage of the electronic components of the axle counters and earthing system, which led to substantial increase in electricity voltage. Most of the incidents also occurred during inclement weather or lightning storms.

14. The West Rail alignment between Tuen Mun and Nam Cheong is 30.5km in length. The track between Tuen Mun and Kam Sheung Road is elevated while the section from Tai Lam Tunnel to Nam Cheong is underground, which is not subject to the impact of lightning strikes. However, the elevated section is comparatively long and exposed to the environment, therefore vulnerable to lightning strikes. In fact, the number of lightning strikes between June and August this year was higher than in normal circumstances.

15. According to KCRC's analysis, most of West Rail's axle counter failures relating to lightning strikes happened on the viaduct but there were no similar cases on Ma On Shan Rail. It is because the viaduct of Ma On Shan Rail is situated between the high-rise buildings, thus less likely to be affected by lightning strikes.

Improvement Measures

16. KCRC fully understands the public concern over the incidents and has engaged a specialist to undertake a comprehensive review of the earthing arrangements of the West Rail network and the lightning protection system and to propose corresponding improvement measures. The Corporation will invest about HK\$ 10 to 20 million to improve the earthing system, including increasing the number of earthing devices and the separation of the earthing system for signalling system and rolling stock electricity supply with a view to minimising disturbances. This is expected to complete before the rainy season next year.

17. Other improvement measures include: -

- To restructure the hardware components of the signalling system to shorten the investigation time and speed up the recovery.
- To increase the stockpile of spare parts at strategic locations in order to reduce transportation time and speed up recovery in case of incidents.
- To install remote monitoring system at the control centre to monitor the functioning of the major facilities and minimise investigation time in the event of failures.
- To tie in with the construction of the Kowloon Southern Link, use optical fibres to further reduce the disturbance of earthing currents on the signalling system.
- To reinforce the manpower of the signal recovery team. It is estimated that the recurrent expenses each year will be about \$3 million.

Passenger Information

18. To let passengers obtain the information on the service impact as early as possible for planning their journeys, KCRC will further improve the information dissemination mechanism to provide accurate and comprehensive information. Measures include:

- At the initial stage of any incidents causing a service delay of 8 minutes or more, KCRC will designate staff to inform the travelling public about the impact on service through the electronic media.
- KCRC will include the waiting time and the total travelling time in the assessment of service delays, and add a buffer time. In addition, we will announce the travelling time on the busiest section between Tin Shui Wai and Mei Foo Stations and keep passengers posted of the latest information.
- We will update the information continuously through electronic media and by public announcements at stations

and inside train compartments to report the latest situation.

Conclusion

19. The Corporation will continue to improve the railway services and adopt appropriate improvement measures to ensure the safe and reliable operation of West Rail and other railways.

Kowloon-Canton Railway Corporation
September 2005