

# **Technical Investigation Report on Escalator Incident**

## **at the Hong Kong Design Institute, Tseung Kwan O**

### **Introduction**

In the afternoon of 24 February 2011, at around 12:38 hours, escalator steps of the Escalator No.E4 were reported jamming at the Hong Kong Design Institute at Tseung Kwan O. This caused the subsequent steps unable to move out from the upper comb plate, leaving steps gap outside the upper comb plate. The jamming of the steps caused the activation of the chain tension switch and stopped the escalator. No person was injured in this incident. EMSD officers arrived at scene at around 15:00 hours and carried out investigation on the same date.

### **Background**

2. The escalator was installed in 2009 by ThyssenKrupp Elevator (H.K.) Limited (TKE). It is driven by two electric motors with rated speed at 0.5 metre per second (m/s). It serves from 1<sup>st</sup> to 7<sup>th</sup> floor of the building with a vertical rise of 25.75 meters.
3. The maintenance of the escalator has been provided by TKE since 2009. The last periodic examination of the escalator was conducted by a Registered Escalator Engineer of TKE on 8 October 2010.

### **Investigation and Findings**

4. In this escalator, each step is attached to two rollers on each side. One roller, known as the step chain roller, is connected to the step chain by means of a step bolt. The step arm is engaged on a hollow axle and secured in position by fastening the lock nut with a tab washer (see Photo No. 1 in Appendix A). The other roller is known as an idle roller resting on the guide rail of the escalator.
5. Inspection by EMSD found that 10 escalator steps were jammed in the upper landing return station of escalator no. E4. The first jammed step, namely step no. 24, was under the comb plate at the upper landing (see Photo No. 2 in Appendix A)

and the step bolt was found broken. No hollow axle with the step roller was attached on the step arm on both sides of the step no. 24 (see Photo Nos. 3 and 4 in Appendix A).

6. Since no foreign objects were found on site, the cause of step jamming by foreign objects is excluded.

7. Deflection measurement of the supporting structure of the escalators was completed on 20 April 2011. Based on the results of the on-site deflection measurement provided by the structural consultant engaged by Vocational Training Council, the supporting structure of the escalators was found to be in a good condition.

8. EMSD engaged an independent expert to conduct examinations on the broken step bolts of step no. 24. No sign of material defects was found on the broken step bolts.

9. To evaluate the possibility on loosened connection of the lock nut and tab washer on both sides of the step, a simulation test was conducted by ThyssenKrupp Fahrtreppen (TKF), Hamburg in Germany. The test indicated that step would drop at the upper return station when the lock nut and tab washer of the hollow axle on both sides of the step were loosened completely. This also explained why the hollow axle on both sides of the step no. 24 was not engaged on the step arm after the incident.

10. It was concluded that the incident occurred when the step no. 24 became jammed in the upper return station. The jamming of the step no. 24 was caused by disengagement of the step arm from the hollow axle where the lock nut and tab washer were not properly secured in their originally designed position.

### **Remedial Action**

11. To prevent recurrence of a similar incident, EMSD requested TKE to enhance the safety checking procedures for escalator steps to prevent reoccurrence of similar incident. EMSD had stepped up the inspections for the escalators being

maintained by TKE. EMSD also reminded all registered escalator contractors to thoroughly inspect, maintain and examine the conditions of the escalators' step assembly during routine maintenance and periodic examination to ensure that all escalators are operated in safe working condition.

12. All the damaged steps of Escalator No. E4 were replaced by TKE. Full load brake test was completed for Escalators on 21 April 2011. TKE had checked all step assemblies for the escalators in Hong Kong Design Institute. The escalators will resume operation after thorough examination and certification by registered escalator engineer.

### **Follow-up Action**

13. EMSD will seek the Department of Justice's legal advice on whether there are any persons or parties liable for the incident under the Lifts & Escalators (Safety) Ordinance. If there is sufficient evidence showing that there are persons/parties liable, EMSD will take necessary legal action.

Electrical & Mechanical Services Department

9 June 2011

Appendix A – Photos

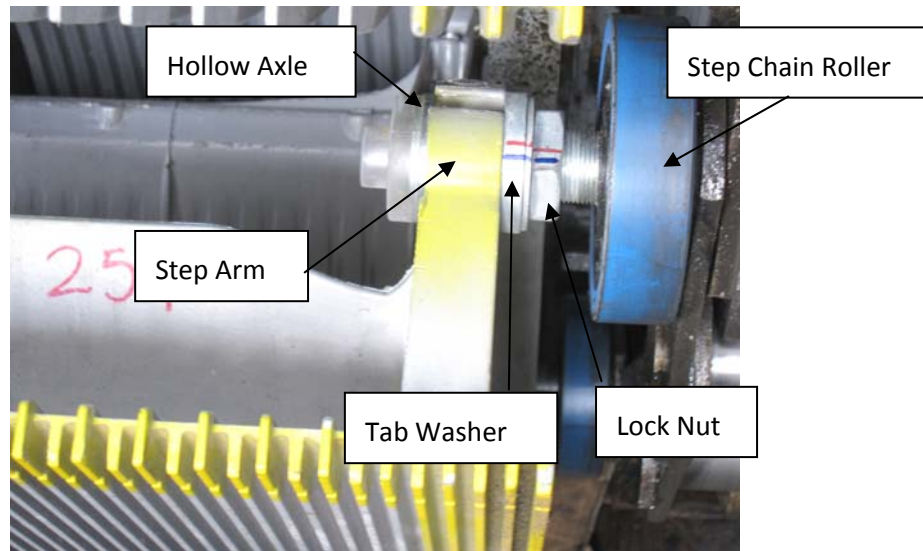


Photo 1 – Step Assembly



Photo 2 – First jammed step (step no. 24) below the comb plate at upper landing.

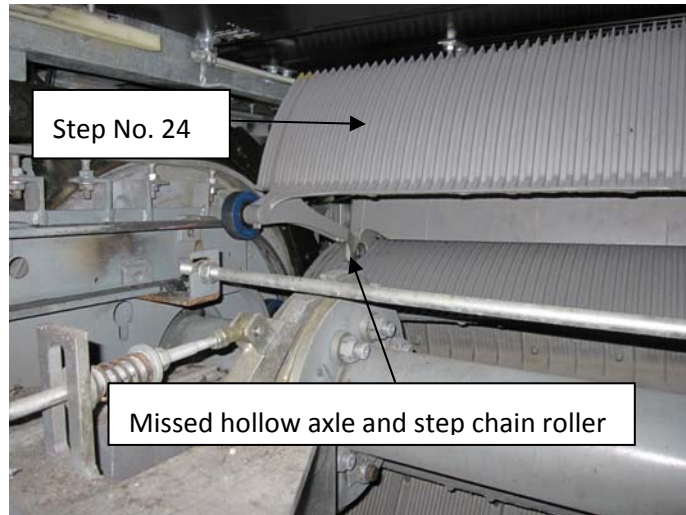


Photo 3 – The hollow axle and step chain roller were found missing  
from the left hand step arm

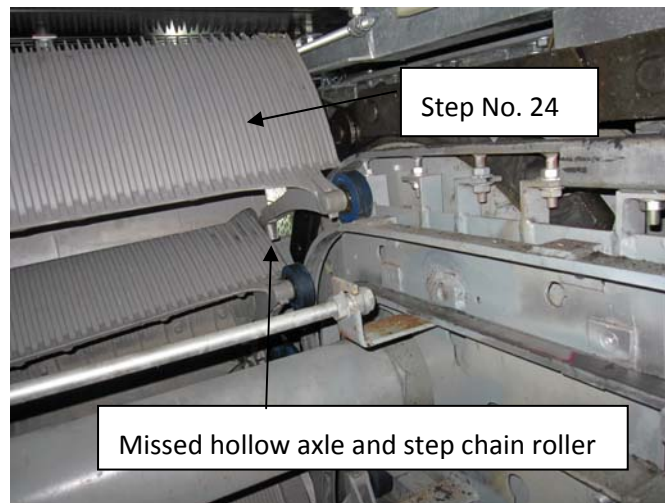


Photo 4 – The hollow axle and step chain roller were found missing  
at the right hand step arm