Welcome to edition 8 of Rail Safety News.

As you would be aware, the biggest thing on the rail horizon at the moment is the implementation of a single national regulator for Australia.

Most accredited rail operators and exempt rail operators in Victoria will be required to comply with the new Rail Safety National Law (the National Law). The National Rail Safety Regulator Project Office has been formed to establish the National Rail Safety Regulator (NRSR) and lead operators through the transition process. Its website (www.nrsrproject.sa.gov.au) includes useful information on the reform including a set of principles to support the transition from the existing regime to the new legislation.

Tram (light rail) and some tourist and heritage operators will not transition to the National Law. These operators will still be required to comply with new local rail safety legislation.

TSV will continue to provide the regulatory functions and services for the rail industry in Victoria under both the National Law and the new local rail safety legislation.

If operators have any questions about the transition to the NRSR, they should refer to the NRSR website or call the project office on (08) 8343 2893.

Locally, nationally and internationally distraction continues to be a major concern for everyone involved in delivering safe public transport. All kinds of electronic devices, not just mobile phones, are common in our private lives and becoming more so in our working lives. These devices distract people at all levels from their task in a safety critical situation.

Passengers and pedestrians are also increasingly distracted by electronic devices whether it is listening to music, talking, texting or online activities. This puts an additional burden on people employed within the rail system to take due care not only of their own safety but also to alert obviously distracted members of the public to imminent danger.

Safety in a high risk environment is everyone’s responsibility. For this reason we are continuing our focus on distraction in this edition with an in-depth look at it from the train driver’s perspective.

Finally, as we approach the end of the year, we remind rail operators to consider what preparations are required to ensure the safe operation of their rail networks throughout the summer period.

I hope you enjoy this Rail Safety News. We are increasingly moving towards electronic delivery of the newsletter either via our website, where you can read or download it, or via email.

If you would prefer to receive your copy by email please provide your details to info@transportsafety.vic.gov.au.

In closing, I would like to take this opportunity, on behalf of TSV, to wish you a safe and happy festive break with your loved ones. I look forward to working with you in the New Year.

Best regards, Andrew Doery
Level crossings are a major interface between the railway and the public and present a high level of risk to safety. This is demonstrated by the fatalities, injuries and significant damage to infrastructure involved with recent level crossing accidents. Effective management of these interfaces is critical in ensuring the risks to safety are controlled ‘so far as is reasonably practicable’ (SFAIRP).

An important consideration in a risk management process is the consequences of failures of the technical system. Level crossings are designed to fail to a safe state. In other words, in the event of failure, the default position is to make the crossing safe for all by ‘closing’ it and warning people not to cross the tracks or enter the rail corridor and to behave as though a train were coming. This state is referred to as ‘safe’ as it results in a continuous warning to the motorist who is legally required to not enter the crossing.

For a level crossing fitted with boom barriers, this ‘safe’ state is both boom barriers horizontal across the road and the flashing lights and bells operating. In a small number of situations, in the order of one to three per cent of level crossing failures, the level crossing fails to provide the normal warning to the motorist and results in an unsafe state. An unsafe state can be a level crossing failing to operate, providing only a very short warning time, one of the boom barriers failing to descend or significant damage to the barrier.

For all failures, safe or unsafe, the effect on the motorists should be considered when analysing the risks associated with level crossings. Human Factors research has found that people use models inside their heads to guide their behaviour. The models can influence what information is perceived from the environment, how it is interpreted and what actions are taken. Motorists can develop models about how, when and where level crossings operate. If the level crossing fails to operate in the manner expected by the motorist, there is a risk that the appropriate model will not be triggered leading to undesirable behaviours occurring.

For example, a motorist would reasonably expect at a level crossing fitted with boom barriers, that the boom barrier will be horizontal when a train goes through. According to the motorist’s mental model, the lowered boom barrier means the presence of a train. Therefore, if the boom barrier is not lowered, the motorist is unlikely to seek further information about the presence of a train and may believe that the lights flashing are an indication that the booms are soon to descend, but there is still time available to cross.

Another consequence of failures to safe states occurs when a motorist has experienced a level crossing repeatedly failing to a safe state and has ceased to trust the warning systems. For example, when warnings continue to operate when no train is approaching and no train is present. This could trigger mistrust of the warnings and encourage work around behaviours such as driving around boom barriers.

The management of risks to safety at level crossings is complex and cannot be accomplished by the rail infrastructure managers alone. They need to work with the relevant road managers who, in turn, are required to understand their safety duties under the Rail Safety Act 2006 (Vic). The necessary collaboration is achieved through a safety interface agreement (SIA) which rail infrastructure managers are required to seek to enter into for public and relevant road interfaces. The SIA provisions of the legislation require the rail infrastructure manager, preferably in collaboration with the road authority, to conduct a risk assessment to identify, assess and manage the risks to safety SFAIRP. The risk assessment then provides a basis for managing the risks to safety and informing the content of the SIA.

Further details on SIA requirements can be located within the rail safety section of TSV’s website. (http://www.transportsafety.vic.gov.au/rail-safety/accreditation/how-to-become-accredited/safety-interface-agreements)
At approximately 11.40am on Saturday 3 November 2012, a Metro train struck the side of a semi-trailer at a railway crossing on Abbotts Road, Dandenong South.

A passenger on board the train died. There were 30 other passengers in the train at the time of the accident, of which 12 were sent to the hospital. The train driver sustained injuries.

The leading, second and third carriages of the six carriage Comeng train were extensively damaged while only the driver’s cab section of the fourth carriage was damaged. Five of the six carriages derailed.

The incident resulted in significant damage to the adjacent rail infrastructure, including track, signals, cabling, stanchions, overhead cables, track circuits and the control box for the level crossing.

Two Transport Safety Victoria rail safety officers attended the site on the day to gather information regarding the incident.

Three separate investigations are underway by Victoria Police, the Office of the Chief Investigator and Transport Safety Victoria.

Driving while distracted in the rail environment is dangerous because a person’s attention is diverted from the central activity to other competing activities. This can lead a driver to miss a critical piece of information such as a signal or warning, an approaching train or vehicle, or a passenger or pedestrian.

Distraction theories and effects are well known in relation to driving a motor vehicle. Examples of distractors, sourced from a review by Young, Regan & Hammer (2003), were provided on p6 of issue 7 of Rail Safety News.

Transport Safety Victoria (TSV) is particularly concerned that the dangers of being distracted while engaged in safety critical tasks are not understood or, worse, being ignored, by some rail safety workers.

The rail industry in general shares TSV’s concern with driver distraction. Earlier this year the Federal Railroad Administration in the US awarded a $250,000 grant to commuter rail operator Veolia Transportation to fund a study into the causes of train driver distraction. The two-part study is intended to ‘find ways the industry can, in all modes of transportation, reduce accidents and violations related to distracted drivers’.

In the first phase, a team of drivers will undergo assessment on a simulator at the Volpe Institute’s Cab Technology Integration Laboratory. Various potential hazards and distractions, including poor weather and other unusual operating conditions, will be introduced during the assessment and the drivers’ responses, overall performances and physical condition during the session will be recorded.

The results of the first phase will be used to draft a training programme, before the drivers are again put through an assessment process. The second assessment process includes various hazards that should allow the benefits of the training to be evaluated.
Mobile phone use in the rail environment is a growing concern to regulators around the world. Recently in the UK, research was undertaken by the Rail Safety and Standards Board (RSSB) on driver distraction due to the use of mobile phones. The study found mobile phone use resulted in, among other things, less checking for hazards, reduced situational awareness, poorer speed control (greater speed variation), slower reaction time and poorer decision-making.

The RSSB research highlighted that rules and enforcement have a role to play in controlling problem mobile phone use. However, relying on enforcement alone is not sufficient due to difficulties in detecting and proving mobile phone violations. An education framework that ensures train drivers understand the potential risks/possible consequences and are equipped with key decision making skills so they can assess when it is safe to use a mobile phone should support enforcement.

Self-awareness is an important strategy in educating and changing behaviour. Research indicates that drivers underestimate the distracting effect of using a mobile phone at the time and for a period post activity. Drivers must be able to exert self-control and regulate their behaviour. Education can assist with this by increasing drivers’ knowledge, skills, understanding and risk awareness of the impact of mobile phone use on behaviour.

If you have further queries about distraction associated with rail safety work, please contact Elizabeth Grey, Manager Human Factors at TSV on (03) 9655 6892.

References

The following is a summary of the investigation reports into rail safety incidents that occurred in Victoria, NSW, Western Australia, Northern Territory, New Zealand, Europe and Canada. These investigation reports have been released since the last edition of the Rail Safety News.

Common themes in these reports include:

- extreme weather events affecting the safety of the rail corridor (Australia, New Zealand)
- signals passed at danger on infrastructure not equipped with automatic train protection (Australia, Belgium, Czech Republic)
- equipment being placed on the track as a result of occupancy works before it is safe to do so (Australia)
- run-away rolling-stock and track trolleys (UK, Ireland)
- railway staff being struck by trains (UK)
- train fires (Bulgaria, Norway)
- bus collisions on level crossings (New Zealand, France)
- risks associated with rail flaw detection (Canada, Australia).

**Victoria - Office of the Chief Investigator**


**15 September 2011**

A V/Line passenger train departing Southern Cross Station bound for Bacchus Marsh had moved only a few hundred metres when there was a loss of brake pipe pressure. The fault was not satisfactorily rectified and it was decided that the train should be driven back to the station. After moving to the other end of the train and activating the new driving cab, the driver found that the brakes would still not release. The maintenance crew was subsequently able to release the brakes by re-activating the original driving cab, now at the rear of the train. However, this activation of a second driving cab also had the effect of isolating the electro-pneumatic braking control system, leaving the less responsive automatic air brake system to stop the train. The driver was not advised of this action. On arrival at the station, the driver attempted to stop the train, but it did not respond as anticipated, resulting in a low-speed collision with the end-of-track buffer.

The investigation found that the manufacturer’s operations manual did not address the operation of Sprinter trains with two driver’s cabs activated simultaneously. It recommended that drivers and maintenance crew be provided with clear instruction regarding the activation of a second cab. The investigation also identified that there was no in-cab warning to drivers that indicated that the electro-pneumatic brake control was not functioning and recommended installing such a device.

**Derailment, freight train, Warracknabeal**

**5 June 2011**

Four wagons of an empty El Zorro freight train travelling towards Hopetoun derailed at an unsealed level crossing near Warracknabeal as a result of a fractured rail. Pre-existing horizontal fractures led to the separation of the rail head and a number of transverse rail fractures had also developed. The rail subsequently suffered failure at the time of the incident, creating a gap of over 800mm in the rail head running surface.

The investigation concluded that the rail had been weakened by corrosion causing a reduction in material thickness which had not been identified during track inspections. In 2009, ultrasonic testing had identified indicators of what was thought at that time to be corrosion. The investigation concluded that a horizontal web fracture probably already existed at this time. This fracture subsequently grew to a length of 1400mm in the following 22 months leading up to the incident. The investigation made recommendations in the areas of track condition monitoring and standards for the construction of level crossings at unsealed roads.

**Safeworking irregularity and near-miss incident**

**Australian Rail Track Corporation (ARTC), between Seymour and Avenel**

**25 July 2011**

The corridor at this location consists of two parallel bi-directional lines, the East and West Lines. Maintenance works had been conducted on the East Line and were in effect on the West Line on 25 July 2011. The network controller had applied electronic track blocking to prevent incursion by rail traffic into the areas of work. The works on the East Line were completed as planned and in time for a passenger train to run from Seymour to Benalla. The applicable track blocking was removed by the network controller at about 13:00.
At about 13:35, the network controller inadvertently set the route onto the West Line and cleared the applicable signals. The train departed Seymour, accelerated to track speed and ran for approximately 3.5km before encountering the track maintenance crew in the process of completing a series of rail welds. The track maintenance crew moved to safety, although a vehicle remained on the track. The train stopped about 26m from the worksite and no injuries or damage were reported.

The investigation could not determine a specific reason for the network controller’s error but found that there were inadequate system defences. The report made recommendations to ARTC regarding aspects of their train control system, the use of temporary rail bonds and advice to controllers of parallel lines. A recommendation was also made to the track maintenance contractor, Downer EDI Works, related to protection requirements when conducting rail welding.

**NSW – The Office of Transport Investigation**

http://www.otsi.nsw.gov.au

**Derailment of Pacific National service MC92, Clifton**

23 November 2011

Train MC92, a 45-wagon train with single locomotives at front and rear, was fully loaded with coal and travelling south from the Metropolitan Colliery at Helensburgh to Port Kembla when it derailed eight wagons at Clifton.

The investigation revealed that the barrel of the No. 3 axle of the eighth position wagon had broken and parted, causing both wheels and the seven following wagons to derail. Approximately 470m of damaged track needed to be replaced. The investigation established that metal fatigue at the site of the fracture led to the break in the axle. The fatigue fracture was initiated some time prior to the derailment but, due to damage sustained in the incident, the initiator of the fracture could not be determined.

The investigation found that the two or three year interval (depending on kilometres travelled) between the non-destructive testing of axles may exceed the time taken from the initiation of a stress raiser to the ultimate failure of an axle.

The trailing locomotive stopped in the tunnel as a result of the derailment and despite repeated attempts, the crew was unable to make radio contact with either the front of the train or Network Control. Communication was only possible once the train crew had walked clear of the tunnel.

The crew in the trailing locomotive (8206) was unable to shut down the locomotive with the emergency stop button after it had lost air and had come to a stand.

The investigation also found that, as there is no weighing facility at the Metropolitan Colliery or along the line to Port Kembla, there is the potential for coal overloading.

Recommendations were made in respect to the inspection of axles, analysis of train loading and shutdown buttons on locomotives.

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**Train collision with road motor vehicle, Woy Woy**

2 September 2011

CityRail’s Sydney to Wyong interurban passenger service 2B9G struck a stationary, unoccupied road motor vehicle at the Rawson Road level crossing at Woy Woy on the Central Coast of NSW. The vehicle had become stuck on the line after its driver became disoriented and turned onto the line from the crossing while trying to locate a street running parallel to the line. While no persons were injured in the incident, a number of safety issues were identified during the course of the investigation, including:

- an inadequate obstruction deflection system to prevent larger obstructions from becoming wedged underneath and potentially derailing the train
- information overload from signage at the crossing
- the lack of road markings inside the rail corridor defining the roadway
- the lack of emergency contact information provided at level crossings.

**Australian Transport Safety Bureau**

www.atsb.gov.au

**Collision between an XPT and a track-mounted excavator near Newbridge, New South Wales**

**Occurrence date: 5 May 2010**

In a collision between an XPT (express passenger train) and a track-mounted excavator near Newbridge, New South Wales the operator of the excavator was fatally injured. During the course of the investigation a similar incident occurred near Wards River, New South Wales (17 March 2011), where two work groups had to hurriedly vacate their on-track worksite due to an approaching train (there were no injuries). Both incidents occurred despite the fact that the work groups had been authorised, under a track occupancy authority (TOA), to occupy and work on the track.

The investigation found that when requesting the TOA, neither the protection officer (PO) nor the network control officer (NCO) positively identified the location and type of worksite. Their actions were influenced by a deficiency in the TOA form, in that there was no provision to record this critical information. Consequently, both the PO and NCO incorrectly concluded that the train had already passed beyond the limits of the worksite. In addition, the workers accessed the danger zone before additional site protection measures (detonators and flags) had been put in place.

The Wards River incident was similar in that the track access point for the work was about 16km into the section defined by the limits of the proposed TOA. The PO did not clearly identify the location of the worksite and the NCO did not ensure the train had passed beyond the worksite or track access point.
The investigation report stated that it is essential that:

- Information critical to the safe implementation of track occupancy is clearly communicated between the PO and network control office.
- Workers do not access the track until all levels of worksite protection have been fully implemented.

Derailment of freight train 1MP5, Goddards, Western Australia

28 December 2010

The derailment occurred within a recently constructed crossing loop on a section of track managed by the Australian Rail Track Corporation (ARTC). Twenty-three wagons derailed, many of which were significantly damaged and about 700m of track required replacement.

The Australian Transport Safety Bureau (ATSB) determined that the derailment was a result of flange climb initiated by a track misalignment which probably grew as train 1MP5 traversed it. Factors which contributed to the misalignment were the high ambient temperature, inadequately de-stressed rail and insufficient ballast through the derailment site. ATSB also found that ARTC’s quality assurance processes used during the contracted construction of the crossing loop could be improved.

The investigation report provided the safety message that track managers should have robust audit and quality control processes in place to ensure that work undertaken on their railway by contractors meets the relevant contracted standard.

Signal passed at danger by XPT ST24 Henty, New South Wales

5 February 2011

A scheduled XPT ST24, travelling from Melbourne to Sydney, passed signal 09-6 at Henty while it was displaying a stop (red) indication. The train stopped about 95m past signal 09-6 with the front of the leading power car on the Yankee Road level crossing. The investigation concluded that notwithstanding a reported issue with the brakes on the leading power car, the driver of train ST24 did not apply sufficient braking effort to enable train ST24 to be stopped before passing the up home signal (09-6).

The driver became distracted by a vehicle being driven at speed on an adjacent flooded road and was not adequately monitoring the braking performance of ST24 as he approached the up home signal. He also acknowledged that when the route was set into the loop, for the Henty passenger platform, the distant signal always displays a caution and he would normally expect the up home signal (09-6) to display a low speed indication rather than a stop indication. During the 19 years he had been driving the XPT service he estimated that the Henty up home signal (09-6) displayed a low speed indication at least 95 per cent of the time.

An examination of occurrence records revealed that a SPAD, with a similar expectation bias, had occurred at the same signal with the same train (ST24) involving a different driver about six weeks before.

ARTC is currently trialling a system called Advanced Train Management System, an automatic train protection system, which, if installed, would provide enforcement of authorities on each locomotive if a train is at risk of exceeding its authority.

Collision between freight train 7SP3 and a track mounted excavator near Jaurdi, Western Australia

28 March 2011

The train driver sustained a minor injury during a collision involving a train and excavator between Jaurdi and Darrine, Western Australia. There was significant damage to the lead locomotive and the excavator and minor damage to the track as a result of the accident. The investigation found that two track mounted excavators had been placed on the track without permission of the authorised employee responsible for the coordination of track side safeworking activities. Other findings were that the communication equipment available to the track crews was inadequate, the sharing of safeworking protection information at pre-work briefings had not occurred and the application of a WestNet rule had been simplified.

Safeworking breach – Track machine BC7, Bogan Gate, New South Wales

15 August 2011

Track machine BC7 was being operated by the rail division of John Holland Group (JHG) under contract to ARTC at the time of the incident. A traffic officer from Rail Infrastructure Maintenance was contracted by JHG to facilitate the transfer of track machine BC7 from Denman Siding to Broken Hill.

During the journey, a limit of authority described on a TOA exceeded. A JHG investigation identified that this may have been due to limitations in the traffic officer’s knowledge of the local area, the change in directional application of the word ‘down’ and the potential for misinterpretation of ‘up’ and ‘down’ terminology in track direction.

ATSB issued a safety message highlighting the potential for confusion around terminology used in track occupancy authority notices. All track personnel and operators were reminded of the need to ensure they know the limits of their authority before moving vehicles.

Derailment of freight train 7AD1 at Edith River near Katherine, Northern Territory

27 December 2011

Freight train 7AD1, owned and operated by Genesee and Wyoming Australia Pty Ltd (GWA), derailed at the Edith River rail bridge near Katherine in the Northern Territory. GWA was also the owner and operator of the rail track. The train driver was unhurt as a result of the derailment, but the co-driver suffered back injuries and there was significant damage to the bridge and rolling stock. A number of wagons including the crew van, which was unoccupied at the time, derailed into the Edith River.
Construction of the Edith River Bridge was completed early in August 2002. It was 120m long, divided into four sections.

ATSB investigation determined that the derailment was caused by the wash-away of the south-eastern embankment, associated sub-grade and ballast on the approach side of the Edith River rail bridge. The magnitude of the wash-away meant that the track could not support the weight of the train and collapsed, initiating the derailment. The wash-away was the result of a severe flood event caused by torrential rains that fell within the Edith River catchment area.

The investigation found that in the lead up to the derailment there had been adequate warning of a cyclone event, the subsequent heavy rainfall and resultant flooding.

ATSB concluded that the flood exceeded a 100 year average recurrence interval (ARI) event and in these circumstances it is not unreasonable to expect partial failure of the bridge structure or approaches. The bridge was designed to Australian Bridge Design Code HB77 which prescribes a design capacity to withstand the flood flow arising from a 100 year ARI event but it was insufficient in this case.

The investigation stated that severe weather events do pose a significant operational risk and, although infrequent, the consequences can involve fatalities, injuries and significant infrastructure damage.

GWA has undertaken a range of actions to enhance its policies, procedures and employee training with respect to managing the risks associated with severe weather events. It will also enhance its systems for alerting staff to severe weather events, including flood risks. ATSB’s investigation issued a safety message stating that it is essential that rail network operators have robust systems in place to monitor and mitigate the risks of severe weather events to ensure the safety of railway operations is not compromised.

Derailment of Ballast Train 8M24N near Broken Hill NSW
11 April 2012

Ballast train 8M24N comprised two locomotives hauling 34 ballast wagons and one ballast plough car at the rear. The wagons were hopper type with discharge doors in the middle of the wagon. The train was operated by Southern Spur Rail Services Pty Ltd (SSR) under contract to ARTC to provide hook and pull services for the Broken Hill to Parkes re-sleeper works. ARTC supplied the ballast wagons and SSR owned the locomotives.

ATSB commented that the load from one wagon had partially discharged from one door resulting in an uneven load. The wagon was therefore unbalanced and, when the train negotiated a curve, the wagon derailed.

The safety message in ATSB’s report states that uneven loading of ballast wagons increases the potential of derailment. In 2010, the Independent Transport Safety Regulator released Rail Industry Safety Notification (RISN) No. 32 titled ‘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.

New Zealand - Transport Accident Investigation Commission
http://www.taic.org.nz
Collision between two metro passenger trains after one struck a landslide and derailed between Plimmerton and Pukerua Bay, North Island Main Trunk
30 September 2010

Ganz passenger train 6250 was travelling from Wellington to Paekakariki on the northbound main line with 44 passengers on board. A landslide from a cutting above the rail corridor had covered the northbound line with debris between Plimmerton and Pukerua Bay. The train struck the landslide and derailed in the direction of the adjacent southbound main line. Train 6247, another Ganz passenger train, was travelling from Paekakariki to Wellington on the southbound main line with 14 passengers on board. The driver saw the train strike the landslide and derail and made a full-service brake application. His train struck the then stationary derailed train a glancing blow, stopping about 75m past the point of impact without derailing. Both drivers had predicted the collision and had left their driving compartments to escape injury and warn the passengers of the pending collision. The passenger compartments suffered broken windows and major structural damage. Nobody was seriously injured in the collision. The landslide had occurred sometime after two other trains had passed the location, 28 minutes earlier.

MetService had issued a severe weather warning the day before, forecasting heavy rainfall for the Wellington area. The KiwiRail network control manager received the warning and passed it on to those responsible for deciding whether to carry out any special track inspections or impose any speed restrictions for their respective sections of track. No special track inspections were made in the area of the landslide and no speed restrictions were put in place.

The rainfall at the time of the landslide was calculated to have been an event expected to occur once in 15 years and the total rainfall recorded for the month of September was the highest recording at the site since 1991.

The Transport Accident Investigation Commission (TAIC) made findings that a special track inspection might have revealed signs that a landslide was about to occur. Had a speed restriction been put in place, the initial derailment might not have been as severe and it was highly likely the opposing train would have been able to stop before meeting the derailed train.

The cutting where the landslide occurred was on an ‘essential features list’ because of previous landslides that had occurred there. The slip site had been assessed by a KiwiRail geologist and its priority ranking meant that remedial work at this site was not due for at least another two years.

TAIC made other findings about the radio equipment on board the Ganz trains that meant train control was not automatically alerted to the accident when the drivers made emergency brake applications, and about the need to improve the crashworthiness of older trains that are going to be kept in service for any appreciable time.

Since this accident, TAIC reported that KiwiRail’s safety actions have been to establish a series of online rainfall monitoring sites within the Wellington rail network. An interim decision-making matrix has been developed to assist
area managers and gangers to decide when to undertake special track inspections and impose speed restrictions. Recommendations were made to address the safety issues of the crashworthiness of older trains and the fitting of modern radio equipment that will automatically alert train control when a train driver makes an emergency brake application.

Wrong line running irregularity, leading to a potential head-on collision, Papakura-Wiri

14 January 2011

A train was signalled to enter a section of track that another train had been authorised to enter from the opposite direction. A potential head-on collision was recognised by the person in charge of a nearby worksite and the situation was resolved before the second train entered the section. The worksite was in double-track territory and one of those tracks was open to trains.

The train controller had planned to stop an Auckland-bound freight train at Papakura while a southbound passenger train crossed over to the northbound line for the journey from Wiri to Papakura, where it was to cross back over to its own southbound line. The procedure for the southbound train to travel on the wrong line required the issue of a specific authority.

Both Wiri and Papakura stations had signal boxes under the control of signalers who were working in accordance with the train controllers’ plan for the duration of the upgrade work. Safety for the worksite was under the control of a person in charge and the worksite was protected at each end by compulsory stop boards. Every train had to stop at these boards and request permission from the person in charge to pass to ensure that the track workers and machinery were clear of the track.

The Papakura signaler was responsible for the last signal controlling entry to the worksite and the compulsory stop board was placed adjacent to the signal. A blocking collar was required to be placed over the lever used to change the signal in the signal box whenever the signaler was instructed to hold it at stop. On the day of the incident, the signal was supposed to be held at red for two reasons - to protect the worksite and because an authority had been issued to a train coming from the opposite direction. The blocking system was not designed to cater for more than one reason.

Neither the driver of the northbound train nor the person-in-charge was told that the northbound train was to be held at the signal for the southbound train. The person-in-charge gave the driver of the northbound train permission to pass the compulsory stop board and asked the signaler to change the signal to proceed. The signaler forgot about the other train coming down the line and removed the blocking collar and changed the signal to green.

TAIC made findings about poor communication leading to the incident, about the design of the blocking system, and about the management and resourcing of signal boxes on the Auckland metro network.

Freight train 261 collision with bus, Paekakariki

31 October 2011

A ‘super-low-floor’ urban bus crossed the Beach Road level crossing at Paekakariki, and stopped at the road intersection with State Highway 1, where it became stuck. There were three sets of tracks at the level crossing and the bus encroached on two of these tracks. There were six passengers plus the driver on the bus. The driver tried various methods to free the bus but did not succeed. After about five minutes a freight train approached the level crossing at about 70km/h and collided with the rear of the bus. The driver and passengers had seen the train approaching and vacated the bus moments before the collision. The train driver was the only person on board the train. Nobody was injured in the collision. The bus was extensively damaged and the train was slightly damaged. The train did not derailed.

TAIC found that the bus complied with the Land Transport Rule: Vehicle Dimensions and Mass for heavy road vehicles. The profile of the level crossing and short section of road leading up to the road intersection however were not compatible with long and low road vehicles as required by the NZ Transport Agency Rules. The TAIC also found that there was not a sufficient stacking distance for road vehicles longer than about 10m to stop at the intersection as required and still remain clear of the level crossing. There are some 251 other level crossings in NZ with similar stacking distance issues.

TAIC recommended that the Chief Executive of the NZ Transport Agency advise other operators of large road vehicles that their drivers should carry the National Train Control Centre emergency telephone number so that they can alert the train controller in any similar situation. Other recommendations were made regarding the layout, profile and stacking distance issues at the Beach Road level crossing, as well as with other level crossings and road intersections throughout NZ with similar issues.

Freight train mainline derailments

6 March 2007 to 1 October 2009

Between March 2007 and October 2009 there were five derailments involving container wagons conveying single 6m containers loaded with bulk grain, positioned on the leading ends of the wagons. TAIC combined the events into a single inquiry.

The key lessons learnt from the inquiry into these occurrences were:

- sufficient resources need to be put into maintaining rail track infrastructure and rolling stock if mainline derailments are to be kept as low as reasonably practicable
- if the allowable tolerances for the condition of rail track and rail wagons are not compatible, dynamic interaction between the track and wagons will result in an increase in mainline derailments.
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http://www.raib.gov.uk/publications/investigation_reports
Container train accident near Althorpe Park, Northamptonshire

18 July 2011

A partially detached metal panel on a container train struck the cab of a passing track maintenance vehicle, smashing the side window. The driver of the maintenance vehicle subsequently reported seeing a similar panel on the tracksde, one mile further on. No-one was injured.

The Rail Accident Investigation Bureau (RAIB) made three recommendations concerned with:

› making the relevant freight container manufacturers, repairers, modifiers, users and approval bodies aware of the need to assess the structural integrity of such attachments
› an amendment of the International Convention for Safe Containers
› train operator processes for assuring the structural integrity of freight containers that it carries on the railway.

Safety incident between Dock Junction and Kentish Town

26 May 2011

A First Capital Connect service from Brighton to Bedford lost traction power and became stranded between St. Pancras and Kentish Town stations. Almost three hours elapsed before the train, with its passengers still on board, was assisted into Kentish Town station.

Eventually, the driver over-rode a safety system in order to move the train. At the time when the train moved a short distance for the driver to test that it was properly coupled, some passengers were alighting from the train to the track. When the train subsequently moved into Kentish Town, it did so with at least two doors open.

RAIB made recommendations to:

› First Capital Connect in relation to its management processes for emergency preparedness
› Network Rail (the infrastructure manager) and the train operators on developing a set of principles for dealing with stranded trains
› Network Rail and the train operators to review their processes for undertaking incident reviews so that safety lessons are captured and tracked to closure and shared with other industry stakeholders.

Fatal tram - pedestrian accident at Piccadilly Gardens, Manchester

5 June 2011

A Manchester Metrolink tram approaching Piccadilly Gardens struck and fatally injured a pedestrian. The tram was travelling at a speed of about 15km/h when a pedestrian ran into its path. The pedestrian appeared to become aware of the tram and tried to stop before reaching the track but fell directly in front of the tram. Although the tram had started to brake before reaching the pedestrian, it did not come to a complete stand before the pedestrian had come into contact with the under-run protector. This is a device that projects down from the underside of the tram and is designed to prevent pedestrians from being crushed under the wheels. There is a clearance of 80mm between its lower edges and the road surface when on level track.

The chest injury sustained by the pedestrian after he came into contact with the under-run protector was rated by the Abbreviated Injury Scale (AIS) severity scale as ‘life threatening’. For the under-run protector to make contact with the chest, the protector had to be able to pass over the arm and shoulder. Tests commissioned by RAIB following the incident found that reducing the ground clearance also improves the principal reason for having an under-run protector, that of preventing persons from making contact with the tram wheels.

RAIB analysed pedestrian collision accident figures from United Kingdom light rail operators, finding that approximately 20 per cent of tram/pedestrian frontal collisions resulted in the pedestrian going under the front of the tram. In the remainder of the accidents, the pedestrians were either moved to one side of the tram, or, following the initial collision, the tram stopped before the pedestrian went underneath. This suggests that in a significant minority of frontal tram/pedestrian collisions, the design of the under-run protector may become a factor affecting the severity of the outcome.

As part of the injury assessment, a comparison was made of the likely initial impact injuries that would be received by a standing pedestrian involved in a collision with the front of a T68 tram and a modern flat-fronted lorry. It was found that the injury severities from the initial impact were similar; one difference found was that the windscreen wipers on the tram were more prominent than those on the lorry and at a height which would increase the severity of a head injury.

RAIB made two recommendations to UK tram operators relating to improvements in the collection of pedestrian injury data in order to better understand the role of the tram front end design in minimising injury, and to research into the design of tram front ends and their potential for injuring pedestrians in collisions.
Person trapped in doors and pulled along platform at King’s Cross station, London

10 October 2011

A passenger’s hand became trapped when she attempted to board the train while the doors were closing. She was pulled along a platform for a distance of approximately 20m because a member of staff on the platform did not fully check the train doors before signalling that the train could depart. The requirement to check doors is given in the railway Rule Book.

The passenger may not have been pulled along the platform if alternative door edge seals had been fitted on the Class 365 train involved in the incident. When the passenger alarm was operated during the incident, the train did not stop immediately because the driver decided to continue to the next station. This decision had no effect on the incident, but was contrary to the railway Rule Book and, in slightly different circumstances, could have increased the severity of the accident.

RAIB identified two learning points from this accident:

- the importance of fully checking train doors before trains depart
- the need for drivers to stop trains immediately if the passenger alarm is operated when any part of the train is within a station.

RAIB also recommended that the design of door edge seals on Class 365 trains is reviewed, and if appropriate modified, when the seals are renewed as part of a mid-life refurbishment due in 2013.

Fatal accident at Mexico footpath crossing (near Penzance)

3 October 2011

On approaching a crossing the train driver observed a person standing to the side of the line and sounded the warning horn immediately before the train reached the crossing. However, the pedestrian then attempted to cross and was fatally injured.

Although it is not possible to be certain why the pedestrian attempted to cross, RAIB considered that she either misjudged the speed of the approaching train or her position in relation to it.

The driver had sounded the train’s horn as required by a lineside ‘whistle’ board when the train was approximately 15-16 seconds from the crossing, and out of sight. If the pedestrian had heard and responded to the sounding of the train’s horn at this stage, it is likely that she would not have passed through the gate and onto the crossing until the train had passed.

RAIB considered that the sounding of the horn when the train was 15-16 seconds from the crossing did not serve its function of warning the crossing user of the approaching train for one of the following reasons:

- the sound of the horn was inaudible to her
- she heard a horn being sounded, but did not distinguish it as coming from a train
- she did not register that the train horn was sounded, because she was only approaching the crossing at this time and not yet focused on crossing the railway.

RAIB made the following recommendations to Network Rail regarding:

- improvements to sighting and warning arrangements for pedestrians using the Mexico footpath crossing
- developing a national approach to the location and marking of decision points at level crossings
- optimising warning arrangements for pedestrians at level crossings provided with whistle boards.

RAIB recommended that the Rail Safety and Standards Board

- improve intelligence on near-miss incidents at level crossings
- enhance processes for reviewing the effect of changes made in 2007 to arrangements for sounding train horns at whistle boards.

It made another recommendation to the train operator regarding a change to standards to require objective testing of horns after a train has been involved in an incident or accident.

Train departed with doors open, Warren Street, Victoria Line, London Underground

11 July 2011

A loaded passenger train departed from Warren Street station with passenger saloon doors open on the platform side of the train. When the train reached 8km/h and had entered the tunnel, a safety system on the train closed the doors. No-one was hurt in the incident. The train, consisting of new 2009 tube stock, is fitted with sensitive edge doors designed to apply the brakes if a thin object trapped by the doors is detected. The sensitive edge system was activated when the train stopped at the previous station, Oxford Circus.

The train left Warren Street station with the doors open because the train operator had omitted to close them, having previously disabled the train door interlock (a safety system that requires the doors to be closed before a train can start). The train operator was unable to reset the sensitive edge system between Oxford Circus and Warren Street, and became more and more confused in his attempts to resolve it.

RAIB found that the modification to allow train operators to override an activated sensitive edge system had changed the operation of an indication light, which probably misled the train operator. Deficiencies in the train operator’s competence had not been identified and this lack of competence was also a probable factor leading to the train operator’s confusion.

RAIB made the following recommendations to London Underground Ltd covering a review of the guidance and instructions to train operators. They related to:
Incident involving runaway track maintenance trolley near Haslemere, Surrey  

10 September 2011

A hand trolley ran unattended for a distance of 4.6km along the Portsmouth main line within an overnight engineering possession. There were no casualties.

The trolley operator did not know he was on a long falling gradient when he let go of the trolley and the brakes on the trolley failed to apply automatically. The brake mechanism probably jammed with the brakes in the ‘off’ position due to a combination of factors including inadequacies in the design, risk assessment and acceptance processes, and in the subsequent maintenance of the trolley.

RAIB made five recommendations to Network Rail. These related to:

- the training and competence of trolley operators
- the product acceptance process
- reviewing the actions it has taken since the incident
- alternative means of communication in areas of poor mobile phone reception
- the process for reviewing RAIB recommendations made to other operators.

One recommendation is made to the maintainer of the trolley, to improve the competence of its staff to maintain equipment.

As a learning point from this incident, RAIB also identified that duty holders should have effective processes for making sure its staff are made aware of changes in the Rule Book which are relevant to the work they perform.

Track worker struck by a train at Stoats Nest Junction  

12 June 2011

A passenger train travelling at about 96km/h from Gatwick Airport to London Victoria struck and seriously injured a member of a team of ten people carrying out maintenance work on the track.

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, work continued in the vicinity of that line. No measures were put in place to protect personnel from the passage of trains on that line.

RAIB made one recommendation to Network Rail relating to the implementation of processes intended to deter managers from undermining the safety related duties of other staff.

Derailment at Princes Street Gardens, Edinburgh  

27 July 2011

While traversing points on its approach to Edinburgh Waverley station the leading bogie of the third coach of the three-coach train derailed and travelled derailed for approximately 110m. The derailment occurred at slow speed and the train remained upright and no one was injured.

The investigation found that the first wheel to derail at the Princes Street Gardens points was not correctly steered by the moveable switch rail to the correct route. Instead the wheel climbed over the rail, pulling the other wheels of the bogie into derailment. The most likely cause of the derailment was that the angle of the switch rail, possibly aided by an increase in friction, enabled the wheel to climb the switch rail.

Three days prior to the accident the left-hand switch rail had been identified as having the potential to cause derailment. A grinding repair was attempted although, according to the company standard, the rail was worn to a point considered beyond repair by that method. The subsequent inspection process did not find the switch to be unsafe and it remained in service.

The local practice of maintaining points to safety limits and the lack of guidance on when a switch rail is unrepairable by grinding were underlying factors in this accident.

RAIB made five recommendations to Network Rail relating to:

- the provision of maintenance intervention limits on switches
- the need for a review of the relevant standard to provide assurance that it addresses all potential derailment mechanisms on switches and to clarify its requirements
- the development of a more accurate method for gauging the angle of switch rails
- the increased use of automatic lubrication on switches vulnerable to wear
- the need to review and address the recurrence of factors in this accident which were previously identified by the RAIB in investigations of similar derailment.

Fatal accident at Grosmont, North Yorkshire Moors Railway  

21 May 2012

A volunteer train guard was fatally injured after becoming trapped between two coaches at Grosmont station on the North Yorkshire Moors Railway. The coaches had just been uncoupled and the accident occurred when the steam locomotive that was reversing the uncoupled coach away from the stationary coaches changed its direction. The driver applied the brake as soon as he realised this, but there was insufficient distance to stop and avoid trapping the guard.
who had moved back between the vehicles to complete the work associated with the uncoupling.

The locomotive changed direction because its screw reverser was not locked and moved under the weight of the valve gear from reverse to forward gear. It is likely that the guard moved back between the coaches because he had no reason to believe that the locomotive and coach moving away from him would change its direction.

RAIB identified two key learning points relating to the locking of screw reversers and not going between railway vehicles unless they are stationary. It also made a recommendation to the North Yorkshire Moors Railway relating to the competence management system covering shunting.

Republic of Ireland – Rail Accident Investigation Unit

www.raiu.ie
Runaway locomotive at Portlaoise Loop
29th September 2011

As part of the train driver’s manoeuvre into Portlaoise Rail Depot he was required to change driving cab, disembark the locomotive and set the route, at a set of points. While setting the route the train driver saw the locomotive rolling away from him down the gradient towards Portlaoise Station.

The locomotive travelled approximately 306m from its stationary position, passing a signal at danger, running over a set of points and striking the buffer stop in Portlaoise Station. It continued for another 9m approximately until finally coming to a stop. There were no injuries or damage to the locomotive or buffer stop as a result of the accident.

The immediate cause of the locomotive running away while left unattended on a gradient was the gradual release of the brakes.

This was as a result of the following causal factors, which were necessary for the accident to occur:

- an air leak in part of the braking system
- the train driver not fully complying with the instructions for vacating and occupying locomotive cabs, set out in Iarnród Éireann’s (IÉ) Drivers’ Manual.

The following factors contributed to the accident:

- the overhaul in the braking system did not occur within the allocated time. Therefore the locomotive was only subject to examination that did not include the brake leakage test which may have detected any faults in the braking system
- the leak in the braking system was not detected during any pre-service checks carried out by the train drivers.

The underlying factors were:

- there was no quality control system in place for the updating of testing procedures which resulted in the omission of the brake leakage test from the newer procedures
- train drivers had not been formally briefed on the IÉ Drivers’ Manual for 071 class locomotives since its introduction in 2005. The train driver did not fully appreciate the necessity of including the brake leakage test in the pre-service checks, or carrying out the braking instructions, in full, in relation to vacating and occupying locomotive cabins
- there was no system in place to ensure that train drivers are routinely assessed in relation to changing cab ends on locomotives.

The Railway Accident Investigation Unit made four new safety recommendations as a result of this investigation.

1. IÉ should review their vehicle maintenance instructions for locomotives to ensure that there are adequate braking tests at appropriate intervals.
2. IÉ should adopt a quality control system for the introduction of new maintenance procedures for locomotives.
3. IÉ should review its system for introducing new train drivers’ manuals to ensure that train drivers are fully trained and assessed in all aspects of these manuals.
4. IÉ should review its competency management system for train drivers to ensure that all driving tasks are routinely assessed.

Belgium – Investigation Body for Railway Accidents and Incidents

www.mobilit.fgov.be
Train collision at Buizingen (signal passed at danger)
15 February 2010

Trains E3678 and E1707 operated by SNCB/NMBS had an almost head-on collision between Hal station and Buizingen. Following a stop of around 30 seconds at Buizingen, having been informed that the unloading – loading operation was complete via the ‘lamp door’ in the driver’s cabin, the driver of E3678 pulled away with full acceleration.

The train 3678 passed the signal H-E.1 at approximately 60 km/h and continued its acceleration. The driver then noticed that the train 1707 was crossing its path, sounded its horn several times and put on the emergency brake. The two trains collided almost head-on resulting in 19 fatalities, 35 serious injuries, 44 light injuries plus significant damage to track, catenaries and rolling-stock.

The investigation concluded that the signal H-E.1 remained red during the stopping and subsequent pulling away and acceleration of the train from Buizingen station. The driver had received a warning signal (double yellow), 590 metres before the platforms.

It did not reveal any physical or physiological reasons that could explain the passing of the signal at danger. Neither did it identify a particular reason for distraction such as abnormal fatigue, time pressures or a state of stress. The study of the driver’s timetable of service over the 45 days preceding the accident did not show an accumulated sleep deprivation and therefore did not increase the driver’s level of fatigue. The only significant element likely to affect the driver’s concentration level was the loss of sleep brought about by an early morning start to his shift on the morning of the accident.

The investigation provided some possible explanations for the overrunning of a signal at danger:
the stop at the unmanned stopping point facilitates short term memory loss of the double yellow warning signal seen before the stop at Buizingen, particularly as no external memory aide was provided

the routine of driving ‘on (double) yellow’ acquired from the high frequency of encountering signals at ‘double yellow’, combined with clearing of the track before the train reaches signal at danger causes a loss or weakening of the mental association ‘double yellow-red’

the different means of communication for drivers for TO (terminated operations) information favours confusion

provision of station departure information independently of a line-clear signal.

The investigation report suggests that the driver’s short night’s sleep and momentarily low concentrations levels may have caused him to react to the door close lamp received at the Buizingen station with an automatic reflex. He subsequently created an incorrect image of the situation in which the signal was symbolically clear and could only be seen as ‘green’.

The investigation notes observance of signals at danger is already at a level (around 10-5) which demonstrates excellent human reliability that is difficult to improve upon in this context. The annual increase in overrun signals at danger in Belgium is due to an increase in passenger transport (number of trains in circulation) and of its density relative to the network capacity. The growth of this produces an even greater increase in interference and therefore the number of signals at danger encountered by drivers.

The investigation states that the only solution for rendering the Belgian railway system sufficiently safe is to install automatic train protection, comparable to that in other European countries. An additional solution identified is to equip the system, in addition to the automatic functions, with a capacity to recover the overrunning of signals at danger.

The investigation also reported on a weakness by the National Safety Authority (the regulator) to propose and impose a systematically integrated vision external to the interests of business, and a considerable delegation of safety management responsibility to the infrastructure manager.

Czech Republic – The Rail Safety Inspection Office

http://www.dicr.cz
Signal passed at danger at Odra, followed by collision of train with buffer and derailment of all rail vehicles

22nd October 2011

A regional passenger train passed a signal at danger and collided with a buffer stop, resulting in a train derailment. Seven injuries were reported.

The investigation reported on driver inattention owing to the operator information system and the sending of an SMS text message from a private phone that was not associated with the driver’s job responsibilities. Recommendations included installation of Automatic Train Protection equipment.

Finland – Safety Investigation Authority

www.onnettomuustutkinta.fi
Collision of a freight train, with Rear End of another Freight Train in Suro, Finland

21 February 2011

A freight train, which had arrived to assist another freight train, collided with the end of it and the engine driver was fatally injured in the accident.

According to the running recorder data, the driver of the assisting train had begun emergency braking, at a speed of 46km/h, five seconds before the impact. The train speed was 43km/h upon impact and its maximum permitted speed was 50km/h.

The accident was caused by erroneous location information about the train to be assisted. This led the driver of the assisting train to approach too fast as he believed that the other train was further away. Darkness and the track geometry led to the driver failing to notice the other train in time. At the speed he had attained, he was unable to prevent the collision. The investigation found that the driver of the train to be assisted had little experience of the particular locomotive and its problem solving procedures.

In order to avoid similar accidents in the future, the Safety Investigation Authority, Finland recommended the following:

- a satellite location system should be implemented as quickly as possible to assist in location
- locomotives and train units should be equipped with checklist-type problem solving diagrams which would help the engine driver when a fault occurs in a locomotive on the line
- reflectors should be installed on the ends of wagons
- the speed of a unit should be limited to 35km/h when it is driving to assist a train on the line
- the use of group calls should be made into a standard procedure in exceptional situations.

France – Bureau d’Enquêtes sur les Accidents de Transport Terrestre (BEA-TT)

www.developpement-durable.gouv.fr
Level crossing collision between bus and train, Auxerre

14 December 2010

A bus carrying 30 passengers was struck by a train and 17 bus passengers were injured, one seriously. The direct cause of the accident was the bus stopping on the exit of the crossing in a position foul of the railway line.

Causal factors included:

- the indiscipline of two passengers on the bus that captured the attention of the bus driver who was forced to make an emergency stop
- a misjudgement of the actual position of the bus in relation to the level crossing owing to darkness.
The BEA-TT investigation made recommendations in relation to:

- maintaining the discipline of students transported by bus
- improvements in the ground markings of the crossing.

Accident Investigation Board Norway (AIBN)

www.aibn.no
Bergen Line Rail Accident, Fire in Tunnel, Hallingskeid
16 June 2011

Train 62 from Bergen to Oslo drove into a snow tunnel which had caught fire. The train stopped before the fire but, due to loss of power, was unable to back out. All passengers were evacuated, there were no personal injuries but the train was totally destroyed. The investigation considered that hot works (track welding) was the probable triggering event that lead to the fire in the tunnel. A weakness was identified in the Railway’s Administration’s risk analysis and control procedures for hot work. As a result of the investigation, AIBN advised the railway administration to consider possible measures to upgrade the fire protection of existing snow tunnels. It also advised the Directorate for Civil Protection and Emergency Planning to take greater responsibility for coordinating fire safety and emergency preparedness in inaccessible places on the railway.

Republic of Bulgaria - Ministry of Transport, Information Technologies and Communications

www.mt.govt.bg
Train Fire, Lesichery - Resen.
20 July 2011

The train crew was unable to suppress a locomotive fire or uncouple a locomotive from passenger carriages. As a result fire destroyed two passenger carriages but no injuries or fatalities were reported. The most likely source of fire was the accumulated oil-dust layer on the electric motor of the air ventilator. Recommendations included provision of extinguishing equipment in difficult to reach areas of the electric locomotive and exploring application of thermographic cameras to locomotives upon their entry into depot.

Transportation Safety Board of Canada

www.tsb.gc.ca
Main track derailment, Alix Junction, Alberta
21 October 2011

A Canadian National Railway (CN) freight train derailed seven cars that were carrying containers loaded with a variety of products including dangerous goods. Approximately 900 litres of phosphoric acid were released and 470 feet of track was destroyed. There were no injuries.

The investigation concluded that a sudden catastrophic failure of the high rail had occurred, likely due to an existing transverse defect in the rail.

The 1950s and 1960s vintage rail did not exceed wear life specifications, despite having been in service for over 45 years. Despite the increased frequency of regular ultrasonic testing of the rail prior to the accident, the defect at the initial point of derailment had not been detected.

The investigation found that a number of rail sections showed head checking and shelling in the central region of the running surface. Ultrasonic rail testing can be unreliable when the rail surface condition is poor or contaminated, resulting in the masking of any developing internal rail defects and increasing the risk of a broken rail derailment. Following the incident and investigation a revised rule came into force concerning ‘Missed Segments of Rail Flaw Inspection’. It states that if the operator of the rail defect detection equipment determines that, due to rail surface condition and or other reasons, a valid search for internal defects could not be made over a particular length of track, the test on that particular length of track cannot be considered as a search for internal defects.

Main-track derailment, Waterfall, Ontario
14 July 2011

A CN freight train proceeding at 40mph, derailed 11 multi-platform intermodal cars carrying 86 containers. Approximately 6800 feet of track was damaged or destroyed including the Waterfall south siding switch. There were no injuries and no dangerous goods were released. The investigation found that a combination of non-urgent non-conforming wheel/rail contacts, track-alignment variations and worn bogie components produced increased lateral curving forces and a higher angle of attack on both the lead and trailing wheel sets at the point of derailment. Also, insufficient low rail fastening, low rail negative cant and wheel contact further to the field side of the low rail reduced the low rail resistance to rollover.

In recent years, the Transport Safety Board has examined three derailments (Burton, South Parry and this occurrence) involving low rail cant/rail rollover. In all three occurrences, the derailment was preceded by track-gauging activities where efforts were made to improve rail-rollover resistance. However, the gauging activities did not equally upgrade the gauge restraint and lateral strength on both the high rail and the low rail. When gauging and tie replacement activities are conducted on curves without upgrading the resistance of both the high and low rail to dynamic gauge-widening forces, the risk of derailments involving low rail cant/rail rollover and wide gauge wheel drop-in is increased.

The investigation also reported on the risks regarding the cornering behaviour of intermodal railway equipment. Multi-platform cars with shared couplers where the male end is leading generate elevated lateral forces during curving that, if high enough, may roll the rail over. It also reported that articulated trucks result in reduced resistance to rail rollover as platforms share a truck instead of each having their own. To minimize the effect of reduced rail-rollover resistance for articulated intermodal cars, a number of risk mitigation strategies, including the use of premium fasteners on curves and ensuring that track gauge/lateral strength is maintained with equal emphasis on the high and low rail are reported upon.

Changes to track spiking and focused inspections followed the derailment and investigation.
A Metro Trains Melbourne case study

To detect defects in tracks, inspection regimes use a number of methods including visual inspection and automated measuring systems. Since the 1970s, track geometry inspection vehicles have been used on major railways and have greatly increased the accuracy and speed of inspections which, in turn, have been a contributing factor in the decline of track-caused derailments.*

Metro Trains Melbourne (MTM) recently changed its track inspection regime and introduced:

- track inspection technology to reduce the subjectivity of track inspections
- efficiencies in its track inspection and maintenance regime.

The track geometry evaluation vehicle, known as the EM100, is now deployed monthly across the entire Metro network to continuously monitor track condition and contribute to directing infrastructure maintenance and renewals activities. Laser rail scan technology that continuously measures rail profile will soon be installed as well as non-contact track geometry in the second stage of a three staged upgrade.

Each month track geometry measurements and ride quality details are recorded in both data and video formats. The data is then reviewed by the track discipline engineer against previous runs so any variations that may be developing can be identified.

MTM has introduced a Leica geometry and profile trolley to measure structural clearance and uses ground penetration radar to identify faulty sub-grade and potential mudspot locations as part of routine track inspections. To monitor track geometry defects in the locations where it is impractical to operate the EM 100, for example during the diverge movement through a cross over, MTM uses a KRAB trolley to measure track condition.

Under a stage 3 upgrade planned for 2013, MTM will introduce other advanced technologies, including photographic track inspections, to further remove subjectivity. Previous photographic images are compared with current images to detect variations. A rail envelope scanning system which can identify when obstructions are encroaching on the track clearance limits is also planned under stage 3.

MTM’s investment in improving the accuracy of track fault detection contributes to a solid business case and also meets Metro’s regulatory obligations.

THE CORNERSTONES OF RUNNING A SAFE TOURIST AND HERITAGE RAILWAY

The Rail Safety Act 2006 (Vic) (RSA) requires a rail operator to demonstrate to the satisfaction of the Safety Director that it has the competence and capacity to manage the risks to safety associated with the rail operations for which accreditation is sought.

The Safety Director’s key concern is to ensure that accredited rail operators are able to manage the risks to safety associated with their rail operations.

In order to comply with the requirements of the RSA, rail operators are expected to demonstrate competence and capacity in all areas of their operations, including:

- governance
- maintenance of rail infrastructure and/or rolling stock
- rail operations, including driving rolling stock and operating safe working systems
- incident management
- risk management
- management of the safety management system
- safety interface agreements.

In practical terms, having competence and capacity means having appropriately skilled and experienced people working in the key operational and management areas of the rail operator’s organisation. It also means having sufficient quantity of resources in these areas to be able to complete all the tasks required for the safe operation of the rail network.

Competence and capacity also means that rail operators should have documented policies and procedures for the maintenance of their rail infrastructure which should form part of the safety management system. They should also have access to relevant technical expertise, such as an experienced track or civil engineer, and appropriately skilled resources to conduct the work in accordance with the policies and procedures.

To promote good governance the rail operator should have an organisation structure that supports all areas of the business. It should be headed by a group of people who are ultimately responsible for management and safe operation.
of the rail network, such as a board of management. These people should have the skills and experience to manage the safe operation of the rail network, including the ability to:

- set safety policy
- set and monitor safety targets
- identify and manage risks to safety
- make objective decisions in relation to the safe operation of the rail network.

In addition, the rail operator should have procedures to ensure that risks to safety are appropriately managed within the organisation and that key risks are elevated to and monitored by the board of management. These procedures should form part of the rail operator’s safety management system.

Procedures for the management of incidents, including reporting obligations, are very important. To manage incidents properly, suitably qualified and experienced staff who understand these procedures must be available whenever the rail network is in operation. They should also have any equipment that could reasonably be expected to support the management of an incident, such as mobile phones or re-railing equipment.

The rail operator may contract in the services of appropriately skilled and experienced resources required to support the operation and maintenance of their rail network. Responsibility for the safe operation of the rail network however, remains with the rail operator and its board of management.

Rail operators are required to demonstrate competence and capacity both when they are submitting their application for accreditation and at all times while they are accredited.

If a person who provides expertise in a particular area, such as rolling stock maintenance, leaves the rail organisation, the rail operator needs to consider whether the operation of its rail network should be altered until this resource is replaced.

Rail operators are reminded of their safety duties under the RSA, which requires them to eliminate or reduce the risks to safety ‘so far as is reasonably practicable’.

Tourist and heritage operators are encouraged to contact their accredited rail operator manager in Transport Safety Victoria to discuss any concerns they have regarding compliance with this requirement of the RSA.

The Regional Rail Link (RRL) is a major new rail line running from West Werribee through suburbs including Deer Park, Sunshine and Footscray to Southern Cross Station.

As the project moves into full construction phase with associated works intensifying, TSV wants to highlight the risks associated with working close to live track. When workers are preparing for work in the rail corridor it is important they are reminded of all the safety protocols and track protection measures that occur on the day of work, particularly when working near live track.

Together, accredited rail operators and contractors should consider appropriate control measures for increased separation and visibility to reduce risks so far as is reasonably practicable. Track workers need to be aware that the track force protection coordinators are responsible for the safety of the site and their instructions must be followed at all times. If there is any excavation or trenching required as part of the works, they must be undertaken to stringent safe work practices and industry standards.

The RRL project has been divided into several work packages. The majority of these are being prepared for major occupations in the lead up to and during Christmas. Despite the temptation to be thinking about social activities rather than work, it is very important to remember health and fitness responsibilities. Employers are reminded to schedule work rosters to allow for breaks and travel time. Employees are reminded to know and understand their physical and mental limits and raise with supervisors any concerns they have about their capacity to work safely.
Transport Safety Victoria’s rail safety compliance program is a targeted risk-based approach aimed at maximising regulatory compliance and improving safety outcomes.

The program involves national and local rail safety audits and inspections of specific safety concerns or rail operators. The program starts at the beginning of the financial year and is reviewed each quarter. This ensures current safety concerns are monitored.

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<td>Red Cliffs Historical Steam Railway Inc</td>
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<td>Geelong Steam Preservation (Bellarine)</td>
<td>Alexandra Timber Tramway and Museum Inc</td>
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<td>Emerald Tourist Railway Board</td>
<td>Yarra Valley Railway Inc</td>
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<td>Melbourne Tramcar Preservation Association Inc</td>
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<td>Private sidings - inspections</td>
<td>Bombardier Transportation Australia Pty Ltd</td>
<td>Diesel Electric Rail Motor Preservation Association</td>
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<td>Steamrail Victoria Inc</td>
<td>Seven-O-Seven Operations Inc</td>
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<td>Hanson Construction Materials - Brooklyn/Westall Depot</td>
<td>Boral Cement Limited - Lyndhurst, Mildura Wodonga</td>
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<td>Hanson Construction Materials - Kilmore Quarry</td>
<td>Wettenhalls Group</td>
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<td>Boral Cement Limited - Somerton</td>
<td>Kalari Pty Ltd</td>
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<td>Boral Cement Limited - Waurn Ponds</td>
<td>Wimmera Container Line</td>
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<td>OneSteel Australian Tube Mills Pty Ltd</td>
<td>BlueScope Steel Limited</td>
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<td>Alstom Ltd (Private Siding Ballarat)</td>
<td>Geelong Port Pty Limited</td>
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<td>Qube Logistics (Vic) Pty Ltd</td>
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RAIL SAFETY WORKER PROGRAM GAINS RAPID MOMENTUM

Since the Rail Safety Worker (RSW) program was launched in late 2011, it has grown to include more than 8,000 registered RSWs throughout New South Wales and now in Victoria. Over 1,000 companies have also registered.

Metro Trains Melbourne (MTM) and Country Regional Network (CRN, John Holland) have since joined program instigator Australia Rail Track Corporation (ARTC). A number of other major rail operators are on the verge of joining the partnership which aims to create a centralised system for RSW identification and competency management across Australia.

Pegasus, a company engaged by ARTC and RailCorp, has been working with functional subject matter experts and MTM to create skills matrices which will be launched towards the end of the year.

ARTC and Pegasus are actively cooperating with other rail operators in the implementation of the program and six rail infrastructure managers have now committed to working together.

A National Rail Safety Worker Governance Committee has been formed comprising senior representatives from ARTC, RailCorp, MTM, Department of Planning Transport and Infrastructure South Australia, Queensland Rail and QR National. The first meeting was held on 10 May 2012.

The committee is working towards national definitions of:

› rail safety work
› core business rules
› standardised competency matrices.

In order to further develop a cohesive national approach to competency management, future scheduled meetings will be held under the Australasian Railway Association umbrella. This aligns with the introduction of the National Rail Safety Regulator in 2013.

Each rail operator in the group is working with its state regulators to implement the competency management system. ARTC will implement its system nationally by 30 June 2013.

The operating platform that supports the RSW-branded program was initially developed to help manage access for mine sites and has grown to include many different applications for companies in a range of industries.

Along with the RSW website (www.railsafetyworker.com.au) and sign up portal, a significant amount of back-end coding was completed in order to handle ARTC’s skills matrices for the nine different role areas. This created the blueprint for other rail infrastructure managers like MTM and established the rules for rail operators that have formed the basis for others to come on board.

At a site level software is deployed using fixed touch-screen logpoints, where workers login at the beginning and end of each shift, or with rugged touch-screen tablets connected to the internet. The software seamlessly integrates into a range of industry equipment, for example, Alcolizers and security boom gates.

By December 2012, it is expected that the software and the RSW program will be active on more than 30 rail projects around Australia with over 120 fixed and mobile logpoints monitoring safety and competency.

For more information about the RSW program, visit www.railsafetyworker.com.au.

This article was supplied by Pegasus. The views and opinions expressed are those of the author and do not necessarily reflect the views of TSV.
In Victoria on 1 July 2012, there were 43 accredited rail operators and 32 private siding operators exempted from accreditation under the Rail Safety Act 2006 (Vic).

Of the 43 accredited rail operators, 26 operators hold full accreditation for commercial purposes and 17 are accredited as a tourist and heritage operator. Of the accredited rail operators, four operators are accredited in Victoria only as their rail operations are confined to this State.

Amongst the 26 fully accredited commercial rail operators, three operators are accredited only for the purpose of being a rail infrastructure manager and 19 operators are accredited only for the purpose of being a rolling stock operator. Six of these rolling stock operators provide passenger services.

With the increased momentum of the Regional Rail Link Project, more rail contractors are seeking accreditation in Victoria.

As a part of her PhD studies and her work at TSV, human factors specialist Miranda Cornelissen presented at the International Conference on Human Factors in Transportation in San Francisco in July. The conference was jointly organised with the International Conference on Applied Human Factors and Ergonomics and had a series of sessions dedicated to rail and road research.

Miranda’s paper looked at ways to visually present complex analyses, especially in relation to their real world meaning, for example, by overlaying the results on a level crossing picture. She hopes such visualisations will improve communication between researchers, analysts, designers and system users.

Presentations in the rail and road research sessions covered a wide range of interesting topics, including:

- the use of rail data monitoring to provide indicators for problems and issues
- the development and evaluation of non-technical skills training courses
- understanding the risks associated with current shift patterns of freight train drivers and contract track workers. The fatigue risk work aimed to develop strategies for risk reduction and control that take a systems perspective on the issues identified rather than prescribing a certain fixed limit of hours
- a comparison of list-based and graph-based tools for railway signallers with a pilot test of an electronic version of the best aspects of these tools underway
- the effect of an on-call system of work on fatigue, well-being and stress amongst railway maintenance workers
- differences in approaches to perceiving and controlling level crossings between rail and road stakeholders. The study identified human factors issues and contained advice for design of future controls
- the diversity of current training for incident investigators and how such training can be more coherent in the future throughout Australia
- a framework to identify information needs of public transport users which forms the basis for journey planning, station and train passenger information. This research used different scenarios to stress test the robustness of the passenger information.

If you are interested in the papers on any of the above topics or the conference in general, please email Miranda on miranda.cornelissen@transportsafety.vic.gov.au or call on (03) 9655 6892.