



Australian Government

Australian Transport Safety Bureau

Derailment of freight train 7MB9

Goulburn, New South Wales, on 31 March 2019

ATSB Transport Safety Report

Rail Occurrence Investigation

RO-2019-010

Final – 7 May 2020

This investigation was conducted under the Transport Safety Investigation Act 2003 (Cth) by the **Office of Transport Safety Investigations (NSW)** on behalf of the Australian Transport Safety Bureau in accordance with the Collaboration Agreement.

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

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Addendum

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Safety summary

What happened

On 31 March 2019, freight train 7MB9, operated by Specialised Container Transport (SCT), derailed while exiting the refuge at Goulburn, New South Wales. A total of five wagons derailed, with wagons coming to a rest foul of both the Up and Down main lines. Prior to the derailment, the driver of train 7MB9 was authorised to pass signal G38 at Stop. This signal could not be cleared due to a track circuit fault. The track circuit fault occurred the evening before, after train 2343 passed through the refuge. At that time, the network controller contacted the on-call signal electrician and it was agreed that trains could continue by passing the signal at Stop.

What the ATSB found

The ATSB found that train 7MB9 derailed due to a broken rail. A crack likely initiated from a lack of weld fusion at the foot of the rail in an aluminothermic junction weld. This defect area was located in a portion of rail not easily detectible through continuous ultrasonic testing, and was not detected during routine maintenance. Train 7MB9 was authorised to pass signal G38 at Stop as the signal could not be cleared. The signal was likely at Stop as a result of the Up rail breaking under the previous train, 2343, that passed through the section. The track failure went undetected.

Following the derailment, a number of other factors were identified that increased the risk of a derailment in the refuge and on the main line. These were communicated with the rail infrastructure manager while the ATSB was on site.

What's been done as a result

The Australian Rail Track Corporation repaired the section of track at Goulburn damaged by the derailment immediately following the occurrence. Additionally, a process is currently being trialled to provide assistance to network controllers when responding to track circuit faults.

Safety message

Network rules that permit degraded operations must be assessed to ensure that the application of these rules do not increase risk to an unacceptable level. Personnel responsible for implementing these rules should have sufficient guidance to assess when it is safe to continue operating trains, or under what conditions operations can continue.

It is critical that areas of the rail that cannot be easily tested during scheduled continuous ultrasonic testing are tested thoroughly at the time of welding to ensure that the weld is free from defects.

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The occurrence

What happened

At 2300,¹ on 30 March 2019, a track circuit fault occurred after train 2343 entered the Goulburn refuge loop in the Down² direction. The Main South A Network Controller (NC), located at Junee, contacted the driver of train 2343 to confirm that the train was complete after entering the loop. The driver confirmed that the train was complete and they had not parted (causing the track circuit to show as occupied).

At 2320, the NC contacted the on-call Signal Electrician (SE) as the track circuit continued to fail intermittently. The NC reported that there was a track failure over 115 points after a train passed into the refuge. The NC reported that the points had failed, but they could work around the fault by authorising trains to pass signals at Stop. The SE reported that there had been some rain and that the fault could possibly be related to the ingress of water. The NC and SE agreed that the fault could remain and an inspection would be undertaken in daylight hours.

At 0403, on the 31 March 2019, train 7MB9 operated by Specialised Container Transport (SCT Logistics) was contacted by the NC while approaching Goulburn in the Up direction (Figure 1). The NC advised there was a track circuit fault and that the train would divert via the refuge loop before returning to the Up main. The driver was advised that the points were set and they were authorised to pass signal G38 at Stop.

Figure 1: Location map



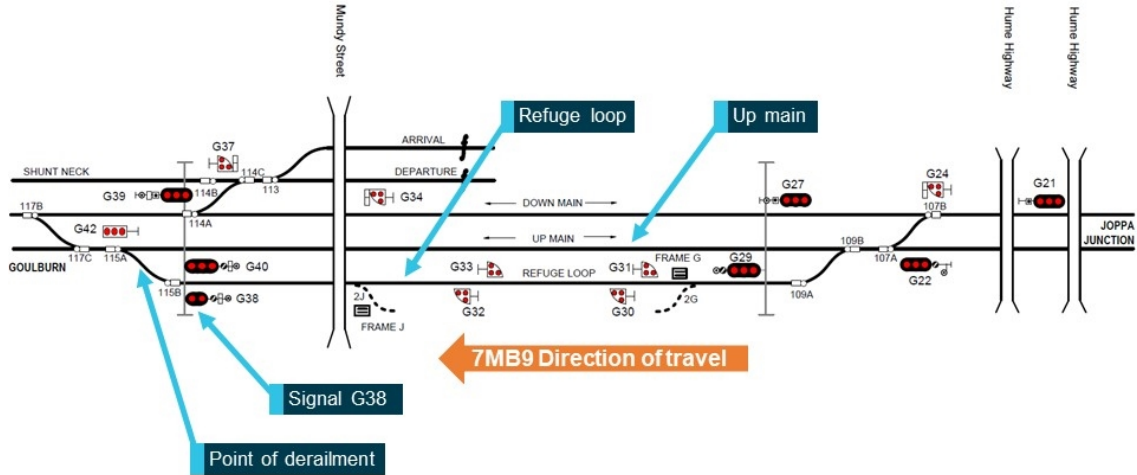
Source: Geoscience Australia with annotations by OTSI

¹ Times shown in 24-hour time as Australian eastern daylight saving time (AEDT).
² The Down track refers to the direction of travel for trains heading away Sydney, the Up track typically refers to trains heading towards Sydney. (Note: Some Up trains in this area are those heading towards Newcastle).

Train 7MB9 was travelling at 17 km/h as it traversed over points 115B and 115A when, at 0416, the driver noticed a loss of brake pipe (BP) pressure and brought the train to a stand. The NC received a track circuit fault indicator and contacted the driver of 7MB9. The driver advised the NC that 7MB9 may have parted and that he would check the status of the train. Shortly afterwards, the driver confirmed 7MB9 had derailed while passing through the turnout and the NC implemented safeworking protection (Figure 2).

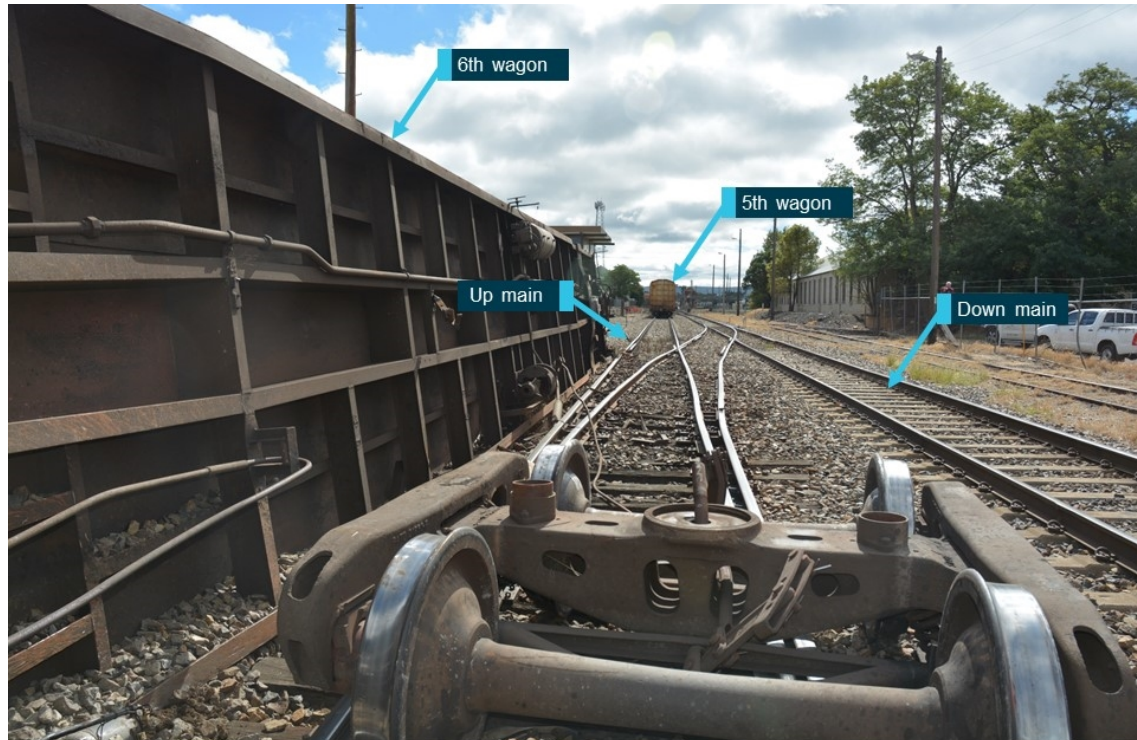
A total of five wagons derailed due to a broken Up rail at 225.413 km³ with the wagons coming to a rest across the Up and Down main lines (Figure 3 to Figure 5).

Figure 2: Goulburn track diagram



Source: ARTC, modified and annotated by OTSI

Figure 3: Derailed wagon and detached bogie



Source: OTSI

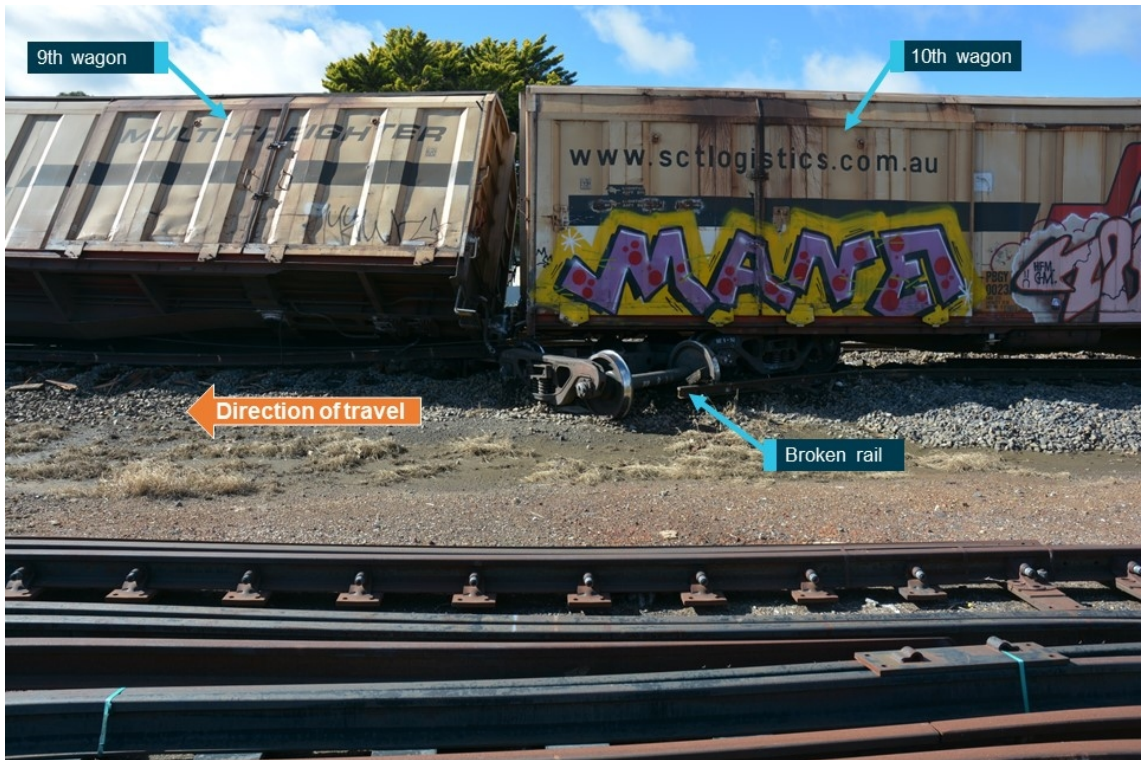
³ The kilometre distance is measured from Platform 1, Central Station, Sydney, New South Wales.

Figure 4: Derailed wagons foul of main lines



Source: OTSI

Figure 5: Broken rail



Source: OTSI

Context

Environmental information

The Bureau of Meteorology (BOM) automatic weather station at Goulburn airport⁴ recorded 30.8 mm of rainfall on 30 March 2019 and 4.8 mm on 31 March 2019. There was no other significant rainfall in the week prior. The temperature was between 4.6 °C to 14.1 °C on 31 March 2019.

Train information

2343

Southern Shorthaul Railroad (SSR) train 2343 was the previous train to pass over the track. It was travelling from Picton to Milvale, New South Wales. This train consisted of three locomotives and a rake of 43 wagons. The train manifest indicated that the wagons were unloaded at the time of passing through the refuge loop.

7MB9

Train 7MB9 was operating between Melbourne and Brisbane at the time of the derailment. This train consisted of three locomotives and a rake of 42 wagons.

The contents of a number of derailed wagons leaked onto the track. The train manifest showed there were no dangerous goods on board. The highest recorded axle load listed in the manifest was 22.88 t, which was within the maximum allowable loading limits for operating on this section of track. Inspection of the derailed wagons did not identify any defects believed to have contributed to the derailment.

Track infrastructure

The section of track at Goulburn was standard gauge (1435 mm) and managed by the Australian Rail Track Corporation (ARTC).

The refuge loop consisted of 47 kg/m welded rail, fastened to timber sleepers. The Up and Down main lines consisted of 53 kg/m welded rail, fastened to concrete sleepers.

Joining rail track

Joining of rail track can be completed by a number of methods, these include mechanical (bolted) or welded joints. The method used varies depending on the location and type of track being joined or repaired. Aluminothermic (thermit)⁵ and flashbutt⁶ welding processes are approved for use when joining sections of rail within ARTC managed track.

ARTC's engineering standards permit the joining of dissimilar rail sizes through the use of a junction rail or junction weld.⁷

- Junction rail, is a section of rail specifically designed and forged rail with two different sizes. This is then welded through standard aluminothermic welding processes for the appropriate rail size.

⁴ Bureau of Meteorology observations at Goulburn were taken from the Goulburn airport automatic weather station. The airport is approximately 5 km from site of the derailment.

⁵ Aluminothermic - also referred to as thermit welding, utilises a chemical reaction between iron oxide and aluminium within a crucible. This produces molten metal that flows into a mould joining the section of track through the fusion of the weld material and parent metal.

⁶ Flashbutt - the fusion welding of rail ends by electric arc heating and contact under high pressure.

⁷ Code of Practice - Section 1 Rail and Used Rail and Welding Policy ETF-01-01.

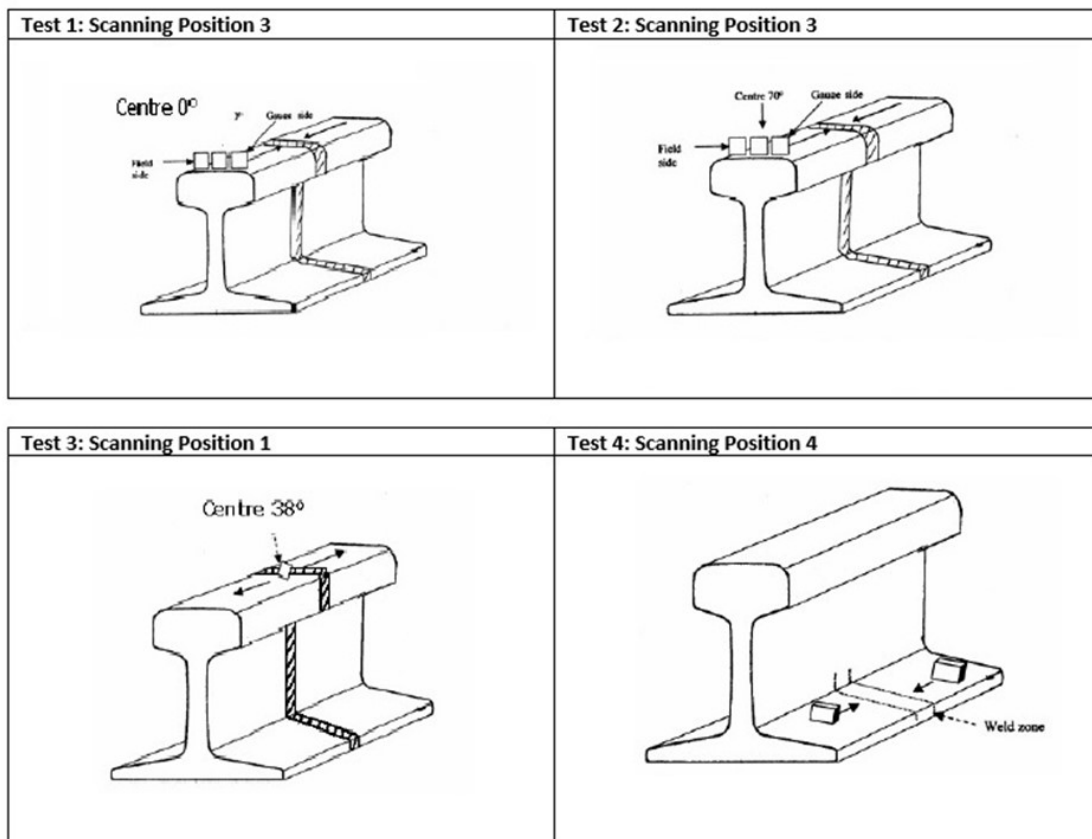
- Junction weld, is a specialised type of aluminothermic welding designed to directly join dissimilar rail sizes. Specific moulds are used to match the dissimilar rail sizes that are being joined.

ARTC advised that rails of dissimilar sizes are typically joined via junction welds and not through the use of junction rails.

Following rail welding, visual and ultrasonic post-weld testing is carried out to check the weld complies with ARTC standards and manuals.^{8 9}

Manual ultrasonic weld testing is completed using hand-held equipment with a number of testing probes to allow for the rail head, web and foot of the rail to be inspected (Figure 6). Hand-held ultrasonic testing is only carried out directly after welding or in response to defects detected through other methods such as continuous ultrasonic testing.¹⁰ The foot of the rail is not typically ultrasonically tested after the weld has been certified.

Figure 6: Typical manual ultrasonic weld-testing positions



Source: ARTC, *Manual for Non-Destructive Testing of Rail ETN-01-04*, modified by OTSI

Track maintenance

Routine track inspection and testing is conducted to identify defects and maintain safe operation. The requirements for these inspections are set out in ARTC *Civil Technical Maintenance ETE-00-03*.

⁸ Non-Destructive Testing of Rail (for Internal and Surface Defects) ETE-01-03.

⁹ Manual for Non-Destructive Testing of Rail ETN-01-04.

¹⁰ Continuous ultrasonic flaw detection performed from a mobile ultrasonic rail flaw detection vehicle.

Track patrol

This section of track was inspected weekly as part of a track patrol, this is completed on foot or from a hi-rail¹¹ or rail vehicle. The inspection scope is a general visual inspection, including the condition of the rail and joints, sleepers and fasteners, points and crossings, ballast, track geometry and stability and drainage. This inspection provides a level of assurance but is limited to detection of large or obvious defects.

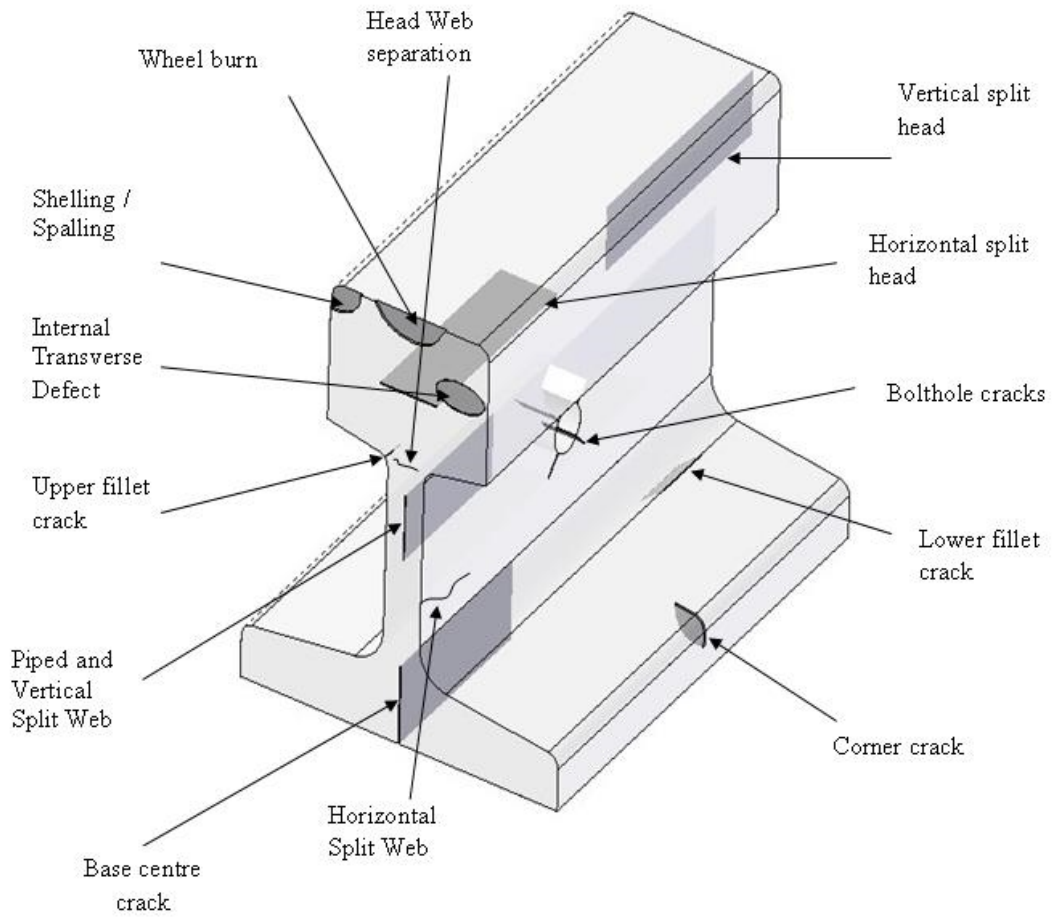
Ultrasonic rail testing

Ultrasonic rail testing provides a non-destructive testing (NDT) method to detect internal and surface defects. The frequency of testing is based on the maximum allowable track speed and gross tonnes of rail traffic over the section of track. Refuges with a track speed of 25 km/h or less, are tested at twice the time period of the adjacent mainline. The track speed in the Goulburn refuge is 20 km/h and required continuous ultrasonic rail testing or manual hand-held testing to be conducted every 244 days.

Ultrasonic testing provides a level of assurance but does not and cannot detect all defects. The ability of this method to detect rail defects (Figure 7) will vary depending on the method of ultrasonic testing utilised, but also on the calibration of the equipment. Calibration of testing equipment is performed on a rolled steel test piece to represent a section of rail, however, may not be representative of a rail weld to the same degree. Continuous ultrasonic rail testing is capable of detecting defects in the rail head and through the web of the rail to the foot. Defects in the rail foot either side of the web are outside the detectable area unless hand-held testing equipment is used (Figure 8).

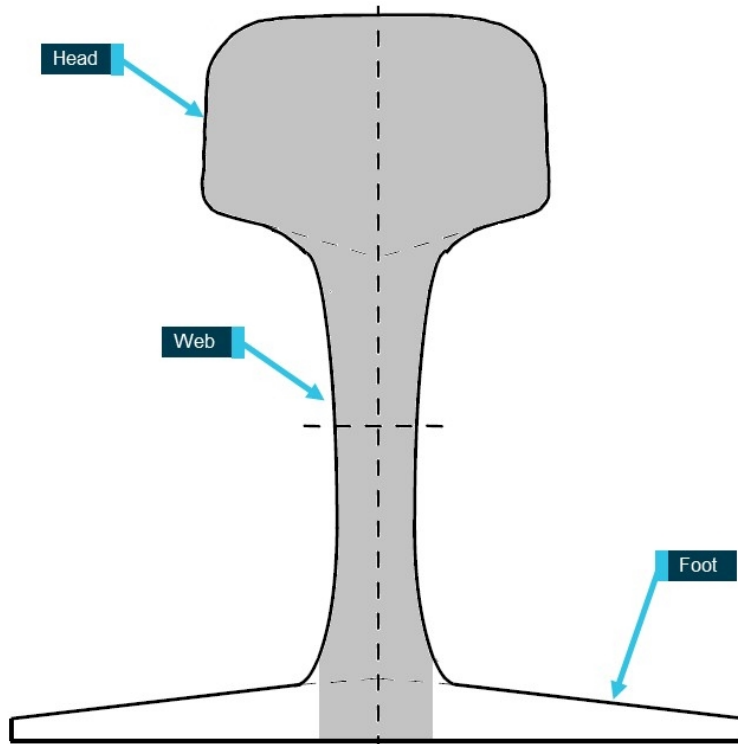
¹¹ Hi-rail vehicles can operate on the road and rail, these are also known as road-rail vehicles (RRV).

Figure 7: Rail defect types



Source: ARTC. Non-Destructive Testing of Rail (for Internal and Surface Defects) ETE-01-03

Figure 8: Continuous ultrasonic rail flaw detectable area



Regions detectable through continuous ultrasonic rail flaw inspection is shown in grey.
Source: Transport for NSW, modified and annotated by OTSI

Network rules

The network rules utilised by ARTC in New South Wales permit signals to be passed at Stop under certain conditions, these are detailed in *ANSG 608 Passing Signals at STOP*. This rule is used when a NC cannot clear a signal for an intended movement. Prior to authorising a train to pass a signal at Stop, the NC must assess the condition of the block¹² ahead for the section of track (Figure 9).

There are a number of potential reasons why a signal may not be able to be cleared, these can include, but are not limited to:

- the track circuit is still occupied
- an electrical fault (damaged bonding, insulated joint, water ingress, loose or faulty electrical connection)
- a broken rail.

¹² Block, refers to a defined section of track that can be ahead or behind the train.

Figure 9: Passing signals at Stop

Condition of the block ahead

Before authorising a Driver or track vehicle operator to pass an absolute signal at STOP, or providing information to a Driver or track vehicle operator about the condition of the *block* ahead of a permissive signal, the Signaller must get available information about the condition of the block ahead from:

- the *track indicator diagram*
- records of previous rail traffic movements
- *work on track authority* records
- reports about the *location* of the last rail traffic to enter the block
- the Signaller at the other end of the *section*.

Signallers must make sure that:

- *points* are set correctly for the *route*, and
- points that are *facing points*, or become facing points, are *secured*.

The Signaller must tell the Driver or track vehicle operator:

- the location of the last rail traffic to enter the block, or that it has left the block complete
- the location of obstructions or failed *infrastructure* in the block, or that the block has been reported as not *obstructed*
- whatever is known or not known about the condition of the block ahead.

If the condition of the block is not known, the Driver or track vehicle operator of the first rail traffic to *transit* the block must:

- report the condition of the block to the *Network Control Officer* as soon as practicable, and
- report when the *train* or *track vehicle* has exited the block.

Source: ARTC, Extract from ANSG 608 Passing Signals at STOP

In addition to ANSG 608, network controllers have general rule *ANGE 220 Unreliable Track-Circuit Operation* to assist when responding to track circuit faults. This rule details the required response when a track circuit fails to detect track occupancy or provides false detection of rail traffic (Figure 10). In this incident, the track circuit at Goulburn provided a false detection of rail traffic after the passage of train 2343.

Figure 10: Unreliable track-circuit operation

False detection of rail traffic

Track-circuit detection is treated as false if it indicates that the track-circuit is occupied without rail traffic being present.

Network Control Officers who become aware that track-circuits are providing a false indication of the presence of rail traffic must arrange for the Signals Maintenance Representative to certify the track-circuits as working correctly.

Until the track-circuits have been certified as working correctly, rail traffic must be worked in accordance with:

- Rule *ANSY 512 Manual block working*, or
- Rule *ANSG 608 Passing signals at STOP*

Source: ARTC, Extract from ANGE 220 Unreliable Track-Circuit Operation

Safety analysis

Broken rail

Post-derailment inspection completed on 31 March 2019 determined that the Up rail broke at an aluminothermic junction weld joining 47 kg/m and 53 kg/m rail. The fracture face exhibited signs of oxidation across the foot and web of the rail, with two small sections in the rail head without oxidation indicating a fresh fracture surface (Figure 11). The rail head at the break also displayed some signs of end batter.¹³

The Down rail was also found to be broken at approximately 225.426 km. The rail displayed no pre-existing defects or oxidation, although the brittle fracture was indicative of overload. The Down rail appeared to have broken secondary to the Up rail, this was likely as a consequence of the derailment.

Figure 11: Broken Up rail



Source: OTSI

The primary function of track circuits is to detect track occupancy and allow for the operation of signalling equipment and separation of trains. Discontinuities in the track circuit can indicate a fault such as a broken rail, although may not detect all instances of a broken rail. The track circuit before the derailment indicated that the section of track was still occupied after train 2343 passed through the refuge. When considering the possible causes of the track circuit fault, coupled with the end batter on the rail, it is likely the Up rail was broken prior to the derailment of train 7MB9.

The leading locomotives and two wagons of 7MB9 traversed points 115B and 115A before the 6th position wagon derailed when the broken Up rail skewed to the left (in the direction of travel), resulting in the uncoupling of the 5th and 6th position wagons. The derailed wagons were pushed

¹³ End batter - a permanent plastic deformation of a rail end at a joint or break resulting from wheel impacts due to a discontinuity (gap) in the running surface.

by the momentum of the trailing wagons and concertinaed across the Up and Down main lines. The 6th wagon came to rest on its side approximately 80 m from the point of derailment.

Maintenance records indicated that the track was subjected to continuous ultrasonic testing on 5 November 2018, with no discontinuities identified. Review of available ultrasonic test recordings indicated that no abnormalities were detected over this section of track dating back to 2013.

Further analysis of the broken Up rail undertaken by an independent metallurgist on behalf of ARTC identified a lack of weld fusion on the foot of the rail between the two rail types. The lack of weld fusion most likely went undetected at the time of welding. This weld fault likely created a stress raiser leading to the initial fracture at the foot of the rail. ARTC were unable to provide welding or maintenance records for the junction weld, however they assessed the weld as having had a long service life.

It is likely the fracture progressed from the foot of the rail and through the rail cross-section after the date of the last ultrasonic inspection. The crack was most likely detectable once the defect propagated into the web of the rail, however, testing was not due until July 2019, as per ARTC maintenance standards. This defect would have been unlikely to be detected during a routine track patrol inspection, in particular, a track patrol completed from a hi-rail vehicle.

Passing signals at Stop

Network rule *ANGE 220 Unreliable Track-Circuit Operation* required the NC to contact the on-call SE when they became aware of the false detection of rail traffic. This rule permitted trains to block work¹⁴ or pass signals at Stop until the track circuit could be certified as working correctly. In response to the track circuit fault, the NC contacted the SE and advised they could continue to operate by passing signals at Stop. The SE agreed and suggested that the fault could have been the result of wet weather in the area.

Review of the audio recordings indicated that the NC advised the driver of train 7MB9 there was a track failure on the other end of the refuge (in the direction of travel), the points were set for the train to return to the Up main, and that the driver was authorised to pass signal G38 at Stop. This information was repeated back by the driver. During this communication the driver sought confirmation that the points were set to return to the Up main which was confirmed by the NC.

The driver was authorised to pass signal G38 at stop while on approach to Goulburn at 0403. On arriving at the signal, the driver did not stop at the signal before passing, as required by network rule ANSG 608. Authorising trains to pass a signal at Stop before arriving at the signal is permissible. This could, however, lead to a train passing the incorrect signal as positive confirmation between the driver and network controller is lost.

The driver was not advised that the condition of the track was unknown and had not been inspected prior to the train traversing points 115B and 115A. The driver operated train 7MB9 at approximately 17 km/h through the turnout, which was within the track speed limit. If the 7MB9 first stopped at signal G38, the train would initially have travelled at a slower speed until either reaching track speed or derailing. Had the NC advised the driver that the condition of the track was unknown, the driver may have operated the train at a slower speed through the turnout, which may have reduced the consequences of this occurrence.

At the time of the occurrence, ARTC's network rules permitted continued operation of trains until the track circuit could be certified as working. These rules did not provide guidance for the NC to continue to assess, the changing conditions and ensure safe operation. Additionally, the rules did not restrict the track speed of trains authorised to pass signals at Stop.

¹⁴ Block working, is a method of train control used to prevent rail traffic from entering a block which is occupied by another train.

While passing signals at Stop is permissible under *ANSG 608 Passing Signals at STOP*, the potential causes or conditions for passing the signal must be fully assessed. Track circuit faults following a recent train movement could indicate a broken rail and should be considered as the source of the fault prior to authorising trains to pass signals at Stop.

The Rail Industry Safety and Standards Board (RISSB) network rule for passing signals at Stop¹⁵ recommends trains operate at restricted speed when the signal is at Stop for an unknown reason. This rule is not mandatory for rail infrastructure managers, but provides industry recommended practice.

Site examination

During the post-derailment inspection there were a number of factors identified that could have increased the risk of a derailment.

During the derailment, the sleepers in the turnout shifted laterally with pooled water present under the sleepers. There was rain during the previous day and night, however the track and ballast was raised above ground level with the ballast retaining water (Figure 12). To satisfactorily meet the design requirements, ballast must be free-draining (not clogged by dirt and mud) so that it allows water to run through it and off into the drainage system.¹⁶

The ballast and sleepers at the site of the broken Up rail were destroyed, preventing a detailed inspection. The broken sleepers in this area fractured into small pieces and appeared to indicate some degree of decaying and the ballast appeared fouled with mud and dirt. It is likely that the track condition at the point of derailment was similar to that of the area in the turnout. It is possible the fouled ballast reduced the track stability and may have allowed greater track movement in this area.

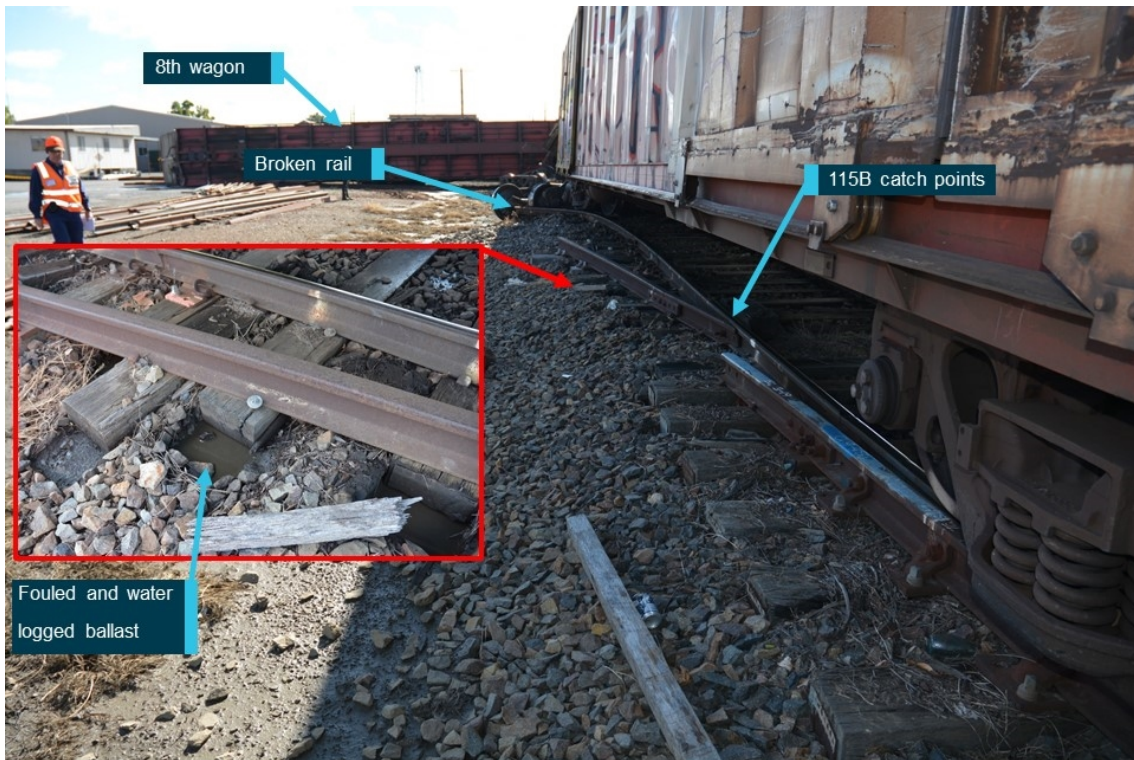
Under the 10th wagon, there were also six sleepers in a row where the fastener was either displaced and not securing the rail foot, or was secured to the sleeper but not in contact with the foot of the rail (Figure 13). It did not appear that these fasteners had displaced as part of the derailment sequence and appeared to be a pre-existing defect.

ARTC advised that in 2017, they identified decayed sleepers in the refuge. In May 2017, ARTC replaced 70 sleepers with concrete sleepers between the 225.440 km and 225.590 km. A further 200 sleepers had been identified as requiring replacement and were being monitored annually. There were no concrete sleepers near the point of derailment.

¹⁵ Rail Industry Safety and Standards Board (2014). *Passing Fixed Signals at Stop ANRP-6013*, June 2014.

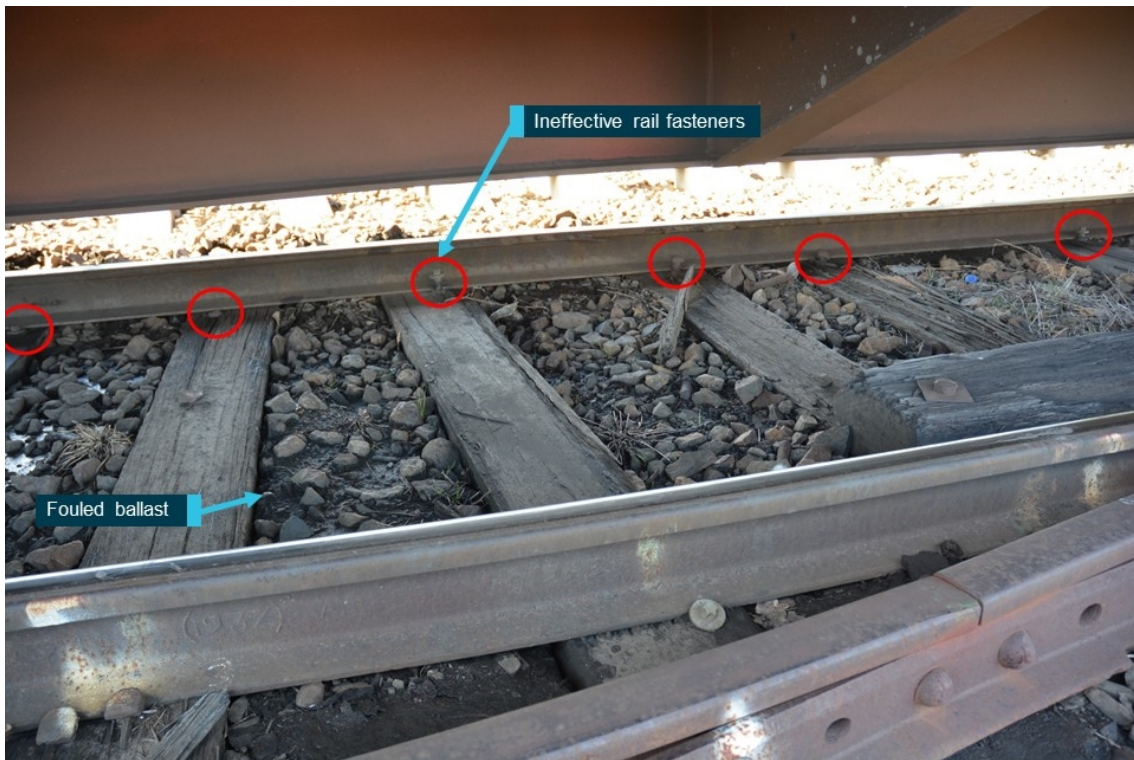
¹⁶ Transport NSW, RailCorp. *Infrastructure Engineering Manual – Track TMC 202 v2.3 2012* pp,145-146.

Figure 12: Refuge track condition near point of derailment



Source: OTSI

Figure 13: Ineffective rail fasteners

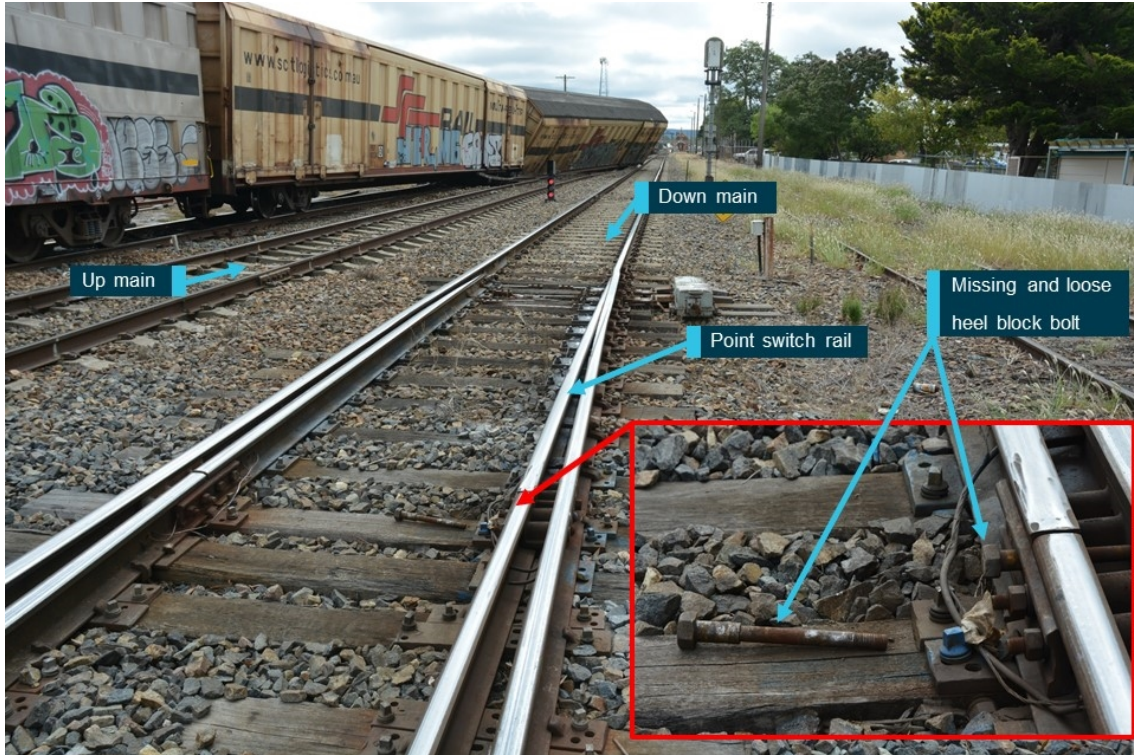


Source: OTSI

While walking the derailment site, the ATSB also identified points 114A on the Down main with ineffective heel block¹⁷ fastening. One heel block bolt was found in the four-foot¹⁸ and the second bolt securing the point switch was loose (Figure 14). The ATSB raised the defect with the ARTC representative on the day of the derailment.

Maintenance records indicated that the most recent track patrol was performed on 28 March 2019, with no reported defects at this location. It was not possible to determine when the bolt dislodged, however the derailment is not believed to have contributed to these defects found on the adjacent track.

Figure 14: Down main heel block bolt missing



Source: OTSI

¹⁷ The heel block secures the switch point and allows the rail to pivot as the points operate.

¹⁸ The spacing between the two railway tracks is referred to as the four-foot, based on the standard gauge of 4'8.5" (1435 mm).

Findings

From the evidence available, the following findings are made with respect to the derailment of freight train 7MB9 that occurred at Goulburn, New South Wales on 31 March 2019. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

Safety issues, or system problems, are highlighted in bold to emphasise their importance.

A safety issue is an event or condition that increases safety risk and (a) can reasonably be regarded as having the potential to adversely affect the safety of future operations, and (b) is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operating environment at a specific point in time.

Contributing factors

- A crack propagated from the foot of the Up rail at a junction weld and was not detected by ARTC maintenance activities. It is likely that after the date of the last continuous ultrasonic testing, a crack progressed through the foot and into the web of the rail.

Other factors that increased risk

- **ARTC's network rules did not provide suitable guidance to assess continued safe operation when responding to track circuit faults. Additionally, the network rules permitting signals to be passed at Stop did not require a reduction in speed when the condition of the track was unknown. [Safety issue]**
- **Post-incident inspection of the derailment site identified a number of factors that increased the risk of a derailment in the refuge and main line. ARTC's maintenance activities had identified some but not all of these factors prior to the derailment. [Safety issue]**

Other findings

- The Up rail broke at an aluminothermic junction weld, joining 47 kg/m and 53 kg/m rail at 225.413 km.
- The track circuit fault was likely the result of the Up rail breaking as train 2343 passed through the turnout, which went undetected prior to train 7MB9 derailing.

Safety issues and actions

The safety issues identified during this investigation are listed in the Findings and Safety issues and actions sections of this report. The Australian Transport Safety Bureau (ATSB) expects that all safety issues identified by the investigation should be addressed by the relevant organisation(s). In addressing those issues, the ATSB prefers to encourage relevant organisation(s) to proactively initiate safety action, rather than to issue formal safety recommendations or safety advisory notices.

Depending on the level of risk of the safety issue, the extent of corrective action taken by the relevant organisation, or the desirability of directing a broad safety message to the [aviation, marine, rail - as applicable] industry, the ATSB may issue safety recommendations or safety advisory notices as part of the final report.

All of the directly involved parties were provided with a draft report and invited to provide submissions. As part of that process, each organisation was asked to communicate what safety actions, if any, they had carried out or were planning to carry out in relation to each safety issue relevant to their organisation.

The initial public version of these safety issues and actions are provided separately on the ATSB website to facilitate monitoring by interested parties. Where relevant the safety issues and actions will be updated on the ATSB website as information comes to hand.

ARTC Network rules and procedures

Safety issue number:	RO-2019-010-SI-03
Safety issue owner:	Australian Rail Track Corporation
Operation affected:	Rail infrastructure maintenance
Who it affects:	All owners and operators of rail networks track circuits.

Safety issue description

ARTC's network rules did not provide suitable guidance to assess continued safe operation when responding to track circuit faults. Additionally, the network rules permitting signals to be passed at Stop did not require a reduction in speed when the condition of the track was unknown.

Proactive safety action

Action taken by:	Australian Rail Track Corporation
Action number:	RO-2019-010-NSA-004
Action type:	Proactive safety action
Action status:	Released

Safety action taken: ARTC has advised that they are currently trialling a process to assist when responding to track circuit faults.

ATSB comment: The ATSB notes that ARTC has implemented a trial for responding to track circuit faults, but this does not contain any references to a reduction in speeds if continuing operation.

ARTC Track infrastructure activities

Safety issue number:	RO-2019-010-SI-02
Safety issue owner:	Australian Rail Track Corporation
Operation affected:	Rail infrastructure maintenance
Who it affects:	All owners and operators of rail networks

Safety issue description

Post-incident inspection of the derailment site identified a number of factors that increased the risk of a derailment in the refuge and main line. ARTC's maintenance activities had identified some but not all of these factors prior to the derailment.

Proactive safety action

Action taken by: Australian Rail Track Corporation

Action number: RO-2019-010-NSA-001

Action type: Proactive safety action

Action status: Released

Safety action taken: ARTC undertook restorative work following the derailment and repaired the section of track.

ATSB comment: The ATSB notes that the action taken will address the immediate safety issue, but does not resolve the underlying factors that contributed to the safety issue.

General details

Occurrence details

Date and time:	31 March 2019 – 0416 AEDT	
Occurrence category:	Accident	
Primary occurrence type:	Running line derailment	
Location:	Goulburn, New South Wales	
	Latitude: 34° 45.733' S	Longitude: 149° 427.805' E

Train 1 details

Train operator:	Southern Shorthaul Railroad	
Registration:	2343	
Type of operation:	Grain	
Departure:	Picton, New South Wales	
Destination:	Milvale, New South Wales	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – 0	Passengers – Nil
Damage:	Nil	

Train 2 details

Train operator:	Specialised Container Transport	
Registration:	7MB9	
Type of operation:	Freight	
Departure:	Melbourne, Victoria	
Destination:	Brisbane, Queensland	
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – 0	Passengers – Nil
Damage:	Substantial	

Sources and submissions

Sources of information

The sources of information during the investigation included the:

- Australian Rail Track Corporation (ARTC)
- Office of National Rail Safety Regulator (ONRSR)
- Specialised Container Transport (SCT).

References

Australian Rail Track Corporation (2009). *Manual for Non-Destructive Testing of Rail ETN-01-04*, September 2009.

Australian Rail Track Corporation (2011). *Used Rail and Welding Policy ETF-01-01*, April 2011.

Australian Rail Track Corporation (2015). *Passing Signals at STOP ANSG-608*, October 2015.

Australian Rail Track Corporation (2015). *Unreliable Track-Circuit Operation ANGE-220*, October 2015.

Australian Rail Track Corporation (2016). *Code of Practice - Section 1 Rail*, July 2016.

Australian Rail Track Corporation (2018). *Non-Destructive Testing of Rail (for Internal and Surface Defects) ETE-01-03*, July 2018.

Australian Rail Track Corporation (2019). *Civil Technical Maintenance ETE-00-03*, March 2019.

Rail Industry Safety and Standards Board. *Glossary of Terms*.

Available at: www.rissb.com.au/glossary/

Rail Industry Safety and Standards Board (2014). *Passing Fixed Signals at Stop ANRP-6013*, June 2014.

Transport NSW, RailCorp. *Infrastructure Engineering Manual – Track TMC 202 v2.3 2012 pp, 145-146*, July 2012. Available at: www.transport.nsw.gov.au/industry/asset-standards-authority/find-a-standard/track-fundamentals-23

Submissions

Under Part 4, Division 2 (Investigation Reports), Section 26 of the *Transport Safety Investigation Act 2003* (the Act), the Australian Transport Safety Bureau (ATSB) may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. Section 26 (1) (a) of the Act allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to Australian Rail Track Corporation, Office of National Rail Safety Regulator, Specialised Container Transport and Transport for NSW.

Any submissions from those parties will be reviewed and where considered appropriate, the text of the draft report will be amended accordingly.

Submissions were received from Australian Rail Track Corporation and Office of National Rail Safety Regulator. The submissions were reviewed and, where considered appropriate, the text of the report was amended accordingly.

Australian Transport Safety Bureau

The ATSB is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within the ATSB's jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Developing safety action

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes it appropriate. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

Terminology used in this report

Occurrence: accident or incident.

Safety factor: an event or condition that increases safety risk. In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence. Safety factors include the occurrence events (e.g. engine failure, signal passed at danger, grounding), individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences.

Contributing factor: a factor that, had it not occurred or existed at the time of an occurrence, then either:

- (a) the occurrence would probably not have occurred; or
- (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious, or
- (c) another contributing factor would probably not have occurred or existed.

Other factors that increased risk: a safety factor identified during an occurrence investigation, which did not meet the definition of contributing factor but was still considered to be important to communicate in an investigation report in the interest of improved transport safety.

Other findings: any finding, other than that associated with safety factors, considered important to include in an investigation report. Such findings may resolve ambiguity or controversy, describe possible scenarios or safety factors when firm safety factor findings were not able to be made, or note events or conditions which ‘saved the day’ or played an important role in reducing the risk associated with an occurrence.