Legislative Council Panel on Transport
Subcommittee on matters relating to railways
Special Meeting on 18 January 2006

KCR East Rail Train Incident on 21 December

Purpose

On 21 December 2005, an East Rail train failed while in operation. Following examination, it was determined that the welding of mounting brackets of a compressor was partially loose. After the incident, KCRC also conducted detailed checks of other components and found that there were minor cracks in the welding of mounting brackets for some components. This paper provides Members with information about the incident, the result of KCRC's preliminary investigation and mitigation measures taken by the Corporation.

Background of Incident

2. On 21 December 2005, the warning light in the driving cab of a southbound East Rail train was lit while it was passing through the Science Park area, denoting the failure of a train component. At the same time, a staff member also detected noise coming from the underframe of the train. The train driver informed the Control Centre immediately. Arrangements were made to disembark all passengers at Fo Tan Station for transfer to another train. Other East Rail train services were not affected.

3. KCRC immediately arranged for engineering staff to conduct an on-site examination. It was found that a compressor under one of the train compartments was partially loose. It was believed that the compressor had hit other underframe component thus generating the noise.

Immediate Follow-up Actions

4. The train was returned to the depot for further inspection and KCRC immediately conducted inspections of compressors and other major components on all trains. No other compressor, or other component was found to be loose.

5. In the two days following the incident, KCRC further performed non-destructive testing on all 116 compressors on its fleet. Cracks were discovered in the welding of mounting brackets of nine other compressors. All

compressors in question were replaced or repaired within two days. In order to reinforce the integrity of the compressor, a metal cradle was added to all compressors within the following week.

6. KCRC also conducted detailed examination of other major components. Minor cracks were found in the welding of mounting brackets of some major components. KCRC has commissioned an independent laboratory to investigate the cause of the cracking issue and immediately liaised with the train manufacturer to look for ways to resolve the issue and to ensure the structural integrity of all components. On 10 January, an Independent Review Panel was set up to conduct detailed investigations and make recommendations on the mitigation measures.

Examination

7. There are a total of about 8,000 underframe components of 23 categories, among which 13 (including the compressors) are major components and 10 non-major. The classification is based on the weight, shape, size and the position of the components.

8. KCRC has started to conduct non-destructive testing (NDT) of the welding of mounting brackets of all the components. The examination of the major components will be completed by 20 January. For the other non-major components, the examination is expected to be completed in end May.

9. As at noon 17 January, cracks were found in the welding of mounting brackets of a total of 10 categories of major components and in the welding of mounting brackets of seven categories of non-major components. Details are appended at Annex 1.

Mitigation Measures

10. Short-Term

- Metal cradle was added to all compressors.

- Industrial-use belts were added on all other major components including those in which with no cracks were found. The industrial-use belts can support at least three times the weight of the component. The works were completed on 12 January.

- By the end of January, belts will be added on two other categories of non-major components.

- The integrity of the major components and belts is examined every 48 hours by visual inspection and a hammering test is also conducted. Should any irregularities be found, cracks can be identified immediately and replacement or repairs can be done.

- Starting from 15 January, all East Rail Trains have been switched to manual operation by drivers under the monitoring of the Automatic Train Protection (ATP) system.

- In order to reinforce the integrity of other major components with minor cracks, necessary metal cradles will be added or components repaired (except for the main transformers). The work will be completed by 26 January.

- The Independent Review Panel and the train manufacturer are expected to have preliminary findings by the end of January. They will make recommendations on the improvement measures and conduct an in-depth investigation to look for the root cause.

11. Long-Term

KCRC will implement the long-term improvement measures as recommended by the Independent Review Panel and will complete all component reinforcement work as soon as practicable.

Independent Review Panel

12. KCRC appointed an Independent Review Panel on 10 January comprising several experts to conduct an in-depth study of the problems and suggest improvements. The Panel is chaired by Mr Edmund K. H. Leung, former Chairman of the Hong Kong Institute of Engineers. Members include Ir Professor S. L. Ho, Chair Professor of Electricity Utilisation, Department of Electrical Engineering of the Hong Kong Polytechnic University; Ir Professor T. M. Yue, Professor, Department of Industrial & Systems Engineering of the Hong Kong Polytechnic University; Ir Dr K Y Sze, Associate Professor, Department of Mechanical Engineering of the University of Hong Kong; and Mr Eric S. W. Tam, Assistant Technical Manager of ETS-Testconsult Limited.

Investigation

13. The Independent Review Panel commissioned by KCRC has begun looking into the problem from four aspects, namely, the rate of change of the acceleration and deceleration of trains, the welding of components' mounting brackets, the profile of the track and train wheels as well as the suspension system. The experts concluded, on a preliminary basis, that the problem was possibly due to the following factors:

a. Since the full introduction of Automatic Train Operation (ATO) on the East Rail system in 2003, the rate of change of acceleration and deceleration resulting from ATO driving added stress to the underframe components. In order to contain the situation, starting from 15 January, all East Rail Trains have been switched to manual operation under the safety protection of the Automatic Train Protection (ATP) mode.

b. The welding of the mounting brackets of major components has cracks. KCRC has plans to conduct additional welding on the mounting brackets again. However, the schedule and the priority can only be set out after a detailed assessment is carried out.

c. The profile of the track and the wheels on some track sections may need fine-tuning for good compatibility. This will cause excessive vibration when the trains pass these sections. KCRC will take some time to collect relevant statistics and conduct analysis before the cause can be identified.

d. The relationship between the suspension system and the vibration of running trains.

Current Service

14. After switching the train operation to ATP mode, the total travelling time between East Tsim Sha Tsui and Lo Wu has been extended by 1.5 minutes from 41 minutes to 42.5 minutes. The total number of hourly runs during the morning peak period has decreased from 24 to 23. Service frequency in the non-peak hours and the evening peak period will not be affected. Through trains and freight services are also not affected.

15. On 16 January, the first working day for East Rail trains operating under ATP, service was running smoothly and the number of passengers

travelling on East Rail was similar to normal days. KCRC has deployed additional manpower and maintained close communication with the Transport Department to closely monitor train services and plan contingency measures.

Reporting

16. KCRC had informed the Hong Kong Railway Inspectorate on the following day (22 December) following the loosened compressor incident happened. The Inspectorate requested for a written report on the incident on 21 December from KCRC, and KCRC agreed to submit a report upon completion of investigation.

17. KCRC later found cracks on other components and completed a preliminary investigation on 9 January and reported to the Chairman on the same day. At the same time, KCRC planned to report the matter to the Railway Inspectorate at its regular meeting on 10 January.

18. On 10 January, KCRC informed Members of the Managing Board of a special meeting to be held on the following day. The Railway Inspectorate immediately visited the maintenance centre.

19. The KCRC Managing Board held a special meeting on 11 January and received a report from the management. The Management Board accepted the assessment results submitted by the Independent Review Panel and the train manufacturer, and concluded that the East Rail fleet was safe for operation.

20. KCRC issued a press release in the night of 11 January to inform the public about the incident and improvement measures taken. A press conference was held in the morning of 12 January to report on the train operation arrangements and the improvement measures taken.

21. On 14 January, KCRC received the latest information from the Independent Review Panel and organised a press conference in the evening to announce details on the latest findings, figures on the component checking and contingency service arrangements. At the same time, KCRC undertook to release the updated figures on the component checking to the major underframe components on a daily basis, until the completion of detailed checking on 20 January.

Conclusion

22. The Independent Review Panel has further reviewed the temporary measures taken by KCRC. It agreed that train operation would be safe if visual inspection and hammering test are done every 48 hours to ensure no major cracks are found in the components. In addition, the belts are inspected every 48 hours to ensure that their reliability as a secondary safety protection measure. The Independent Review Panel agreed that since KCRC had accepted all recommendations made by the Panel, it had taken all necessary interim precautions to ensure the provision of safe train services. The manufacturer has also reaffirmed that the measures adopted by KCRC can guarantee safe operation and the East Rail fleet can continue to operate.

23. KCRC is confident that the root cause of the cracks can be identified by the end of January. By then KCRC can confirm the measures on strengthening the integrity of all components and the programme and schedule for permanent measures to solve the problem.

24. KCRC will continue to closely monitor the safety of train operations. KCRC will keep close liaison with the Transport Department and relevant departments, and to adopt contingency measures during incidents as required to cater for passengers' needs.

Kowloon-Canton Railway Corporation
January 2006

As at 17 Jan Major Item	Total	No. of cracked equipment found after NDT		Progress of applying nylons	Progress of installing secondary support
		No. of equipment inspected	No. of equipment with crack found		
DC Equipment Case	59	16	2	59	0
Main Equipment Case	57	57	18	57	12 out of 18
Main Compressor	116	116	10	N/A	Completed
MA Set	116	116	31	116	0
MA Converter Case	116	93	15	116	75 out of 84
Auxilliary Equipment Case	116	116	72	116	(5 repaired)
Main Transformer	116	33	<2>	116	0
Battery Charger	84	22	0	84	0
Battery Box	336	76	1	336	0
Cab Air Conditioning Unit	58	10	3	58	0
Compressor Choke	116	116	8	116	0
MA Choke	116	34	0	116	0
Smoothing Inductor	59	23	0	59	0
Total	**1465**	**828**	**162**	**1349**	
Non-major item					
Traction Motor Mounting	464	24	0	---	
Brake Unit	348	27	1	---	
Main Reservoir	792	54	12	By 31/1	
Auxiliary Reservoir	116	38	1	---	
Surge Suppression Reservoir	1392	90	23	---	
Wheel Slide Unit	348	27	1	---	
Brake Caliper	2784	144	0	---	
APC Antennae	116	12	1	---	
Resistor Case	116	5	0	---	
Rectifier Case	59	7	1	59	
Total	**6535**	**428**	**40**	**59**	

Remark:

<> Represents upper mounting bracket.