



6. Safe design, operation and maintenance of on-track plant and trolleys

Purpose of this summary

The purpose of this document is to provide a repository of some of the most important areas of learning identified in RAIB's investigations to date, cross-referenced to relevant reports. It therefore provides a reference source for those looking to understand real-world railway safety issues and potential control measures.

When preparing this document, RAIB has selected those issues which:

- have recurred in different RAIB investigations
- have still to be fully addressed
- could be a factor in the cause of a fatal accident.

RAIB is aware that many of the issues raised have already been the subject of actions by duty holders when responding to RAIB recommendations or are in the process of being addressed. The inclusion of a topic in this document should not be taken to mean that no action has been taken in response to relevant recommendations. However, its inclusion indicates that RAIB is of the view that the issue still needs to be actively managed by duty holders.

The current status of each recommendation made by RAIB can be checked by reference to the [Index of RAIB recommendations](#), and details of the actions taken are published by ORR.

It is not the purpose of this document to quantify the risk associated with each of the identified safety issues. Readers seeking to understand the overall risk of harm associated with various dangerous events should refer to RSSB's Annual Safety Performance Report. This presents historical information on actual harm caused, and estimates of risk based on extensive modelling.

Overview

Adapting construction equipment for use on rails is not always straightforward. Machines that are designed to rely on a substantial 'footprint' formed by contact between rubber tyres and the surface of the ground may perform very differently when that contact is replaced by steel wheel on steel rail. Being unable to turn the machine round without removing it from the rails may also lead to unforeseen consequences for users. RAIB has investigated many incidents in which the people in charge of these machines have lost control of them on sloping sections of line, resulting in the machine running away downhill and sometimes colliding with other vehicles or buffer stops.

While the industry has made progress in controlling these risks (for example by mandating braking that is effective while vehicles are being on-tracked), there is still work to be done, in particular to ensure that safe operation is designed into machines when they are built or adapted for rail use.

Important areas for safety learning

The areas of significant concern to RAIB fall into the four main themes described below.

Road-rail vehicle braking

Road-rail vehicles (RRVs) are normally items of construction plant that have been constructed or (more usually) adapted to be able to operate either on roads (or on general construction site ground conditions) or on rails. They can be used as access platforms, excavators, cranes, spoil carriers or rail handlers, among other applications. There are several ways of achieving the dual road/rail traction and braking capability, and the safety systems associated with these have been the subject of considerable development in the years that RAIB has been operational.



RRV after running away into Glasgow Queen Street station.

It is important that, regardless of the type of system in use, the vehicle brakes are correctly adjusted and properly maintained. RAIB's investigation of an RRV runaway incident at Bradford ([report 01/2019](#)) found that the vehicle's brake pads were worn and the system had not been adjusted to compensate for this. The fitters who were responsible for carrying out maintenance were not following instructions and were not properly supervised or audited. Another runaway incident at Belle Isle Junction in London ([report 04/2022](#)) found that a valve had been left open after maintenance, rendering the brakes ineffective in certain circumstances. The possibility of this had not been recognised during the design or risk assessment of the vehicle, nor during operation or testing. We have found problems with the maintenance of RRVs and their associated trailer vehicles in the past ([report 03/2018](#) and [report 15/2014](#)), and made recommendations covering the safety management and quality assurance systems used by plant hire companies.

Operator competence

Even when vehicles have had properly maintained brakes, runaways have still occurred. Our investigations have found that machine operators and machine controllers did not know how to safely carry out the process of moving the machine on and off the track. These operations involve raising and lowering the road and rail wheels, and it is important that this is done in the right sequence to ensure that there is sufficient braking available at all times. In both the runaways at Bradford that we have investigated ([report 01/2019](#) and [report 09/2013](#)), the machine operators did not follow the correct procedure, and their competence was not properly managed. The investigation of an RRV runaway and collision at Glasgow Queen Street ([report 15/2014](#)) found that a machine operator had not followed the procedure he had been trained in, for reasons that could not be established.

RAIB has investigated two separate RRV collisions in Essex where compliance with procedures relating to maintaining vision of the line ahead and separation between the RRVs were factors ([report 08/2020](#) and [report 09/2022](#)). It is important that the employers of people who operate and control RRVs take action to ensure that their competence is properly managed, including the necessary training, instruction, supervision and monitoring.

Vehicle conversion



Ballast distributor RRV, and the view from the cab when running in reverse.

When vehicles that were originally designed for use on the road are adapted to run on railways, it is important that the conversion takes account of the conditions in the rail industry. In particular, it is often impracticable for rail-mounted machines to be turned round when they need to return to the place where they were originally on-tracked. This may mean that the machine will spend a large proportion of the time running in reverse. RAIB's investigation of a collision at Cholmondeston in 2018 ([report 08/2019](#))

found that the driver of a ballast distributor, converted from a dumper truck, had a very restricted view of the line when driving in reverse, and did not see another, smaller, vehicle on the line before they collided with it.

Compliance with the restriction placed on the machine, that its movements should always be controlled by a person on the ground when it was being driven in reverse, would have meant that it could not travel at more than 3 mph. This would have had significant implications for the efficiency of the work and should have been considered when this machine was selected as being suitable for the planned work activity.

Trolley and trailer braking systems

Trolleys are small four-wheeled vehicles used for transporting people, tools, equipment and materials in connection with work on the track. They are manually propelled, and in the past trolleys have been used without any form of braking system. More modern trolleys have spring-applied brakes which must be held released by the person in charge of the trolley. Although they may be small in size, the consequences of a runaway can be extremely serious. RAIB's investigations into trolley runaways have found that these braking systems are not always adequately maintained, or in some cases have been removed altogether ([report 18/2018](#), [report 13/2015](#), and [report 14/2012](#)). In a related incident, a trailer for carrying personnel became detached from the towing vehicle and ran away because the trailer brakes had been disabled ([report 03/2018](#)). We have recommended substantial improvements in the standard of maintenance of these vehicles, consideration of the conditions, if any, in which unbraked vehicles might be permitted to be used, and changes to the management of the competence of the people who operate and maintain such items of plant.

Rail industry's strategic safety groups

Relevant rail industry groups working in this field include the Plant Standards committee, which is responsible for Railway Industry Standards (RISs) covering the technical requirements and assessment of mobile plant used for the maintenance and construction of the railway infrastructure. Details of its work can be found at <https://www.rssb.co.uk/what-we-do/groups-and-committees/standards/industry-standards-coordination-committee/plant>.

The M&EE Networking Group is an industry-wide body representing infrastructure owners and standards owners, as well as plant suppliers, manufacturers and operators. Its role is to lead and influence how legislation, standards, procedures and guidance are implemented across the industry, through the production of Codes of Practice that define best practice. These codes of practice are disseminated via the [RSSB Standards Catalogue](#).

Relevant RAIB publications

- Class investigation into RRV runaways ([report 27/2009](#))
- Runaway and collision at Raigmore, 20 July 2010 ([report 10/2011](#))
- Runaway near Haslemere, 10 September 2011 ([report 14/2012](#))
- Runaway at Bradford Interchange, 25 March 2012 ([report 09/2013](#))
- Runaway at Glasgow Queen Street, 21 April 2013 ([report 15/2014](#))
- Runaway at Raven Crossing, 1 November 2014 ([report 13/2015](#))
- Runaway near Hope, 28 May 2017 ([report 03/2018](#))
- Collision with crossing gates at Ramsbottom, 15 March 2018 ([report 18/2018](#))
- Runaway at Bradford Interchange, 8 June 2018 ([report 01/2019](#))
- Collision at Cholmondeston, 19 September 2018 ([report 08/2019](#))
- Collision at Rochford, 25 January 2020 ([report 08/2020](#))
- Collision near Ramsden Bellhouse, 2 May 2021 ([report 09/2022](#))
- Runaway at Belle Isle Junction, 16 May 2021 ([report 04/2022](#))