

資料文件

立法會交通事務委員會  
鐵路事宜小組委員會

廣深港高速鐵路香港段  
石崗列車停放處維修車庫列車車輪偏離路軌事件

**(I) 引言**

1. 於二零一八年四月三日，一名香港鐵路有限公司（簡稱「港鐵公司」）職員於廣深港高速鐵路香港段（簡稱「高鐵」）石崗列車停放處維修車庫巡查時，發現一架列車尾卡兩個轉向架的其中四個車輪偏離第四號維修路軌。

2. 事後，港鐵公司在高鐵項目列車供應商的鐵路專家及獨立鐵路專家的協助下作調查。港鐵公司在二零一八年五月二十八日，就事件原因及建議跟進措施，向政府提交調查結果（見附件一，只備英文版本）。

3. 本文旨在向委員會敘述事件序列、即時處理及復修安排、調查結果與及相關的跟進工作。

**(II) 事件序列**

4. 二零一八年四月三日晚上約九時十五分，一名港鐵車廠職員於巡查時發現上述車輪偏離路軌情況，港鐵公司管理層隨即將有關事件通報機電工程署鐵路科。港鐵公司於翌日四月四日凌晨約二時十五分就事件主動發新聞通告（見附件二）。

5. 現場隨即作圍封，以配合港鐵快速應變隊及內部專家的調查及復修安排。翌日（即二零一八年四月四日），列車供應商中車四方車輛有限公司（簡稱「四方」）的專家，以及澳洲 Monash University 鐵路技術研究所的獨立鐵路專家（簡稱「獨立鐵路專家」）亦到場協助調查。

6. 為謹慎起見，港鐵公司在事件發生後隨即暫停高鐵列車的試運行，並停用維修車庫第四號維修軌道，並於二零一八年四月四日下午主動安排會見傳媒及發放另一份新聞通告（見附件三），就事件提供進一步的資料。

7. 作好相關紀錄後，涉事列車尾卡的車輪已於二零一八年四月五日重新扶正，列車亦調動至第四號維修軌道的北端。

8. 詳細的事件序列見附件一之調查結果第十至十一頁。

### **(III) 初部調查及恢復高鐵列車試運行**

9. 根據調查結果顯示（見附件一），於維修車庫第四號維修軌道平交道至相關列車尾卡轉向架之間的一段軌道現場所錄得的軌距為介乎 1,436 毫米至 1,525 毫米（超過標準軌距 1,435 毫米可容許+8 毫米或-6 毫米的容差），這是導致尾卡四個車輪偏離原有位置的原因。同時，在離開半徑 180 米曲線彎道與直軌接點 1.65 米處右邊路軌位置發現有車輪向下偏移痕跡。

10. 四方的專家就涉事列車進行檢查，確認除車身及尾卡兩個相關的轉向架因車輪偏離軌道而造成輕微損毀外，並未有其他異常狀況，而涉事列車亦符合高鐵項目運行所需規格。

11. 港鐵公司安排特別檢查維修車庫第一號至第三號維修軌道，並確認其軌距符合標準。維修車庫第四號軌道於工字鐵承托結構上有一段短而彎的軌道，而第一至三號軌道為直軌。負責石崗列車停放處軌道工字鐵及其承托軌道結構裝置的詳細設計顧問，同時就維修車庫第一號至第三號軌道進行了詳細結構分析，確認第一至三號軌道相關承托結構裝置可承受實際高鐵列車荷重。

12. 獨立鐵路專家經現場調查後，認為事件是由於石崗列車停放處維修車庫內第四號維修軌道位置的獨特性，與工字鐵承托結構裝置上有一段短(約 6.6 米)而彎的軌道相關。

13. 基於事件結論確認與高鐵列車的試運行無關，在相關政府部門無異議的情況下，高鐵列車的試運行於二零一八年四月十三日起恢復，惟維修車庫第四號維修軌道繼續暫停使用。同日，公司亦發放第三份新聞通告，向公眾提供進一步的資料(見附件四)。

#### **(IV) 事件成因**

14. 現場證據顯示，支撐該段相關軌道結構的工字鐵出現移位及輕微變形。

15. 維修車庫第四號維修軌道總長 435 米，而涉事位置為一段 6.6 米長、半徑 180 米的彎道。港鐵公司調查委員會及獨立鐵路專家均指出，即使高鐵列車以低於每小時 8 公里的極低速駛過該段軌道時，對承托路軌的工字鐵結構裝置會產生相對較大的橫向壓力。

16. 調查委員會向詳細設計顧問了解，該顧問公司表示當時認為列車經過第四號維修軌道一小段彎位時產生的橫向壓力非常輕微，因此維修倉庫內四條維修軌道的「工字鐵」及其結構裝置均採用相同設計。惟現時證據顯示，列車車輪行經第四號維修軌道時實際所產生的橫向壓力超過原先設計的假設，是導致事件的根本原因。

## **(V) 改善措施**

17. 為杜絕事件再次發生，港鐵公司現正為維修車庫第四號維修軌道該段彎道制定改善措施，建議在該段彎度軌道，以兩幅鋼筋混凝土矮牆取代，強化原有的工字鐵及垂直支撐。改善措施完成後，軌道結構將可承受實際的橫向壓力，而維修工作仍可於列車下方進行。

## **(VI) 結論**

18. 港鐵公司及獨立鐵路專家均總結事件成因與列車停放處維修車庫內第四號軌道的獨特性有關，其獨特軌道結構引致這次列車車輪偏離軌道事件。而高鐵項目其餘位置並無類似的高架彎度軌道路段。

19. 根據事件發生後所進行的調查，及就項目正綫路軌及維修車庫內其餘維修軌道完工狀況的詳細檢視，確認高鐵項目其餘範圍並不存在引致這次事件的狀況。高鐵的正綫路軌亦按國際高速鐵路的標準設計及建造。

20. 港鐵公司將會向政府提交改善措施的正式建議，待相關審視後才落實。並會朝著二零一八年九月如期通車的目標，繼續試營運工作。

港鐵公司

二零一八年五月

附件一 (只備英文版)

**Investigation Results on**

**Shek Kong Stabling Sidings**  
**Running Maintenance Shed Track No. 4**  
**Wheel Shift Incident**  
**of Guangzhou-Shenzhen-Hong Kong**  
**Express Rail Link (Hong Kong Section)**  
**on 3 April 2018**

**Date: 27 May 2018**

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## **List of Contents**

### **1. The Incident**

### **2. Sequence of events**

#### **a) Incident reporting**

#### **b) Immediate actions and recovery measures undertaken**

#### **c) Post-incident initial investigation and resumption of trial running of XRL trains**

### **3. Root Cause of the Incident**

### **4. Conclusions**

### **5. Recommended Improvements**

**Annex 1 - Diagram showing the position of the train wheels**

**Annex 2 - Sequence of events for the Incident on 3 April 2018**

**Shek Kong Stabling Sidings  
Running Maintenance Shed Track No. 4 Wheel Shift Incident  
of Guangzhou-Shenzhen-Hong Kong Express Rail Link  
(Hong Kong Section) on 3 April 2018**

**1. The Incident**

1.1 At around 2115 hours on 3 April 2018 (Tuesday), an MTR depot staff member found that four wheels on two bogies of the last car of Train 0256 had shifted out of position at the Running Maintenance Shed (“RMS”) Track No. 4 in Shek Kong Stabling Sidings (“SSS”) of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (Hong Kong Section) (“XRL”). Upon investigation, it was found that the incident occurred at around 1930 hours when the incident train was shunted back to RMS.

1.2 The train wheels position immediately after the incident took place is shown diagrammatically in **Annex 1**.

**2. Sequence of events (see Annex 2)**

2.1 The key sequence of events for the incident can be broadly divided into three series of actions.

a) **Incident reporting**

The on-duty Depot Yard Master (“DYM”) was conducting inspection on a working team between RMS Track No. 3 and 4 at around 2115 hours when he found that four wheels on two bogies of Train 0256 coach No. 1 (last car of the train) stabled at RMS Track No. 4 had shifted out of position. He immediately informed the Depot Engineer who confirmed that four out of eight wheels had shifted out of position and the incident was

immediately reported to the Depot Manager and other senior managers within the MTR Corporation (“the Corporation”) in accordance with the protocol. Although the incident only occurred within the maintenance area (not accessible to the public), after due considerations of the situation, the Electrical and Mechanical Services Department – Railway Branch (“EMSD-RB”) was notified at 2200 hours.

**b) Immediate actions and recovery measures undertaken**

The MTR Rapid Response Units and in-house experts on rail investigation were mobilized in accordance with the protocol after the incident was reported. The site was immediately cordoned off and traction current on RMS Track No. 3 and 4 was switched off to facilitate investigation and recovery actions. The Corporation set up an investigation panel (“the Panel”) which carried out a detailed investigation to identify the cause of the incident. The Corporation notified the train manufacturer CRRC Qingdao Sifang (“Sifang”) of the incident, and Sifang confirmed that a team of experts would arrive by air on the following day (4 April 2018) to assist with the investigation and recovery. The Corporation also invited an independent railway expert from the Monash University Institute of Railway Technology (“IRT”) to assist in the investigation. The Corporation temporarily suspended the trial running of XRL trains and the use of RMS Track No. 4 pending the results of further investigation and safety assurance. After the initial investigation as well as a number of recovery actions and safety checks at the incident site, the wheels of the last car of the incident train were re-positioned and shunted towards the northern end of RMS Track No. 4 in the early morning of 5 April 2018.

**c) Post-incident initial investigation and resumption of trial running of XRL trains**

On-site measurements by the Corporation’s in-house experts on rail investigation revealed that the track gauges over the affected section in RMS Track No. 4 ranged from 1,436mm to 1,525mm (exceeding the



standard dimension of 1,435mm with +8mm/-6mm tolerance), causing the wheels shifted out of position. The location of the wheel drop point on the right-hand side rail at 1.65m from the tangent to the 180m radius curve was identified. Slacking of the I-beam in the elevated track section for the left-hand side rail was found.

The experts from Sifang inspected the incident train and confirmed that there was no anomaly except the slight damages to the car body and the two concerned bogies on last car of the incident train which were caused by the wheel shift incident. Sifang subsequently concluded on 17 April 2018 that the incident train conformed to the operational requirements of XRL and the train did not contribute to the cause of the incident.

The independent railway expert from IRT conducted site investigation and was of the view that the incident had occurred in a site-specific situation that is unique to RMS Track No. 4 at SSS. The expert had taken rail and wheel profiles, track alignment measurements from the incident site and car dimensions related to the incident. IRT has confirmed that they concur with the Corporation's findings that this incident is a site-specific issue.

There are four maintenance tracks at RMS. Following the incident, the Corporation installed video camera to check the wheel running condition and confirmed that there is no flange contact to push against the rail head on the other three maintenance tracks which are straight without any curve.

A special track inspection which measured RMS Track No. 1-3 was conducted by the Corporation's maintenance department and it was confirmed that the track gauge is within acceptable maintenance limit. The relevant construction records for the rails and track supporting structures of the four maintenance tracks in RMS were checked and reviewed by the Corporation's project management team with no anomaly identified.

The results of a detailed structural analysis for RMS Track No. 1-3, i.e. straight track, conducted by the Detailed Design Consultant, Ove Arup & Partners (“ARUP”) confirmed that the supporting structure assembly can cater for the actual loading of XRL trains on RMS Track No. 1-3.

It was concluded that the incident did not have any correlation with the trains, the rail including the mainline and RMS Track No. 1 - 3 which are all in good condition. The Corporation obtained no objection from the relevant Government department to resume trial running of XRL trains starting from 13 April 2018 except that RMS Track No. 4 will continue to be suspended for use until further notice.

Meanwhile, the Corporation’s maintenance department continues to conduct manual measurement of track gauge in SSS until the completion of the RMS track modification works for the resumption of use without restrictions.

### **3. Root Cause of the Incident**

3.1 The RMS tracks involve two design parties. The running rail and rail fastenings were designed (and built) by the contractor responsible for the trackworks (P-Way). A separate Detailed Design Consultant, ARUP, was responsible for the design of the I-beam and supporting structure below the rail in the SSS. (See **Annex 1**).

3.2 The results of the technical investigation revealed that track gauges of 1,436-1,525mm, exceeding the 1,435mm +8mm/-6mm tolerance, were found at the incident track location on the elevated track support section of RMS Track No. 4. With the measured dimensions of the wheelsets all within their specifications and maintenance standards as confirmed by the experts from Sifang after the incident, the conditions of the track gauges explained how the four wheels of the incident

train had shifted out of position. The rail fastenings of RMS Track No. 4 were found to be securely in contact with the rail foot of both rails after the incident. The evidence on site indicated that the I-beams supporting the running rails above had been displaced and were slightly deformed.

3.3 While all four maintenance tracks rest on I-beam supporting structures to enable maintenance staff to carry out any necessary works underneath the trains, RMS Track No.4 is the only maintenance track which has a very short 6.6m long curved section with radius 180m at the incident location. The other three maintenance tracks are straight tracks. Both the Corporation's investigation panel and IRT are of the view that the unique track configuration with the existence of this curved section at the incident location on RMS Track No. 4 has a direct bearing on the incident, relatively high lateral forces have been exerted on the I-beam assembly structure supporting the track form even though trains pass through the section at a very low speed of less than 8kph.

3.4 The Panel has interviewed the detailed design consultant responsible for the design of the I-beam assembly structure supporting the maintenance tracks at RMS. It was identified that the consultant had assumed the lateral forces imposed on the short curved section of RMS Track No.4 would be insignificantly small and therefore adopted the same design for the I-beam assembly structure for all of the four maintenance tracks at RMS.

3.5 The actual lateral forces exerted by the train wheels at RMS Track No. 4 have exceeded the original design assumptions used by the detailed design consultant and this is considered to be the root cause of this incident. With repeated running of trains over that section since April 2017, the track support assembly eventually succumbed during the passage of the incident train on 3 April 2018.

#### **4. Conclusions**

4.1 The wheel shift incident involved only the unique track configuration at RMS Track No. 4 located at SSS. There is no similar elevated curved section along the

mainline tracks or anywhere else in XRL. The section of R180m curve measuring 6.6m is a small section of RMS Track No. 4 which has a total length of 435m.

4.2 The investigation of both the Corporation and the independent expert from IRT confirmed this is a unique site-specific issue at RMS Track No. 4.

4.3 With the conditions of the incident train confirmed to be all within specifications and maintenance standards together with the rails and rail fastenings found to be securely in place, they are ruled out to be the cause of the incident.

4.4 It is evident that the detailed design consultant's assumption of a very small lateral force on the structural track support system at this unique elevated curved track is not sufficient for the track supporting I-beam to withstand the actual lateral forces. This is supported by the displacement and slight deformation of the I-beam found at the incident site.

4.5 In the post incident investigation and thorough review of the as-built conditions of the mainline tracks and the other RMS Track No. 1-3, it is confirmed that the conditions leading to this incident do not exist anywhere else in XRL. The overall design and construction of the mainline are in accordance with established international high speed rail standards. After the incident, the Corporation has checked all tracks of the XRL, including the mainline and other maintenance tracks, and confirmed they are in good order.

4.6 The running maintenance tracks are located in an area that is out of bounds to the public and are used only by not-in-service trains which travel at very low speed. The deficiency of this unique elevated curved section of the RMS Track No. 4 was identified in the initial stage of XRL trial operations which began on 1 April 2018.

4.7 This incident occurred on a maintenance track inside SSS where trains operate at very low speed, hence the impact was low and there was no injury. This localised problem will be addressed vigorously and there is regular inspection and measurement to monitor and control the track gauge condition. Hence, there will be no impact on the XRL programme.

## **5. Recommended Improvements**

5.1 To prevent recurrence, the Corporation is now working on an improvement measure to strengthen the track support assembly on this curved section of RMS Track No. 4 so as to re-open RMS Track No. 4 for use. It is proposed to enhance the track support assembly at the curved section, by replacing the section of I beams and vertical supports with two reinforced concrete walls under the rails. With this enhancement, the structure can withstand the actual lateral forces while still allowing maintenance works to be carried out underneath the train. Formal submission of the design proposal will be submitted to relevant Government bureaus/ departments for their review before implementation.

# Annex 1

## Normal Wheel Rail Interaction

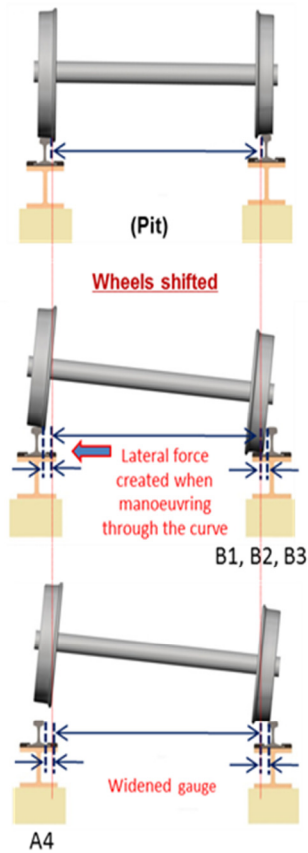
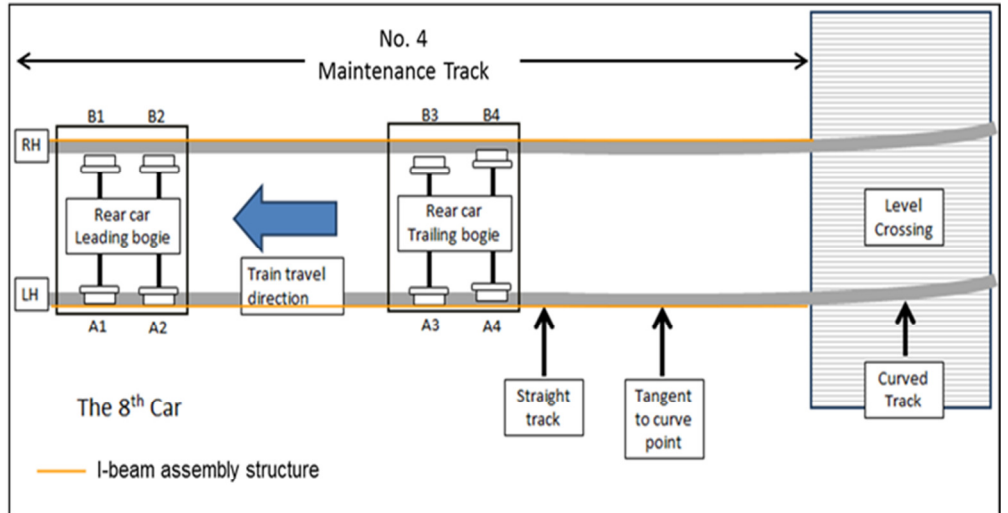


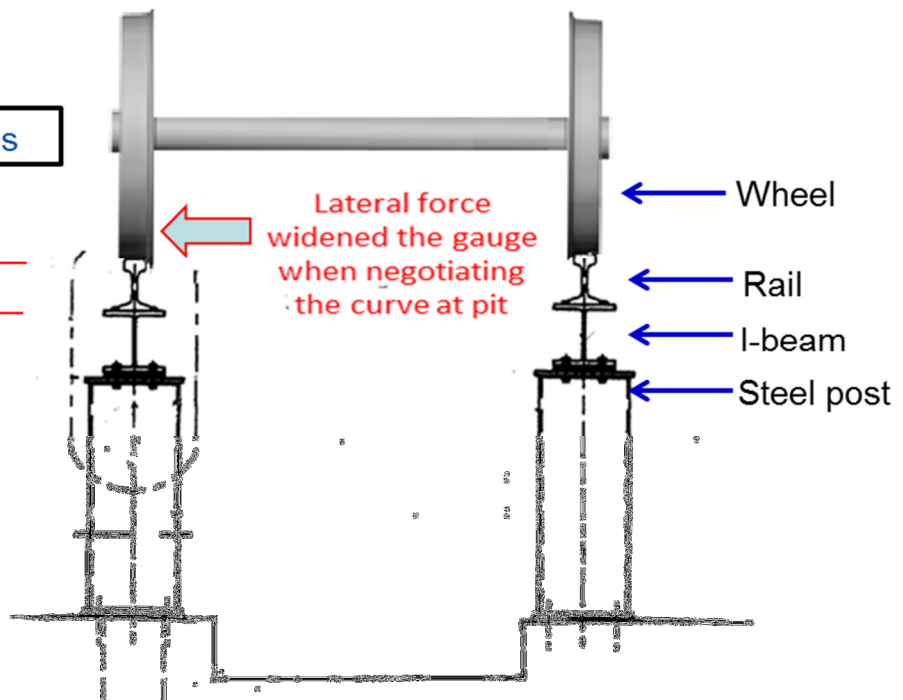
Diagram Showing the position of the train wheels



## Interface Parties

Rolling Stock  
 P-Way

Civil



## Annex 2

### Sequence of events for the Incident on 3 April 2018

Time	Event
<b>3 April 2018</b>	
1933 hours	Train 0256 moved into SSS RMS Track No. 4 for checking after completion of daily trial run.
2115 hours	DYM informed that, while he was on the way to carry out works inspection on a working team between RMS Track No. 3 and 4, he found that some wheels of two bogies of Train 0256 coach 01 (last car of the train) stabled at RMS Track No. 4 were not on the track. Depot Engineer carried out an immediate check and confirmed that four wheels had shifted out of position.
2120 hours	RS-RRU arrived at the incident site.
2200 hours	Notified EMSD-RB.
2245 hours	The Corporation's senior management arrived at the incident site.
2315 hours	EMSD-RB arrived at the incident site.
<b>4 April 2018</b>	
0215 hours	The first press statement on the incident was issued.
0230 hours	All parties left the scene except RS staff for on-site monitoring. RS staff were scheduled to discuss with Sifang for a proper recovery measure to reposition the train.
1330 hours	Sifang representatives arrived at the site for investigation.
1530 hours	Railway expert from IRT arrived at the site for investigation.

<b>Time</b>	<b>Event</b>
1730 hours	RS staff started to recover the two incident bogies to bring them back to track.
1845 hours	A media standup was held to provide information on the incident.
2030 hours	The two incident bogies were recovered on the tracks.
2100 hours	IMD started the track gauge inspection and adjustment.
2200 hours	The second press statement on the incident was issued.
<b>5 April 2018</b>	
0000 hours	The affected section of RMS Track No. 4 was re-adjusted to acceptable values and it was confirmed that RMS Track No. 4 was safe for train shunting at low speed.
0030 hours	MTR Projects team and Sifang inspected the train underframe and confirmed the train was fit to shunt.
0045 hours	Train 0256 was shunted towards the buffer stop at the end of RMS Track No. 4.

## Glossary

<b>DYM</b>	<b>Depot Yard Master</b>
<b>EMSD-RB</b>	<b>Electrical and Mechanical Services Department-Railways Branch</b>
<b>IMD</b>	<b>Infrastructure Maintenance Department</b>
<b>IRT</b>	<b>Monash University Institute of Railway Technology</b>
<b>RMS</b>	<b>Running Maintenance Shed</b>
<b>SSS</b>	<b>Shek Kong Stabling Sidings</b>
<b>RS</b>	<b>Rolling Stock</b>
<b>RS-RRU</b>	<b>Rolling Stock-Rapid Response Unit</b>
<b>Sifang</b>	<b>CRRC Qingdao Sifang</b>
<b>XRL</b>	<b>Express Rail Link</b>



**END**

## 新聞稿

### Press Release

新聞通告 二零一八年四月四日

#### 廣深港高鐵（香港段）石崗列車停放處

港鐵公司就昨天(二零一八年四月三日)晚上廣深港高速鐵路（香港段）石崗列車停放處一宗可能引起公眾關注的事情提供資料：

昨晚約九時十五分，車廠工程人員進行巡查時發現一列停泊於維修車庫的高鐵列車，其尾卡部份車輪偏離路軌，事件中無人受傷。該列列車昨日較早時進行試運行後，返回石崗列車停放處。

公司非常關注有關情況，將就事件進行詳細調查，並已通知機電工程署。

(完)

## 新聞稿

### Press Release

新聞通告 二零一八年四月四日

#### 廣深港高鐵(香港段)石崗列車停放處

港鐵公司就昨天(二零一八年四月三日)晚上廣深港高速鐵路(香港段)石崗列車停放處一宗可能引起公眾關注的事情提供進一步資料：

昨晚約九時十五分，車廠工程人員進行巡查時發現一列停泊於維修車庫的高鐵列車，尾卡其中四個車輪偏離路軌，事件中無人受傷。

公司非常關注事件，調查工作亦已經展開，包括邀請列車、軌道等專家協助調查，以了解事件原因。

經過初步調查，有關列車事發時運作正常，初步排除事件涉及列車或路軌因素。初步檢查亦顯示，第四號維修軌道有一個承托路軌的「工字鐵」有輕微變形，工程人員會循這個方向調查事件原因。調查期間，該維修軌道暫時停用。

現時車廠內仍有另外三條維修軌道，可供列車作維修之用，可應付列車試運行的需要。公司亦會檢查車廠內所有維修軌道，確保狀況良好。

至於其他試運行工作，例如車站系統及設備等，則不受影響。現階段事件對整體高鐵列車試運行及通車時間沒有影響，然而，公司會密切留意有關情況。

港鐵公司完成詳細調查後，會向有關政府部門提交報告。

傳媒查詢：

黃家俊先生  
傳媒關係高級經理  
電話：2993 3223

二十四小時傳媒查詢：  
電話：2212 2813

(完)

新聞通告 二零一八年四月十三日

**就廣深港高鐵(香港段)石崗列車停放處  
於四月三日發生的事件提供更新資料**

港鐵公司就上星期二(二零一八年四月三日)晚上廣深港高速鐵路(香港段)石崗列車停放處發生的事件，提供進一步資料：

港鐵公司非常關注事件，在事發後隨即展開調查工作以確定事件原因及避免再出現同類事件。廣深港高速鐵路(香港段)的列車試運行工作事後已即時暫停，而高鐵香港段其他試營運工作，例如車站系統及設備等則按計劃進行。

調查顯示，有關列車的前七卡車廂穩妥地停放在第四號維修軌道上，惟尾卡兩個轉向架的其中四個車輪偏離路軌，三個位於右邊的車輪向下偏移，而一個位於左邊的車輪則稍微升高。承托該段軌道的「工字鐵」及其結構裝置出現輕微變形，影響了路軌之間的寬度，車輪橫向偏離了路軌約 2.2 至 3.3 吋。(請參考附圖)

港鐵公司的列車及軌道專家，在高鐵列車供應商及獨立軌道專家的協助下展開調查。經過仔細檢查，確認列車及在石崗列車停放處的有關路軌事發時均狀況良好。

基於調查結果，專家相信事件成因與事發位置的獨特性有關，認為承托路軌的「工字鐵」及其結構裝置出現輕微變形，是因為該段軌道有一個獨特之處，就是第四號維修軌道由「工字鐵」及其結構裝置承托，而軌道走綫有一小段較彎的走綫。這是整個廣深港高鐵(香港段)唯一一個由「工字鐵」及其結構裝置承托的彎位路軌段。當列車慢速駛過該彎位前往車庫停泊時，會產生橫向壓力。承托路軌的「工字鐵」及其結構裝置經長期重複的橫向壓力，產生輕微變

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形，相關路軌之間的空間亦被拉闊，引致尾卡部分車輪偏離路軌；而第四號維修軌道是自二零一七年四月開始使用。

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港鐵公司亦確定廣深港高鐵(香港段)的所有路軌以及車庫內其他維修軌道的結構裝置均符合相關設計準則和安全規定而建造。所有新鐵路項目在投入服務前，均須經過嚴謹的試營運階段，確保設計能符合實際營運情況，並在有需要時作出修正才正式開始載客服務。

港鐵公司與工程設計顧問正著手制訂修正及加固有關路段「工字鐵」及其結構裝置的方案。四月三日在石崗列車停放處發生的事故與事發位置的獨特因素有關，該段由「工字鐵」及其結構裝置承托的維修路軌有一小段較彎的走綫。車廠內其餘三條維修軌道走綫均為直線，沒有彎位，經詳細檢查後亦確認全部狀態良好；而廣深港高鐵(香港段)的正綫路軌均牢固安裝在混凝土基座或軌枕上。正綫路軌無須於車底提供較大空間予維修之用，因此無須採用「工字鐵」及其結構裝置。

港鐵公司與相關政府部門已取得共識，可以恢復高鐵列車試運行。港鐵公司將於今天(四月十三日)恢復高鐵列車試運行工作。第四號維修軌道將繼續停用，直至完成相關改善工程。停用第四號維修軌道不會影響試營運工作。

在初步調查結果的基礎上，公司將繼續探討可強化第四號維修軌道的其他措施。待完成詳細調查後，港鐵公司會向有關政府部門提交報告，亦會在適當時間向公眾交代事件的調查結果。

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