This is a collation of some of the world’s railway formal inquiry reports. It includes a brief incident synopsis, along with the main causes and recommendations from each investigation. Readers may find some of the actions and recommendations useful to their own operations.

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**Key issues in this edition:**

- Safe systems of work
- Absence of COSS
- Safety culture and leadership
- Staff competence
- Wagon loading
- Signaller error
- Signaller supervision and management
- Failure to learn from previous incidents
- Point maintenance – and associated guidance
- Drainage management
- Shunting operations
Published 6 August

**UK: Track worker struck by a train at Stoats Nest Junction, 12 June 2011**

For the full report, click here: [LINK](#)

At 05:28, a Gatwick Airport–London Victoria service, travelling at about 60 mph, struck and seriously injured a track worker at Stoats Nest Junction. There was no damage to the train or infrastructure.

RAIB’s investigation revealed that the track worker did not move to a position of safety and remained in the path of the train as it passed the site of the work. Although one of the lines at the site had been returned to use shortly before the accident, having been closed as part of a possession, work continued in the vicinity, and no measures were put in place to protect personnel from the passage of trains on that line.

RAIB also listed the following causal factors:

- No safe system of work was put in place to protect staff from train movements on the Up Slow line after that line had been returned to traffic;
- The controller of site safety (COSS) was not present when the Up Slow was returned to traffic, and no replacement had been appointed;
- The engineering supervisor was aware that the COSS was not carrying out all his safety responsibilities and had left the site, but did not establish who was then responsible for the safe system of work; and
- The track workers did not hear any warning from the train as it approached.

RAIB listed the following underlying factors:

- The authority of the COSS was confused and undermined by the presence of more senior management on site. This adversely affected the implementation and maintenance of a safe system of work; and
- Network Rail’s national initiatives intended to address safety related behaviour of track maintenance staff had not yet reached the staff based at East Croydon depot.

**Learning point**

‘This accident forms an effective example for use in training material and briefings given to track workers and their managers, and for use in industry safety publications.’

**Recommendation**

- Network Rail should develop a time-based programme which expedites the implementation of its existing activities designed to improve safety culture and qualities of safety leadership for track maintenance staff and their managers. Activities covered by this programme should include steps to enhance the quality of safety leadership provided by the COSS, and to address the behaviour of managers when working on site such that this role of the COSS is not undermined.

Published 7 August

**Australia: Derailment of a ballast train near Broken Hill, NSW, 11 April 2012**

For the full report, click here: [LINK](#)

On 9 April 2012, a 34-wagon ballast train was driven to the Broken Hill ballast siding for stabling after discharging ballast as part of the Broken Hill–Parkes re-sleepering project. Once berthed, the consist was inspected to ensure that the wagon doors were closed and secured. The train was scheduled to be reloaded the next day, in order to continue working on the project.
At 09:00 (local time) on 10 April, a front-end loader began loading ballast into the wagons. To facilitate the process, a ramp was constructed from ballast adjacent to the track. This helped the loader operator to obtain the required height to access the top of the wagons. The filling procedure was to place a bucket load at each end of the wagon visually checking every bucket load to ensure that there was no discharge under the wagon. Once the operator was satisfied that the wagon was not discharging, he then finished loading it. The operator stated that he did not recall any of the wagons discharging ballast. The operator loaded all the wagons apart from six that were inaccessible due to obstacles next to the track.

Once the train crew arrived, the loader operator requested that they shunt the train to permit access to the remaining empty wagons. The loader operator noted that everything appeared to be normal as the train was being moved. He then proceeded to load the remaining empty wagons. The operator reported that he did not observe anything abnormal during the loading and movement of the wagons and noted that all the discharge doors were secured. Loading finished that afternoon and the train was stabled and the locomotives removed.

At around 03:00 (local time) on 11 April, the train crew arrived at the ballast siding and prepared the train for departure. As they did so, they observed that the middle door on wagon AHBY0001R was open and that a small amount of ballast had discharged from it. The amount was so small that the crew believed the wagon would be relatively full and still evenly loaded. They had no means to visually check inside the wagon as there were no safe vantage points to do so from above and there was no external lighting at the siding. As the discharged ballast was not fouling the wagon, the train crew completed their preparation for departure.

At 04:06 (local time), the train crew had received their authority to proceed and headed in an easterly direction towards Parkes to begin discharging ballast at various work sites. Shortly after, at approximately 04:09 (local time), the train crew noticed ‘dust and sparks’ coming from the rear portion of the train while it was traversing the Menindee Road level crossing. They stopped the train at the 1118.500 km point to conduct an inspection. They found that the 26th wagon, AHBY0001R, had derailed by both bogies. The train crew notified Network Control and then secured the train. Subsequent to the derailment, there was considerable track damage over a four-kilometre length. The derailed wagon sustained minor damage and was able to be re-railed. An inspection of the wagon after the derailment found that the load was uneven.

Safety message

- Uneven loading of ballast wagons increases the potential of derailment. In 2010, the Australian Independent Transport Safety Regulator (ITSR) released a Rail Industry Safety Notification (RISN) on the ‘operation of less than safely loaded wagons’. Although the notice refers to coal trains, some of the issues raised in the RISN are also applicable to ballast trains such as ensuring the appropriate wagon loading configurations are in place. To ensure wagons are evenly loaded, the rail operator’s procedures for checking the load distribution need to be followed and carried out to the required standard.

US: Collision between two Metromovers in Miami, Florida, 20 July 2010

For the full report, click here: LINK
At 17:39 (local time) on 20 July 2010, a Miami-Dade Transit (MDT) Metromover\(^1\) travelling at approximately 10mph struck the rear of another, which was then stopped at Brickell, near downtown Miami. There were a total of 45 passengers on board the two vehicles. Sixteen sustained minor injuries and were transported to local hospitals.

The National Transportation Safety Board (NTSB) determined the probable cause of the accident to be the MDT rail traffic controllers' decision to restart automated train operations without accounting for the location of all vehicles following a safety shutdown after the signal rail had been damaged by a defective Metromover guide wheel. Inadequate supervision and management was noted as a contributory factor.

**Post-accident actions**

**MDT has enhanced the safety of its computer shutdown and shutdown reset procedures.** In addition, it has improved its management oversight and equipment procedures, including:

- Developing and implementing annual refresher training of the shutdown reset procedure;
- Revising the computer shutdown procedure, verifying compliance by testing daily during non-passenger service hours;
- Conducting weekly radio communication audits with rail traffic controllers (RTCs) and Metromover maintenance personnel, in order to verify and improve communications and to verify compliance with and effectiveness of procedures;
- Requiring all Metromover RTCs to receive Metromover familiarization training; and
- Relocating the general superintendent, rail transportation office to the control centre to improve oversight and procedural accountability.

**Bombardier – Automated People Movers**

Bombardier has made, and continues to make, changes to specified requirements and procurement notes that include requalification of suppliers by first article inspection.

**Published 9 August**

**UK:** Container train accident near Althorpe Park, Northamptonshire, 18 July 2011

For the full report, click here: [LINK](#)

At 17:52, a partially detached metal panel on a container train struck the cab of a passing tamper, smashing its side window. The driver of the tamper subsequently reported seeing a similar panel on the trackside one mile further on. There were no reported injuries.

The panels were from two modified freight containers, which were fitted with power-generation equipment and were being exported overseas. The panels had covered two ventilation apertures in the container sides. They had been fitted as a temporary measure to help prevent water ingress during the sea voyage.

RAIB found the immediate cause of the accident to be that screws securing the panels had become loose during rail transit. This was initiated by a loss of the clamping force in the bolted joint because of the mechanical properties of a foam seal that was used. The manufacturer had ensured that the containers were approved in accordance with the International Convention for Safe Containers (the regulatory regime used for assuring the structural safety of freight containers used internationally and

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\(^1\) Metromovers operate in a fully automatic mode without human operators.

*Produced by RSSB*

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transported by surface means). However, neither the convention nor the manufacturer required a structural assessment of this bolted joint. The operational safeguards used to prevent unsuitable freight containers being carried on the railway relied on visual examination, and were therefore unable to identify the hidden structural defect.

RAIB listed the following causal factors:

- The loosening of the screws securing the transit plate that was initiated by a loss of preload in the bolted joints as a result of the continued compression of the polyethylene foam after tightening.
- Broadcrown, the designer and manufacturer of the power-generation units, did not require that the bolted joints were designed or assessed against an external load criterion, or consider their possible failure mechanisms. Broadcrown’s response to previous related incidents is a possible factor to this.
- The lack of a specific external requirement for the bolted joints to be independently assessed.

RAIB noted that it is possible the following was also causal:

- The reliance only on visual examinations when determining whether a freight container is fit to travel by rail.

RSSB listed the following ‘probable’ underlying factor:

- A probable underlying factor was the reliance on a regulatory structural assurance scheme (the CSC) that excluded any requirement to assess freight container attachments (such as the transit plates fitted to container CPIU 900609) against any foreseeable external load criterion.

Recommendations

- The Health and Safety Executive (HSE) should issue a safety bulletin to make manufacturers and users of converted freight containers aware of the need for a competent assessment of the adequacy of bolted joints, which are used to secure exterior attachments, when designing, modifying or repairing containers. It should also ask the organisations authorised to approve containers to cascade this information to their clients.
- The HSE should request that the International Maritime Organization issue a safety brief to all bodies authorised to approve freight containers in accordance with the International Convention for Safe Containers (ICSC). This should advise them of the need to consider the integrity of all exterior attachments, and their fixings, against all foreseeable in-service loads when approving new, modified or repaired containers.
- The HSE should request that the International Maritime Organization reviews international reports of structural detachment from freight containers and evaluates the risk to human life during transportation and handling. If appropriate, it should update the ICSC to include requirements for the integrity of all exterior attachments, and their fixings, against all foreseeable in-service loads.
- Freightliner should review its current operating procedures and conditions of acceptance for freight containers. It should confirm that the arrangements in place to ensure that containers (including any externally attached structures) have been assessed as having sufficient structural integrity are sufficient for the risk posed. This recommendation may also be applicable to other train operators that carry freight containers.
Published 30 August

UK: Derailment at Princes Street Gardens, Edinburgh, 27 July 2011

For the full report, click here: LINK

At about 17:52, an empty coaching stock formation derailed while traversing points in the Princes Street Gardens area, on the approach to Edinburgh Waverley. The leading bogie of the third coach of the three-car train derailed and travelled for approximately 110 metres. The incident occurred at slow speed and the train remained upright. The driver and conductor were uninjured. The derailment affected two lines, which were closed until 29 July 2011.

RAIB found that the first wheel to derail was not correctly steered by the moveable switch rail to the correct route. Instead, it climbed over the rail, pulling the other wheels on the bogie into derailment. The most likely cause was that the angle of the switch rail, possibly aided by an increase in friction, enabled the wheel to climb in this way. Three days prior to the accident, the left-hand switch rail had been identified as having the potential to cause derailment. Although it was worn beyond repair by grinding in accordance with the company standard, a grinding repair was attempted. The subsequent inspection process did not find the switch to be unsafe and it remained in service.

The leading left-hand wheel of the third vehicle climbed the switch rail in the first two metres from the switch toe. This was due to the unsafe profile of the switch rail and the presence of one or more derailment hazards. The decision not to impose a ban on facing moves on a switch that was beyond repair by grinding in accordance with the appropriate standard was also causal.

RAIB list the following as ‘probable’ causal factors:

- The grinding repair to the left-hand switch rail of points 167B did not restore an angle steeper than 60°;
- The former grinding supervisory manager (GSM) did not inspect points 167B in accordance with the procedure in the standard for post-grinding inspection to establish whether the switch was safe to be used for traffic;
- The former GSM did not properly inspect the switch in accordance with the standard at the follow-up inspection and the switch was allowed to remain in traffic; and
- The former GSM’s competence to inspect and repair switches in accordance with the standard had not been assured.

RAIB also note the following ‘possible’ causal factors:

- The grinding repair to points 167B was not scoped and therefore properly planned before the grinding team and the former GSM arrived on site and
- There was an increase in friction on the switch rail due to thinning lubrication and scoring from the recent grinding.

The underlying factors include that the maintenance of switches was driven by compliance within the safety limits of the standard rather than proactive re-building of worn switches by welding before the limits were reached. Furthermore, there is no guidance in Network Rail company standards about conditions that make it difficult, or impossible, to restore a switch to compliance with the standard by grinding.

Recommendations

- Network Rail should provide guidance on maintenance intervention limits and their application to manage wear on switch rails as part of its asset management strategy to reduce the likelihood of switches failing the standard and the risk of derailment.
Network Rail should carry out a thorough technical review of the standard to satisfy itself that it has a full understanding of how the standard addresses the following:

- The risk of derailment from worn wheels on a switch rail that is compliant with the TGP8 gauge;
- The practicability of achieving a 1:600 gradient when blending-out a grinding repair of switch rail damage, or for removing a derailment hazard 1; and
- The potential risk of a ramp being created by the introduction of a switch rail that is failing gauge 2 in the first metre, between a sideworn stock rail and wheel flange, particularly where the wheel flange is in flange contact with the stock rail.

In the short term, Network Rail should also review the scope for misinterpretation and inconsistent application of the standard’s requirements and take any necessary action, for example, through briefing and its competence management system, to ensure that there is a common understanding and application of the standard’s procedures for inspection and repair.

Network Rail should investigate potential improvements to the TGP8 gauge for conducting detailed inspections to the standard, or develop an alternative means for assessing the flange contact angle of switch rails. The aim should be to provide a more accurate and objective method for determining a non-compliant flange contact angle on a switch rail and which is more ergonomically suited to on-track conditions of use. Network Rail should then take steps to implement any improvements identified, or introduce any alternative assessment method, and train/brief staff as necessary.

Network Rail should consider whether the criteria specified in NR/L3/TRK/3510/A01 for the installation of automatic lubricators on switches should be extended to include the high rails of switches subject to sidewear in areas, such as the approaches to busy stations, where access for maintenance is limited, and where automatic lubrication could slow the development of sidewear and mitigate the risk of derailment.

Network Rail should review the actions taken in response to the recommendations in the RAIB report 44/2007 to identify why these were insufficient to prevent the recurrence of issues they were intended to address. The review should include an assessment of how operational expectations of availability for service influence the implementation the 053 standard and consider the need for a reappraisal of how derailment risks at switches are managed to prevent their recurrence in future.

UK: Derailment at Clarborough Tunnel, near Retford, Nottinghamshire, 27 April 2012

For the full report click here: LINK

At approximately 11:55, a passenger service ran into a landslip as it exited Clarborough Tunnel, near Retford. The train, formed by a Class 142, derailed. There were 17 passengers and two crew on board; the driver and one passenger were taken to hospital with minor injuries. The train suffered damage to its coupler and underframe equipment; several bodyside panels also came loose during the impact.

Learning points

- Crest drain management

  This accident reiterates the importance of correctly identifying and managing the risk from drainage of land outside of the railway’s boundary. Where the risk is not being effectively managed by the railway’s neighbour, the infrastructure manager will need to:

  - Identify drainage that is critical to the stability of the slope; and
Assess the adequacy of existing drainage, such that suitable arrangements can be established with neighbours to cover:

- The inspection and maintenance of drainage; and
- The identification and implementation of any necessary improvements.

Where such arrangements cannot be established infrastructure managers need to consider implementing measures on their own land to manage the risk.

This occurrence may indicate the need for Network Rail to review the prioritisation and planned timescales for implementing such actions.

- Minimising the degree of derailment
- RAIB has observed in several previous derailments that features of the bogie, underframe equipment and running gear have, following a derailment, engaged with the running rails and limited the degree of lateral deviation. RAIB has made recommendations to RSSB to consider the practicability of including design elements to limit the degree of deviation. However, RSSB concluded that it is inappropriate to recommend changes to the relevant standards, and the ORR accepted this position. The basis for RSSB’s conclusion is not fully detailed in the related RSSB report.

RAIB observes that in this derailment a feature of the running gear has again provided this function. RAIB believes there is a case for the industry to revisit its previous study and to carry out a more detailed assessment.

Recommendations

- None issued.

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Published 16 August – bulletin

UK: Incident at Margam Yard, near Port Talbot, 12 June 2012

For the full report click here: [LINK](#)

At approximately 10:50 on 12 June 2012, a member of staff was crushed between two wagons while carrying out shunting work on a maintenance siding at Margam Yard. He was seriously injured.

According to witness evidence, the designated person spoke to the victim about the proposed shunt move before he walked to the handbrake. The victim confirmed that he was clear of the wagons and that he understood the designated person was going to start the move.

The victim said that he was standing clear of the shunting operation, watching both wagons. However, very shortly before the wagons coupled, he moved to a position where he could concentrate on watching the stationary wagon. The grease mark on his overall shows that he was standing upright and very close to the track when he was crushed between the buffers. RAIB say it is probable that, when moving to concentrate on the stationary wagon, he misjudged his position or momentarily forgot about the moving wagon.

A reconstruction showed that, when walking to the handbrake and then standing at this position to instruct the forklift driver, the designated person could not have seen between the wagons. The forklift driver would also not have been able to see between the wagons.

Inspection of the buckeye couplings showed that they had engaged correctly, with a gap of about 150 millimetres between the buffers. Had they not engaged, it is possible that the gap between the buffers would have been about 30 millimetres and it is unlikely that the casualty would have survived.
Learning points

- Staff must never go between vehicles unless they are absolutely sure that the vehicles will not move;
- When working in a team, staff must never go between vehicles without reaching a clear understanding with the person controlling the movement of vehicles that it is safe to do so; and
- Shunting movements should involve only the minimum practical number of staff with other people remaining well clear of the movement.

Recommendations

- None issued.