

RAIL SAFETY REPORT



SAFE RAILWAYS FOR AUSTRALIA

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ESSA REGULATO

ONRSR's operational mantra The ONRSR Way lists among the fundamentals of our approach a desire to pursue continuous improvement, both in our own performance and more broadly across the rail industry. That need for reflection and refocussing is something I found myself coming back to when contemplating the rail safety landscape in Australia, described in the pages that follow.

> By comparison with most mass transit systems, and specifically with train networks around the developed world, Australia remains home to a largely safe and safety conscious rail industry. The roles and responsibilities all of us have for the management of safety have been successful in preventing mass casualty incidents like the terrible accidents we have seen in places like Egypt and Taiwan in the last 12 months. However, the reality is that recent years have been sobering ones for rail in Australia, punctuated by the deaths of four rail safety workers in three separate accidents, in three different states. We have also seen tragic accidents at level crossings across the country that have resulted in deaths and serious injuries.

> While each of these incidents has its own unique set of circumstances, what is not in question is that they were all preventable. Similarly, in time they will give all of us with a stake in rail safety the opportunity to learn lessons. The ultimate outcomes are still to be finalised but it is clear that in the meantime incidents like these must drive improvements in rail safety. At the very least they must serve as a tragic reminder of the need for vigilance where safety is concerned - for both rail operators and road users - and the criticality of the so far as is reasonably practicable (SFAIRP) principle when it comes to the management of risk in our industry.

The information in the ONRSR Rail Safety Report 2020–2021 is designed to help all rail transport operators, whatever the size and scope of your operation, identify where improvements can be made and understand where opportunities exist to refocus on safety management. Like the previous eight iterations ONRSR has produced, advances in data quality, collection and analysis mean this edition presents an even sharper and more detailed examination of safety performance across all jurisdictions and modes. The progress ONRSR and, by extension, rail transport operators are making in addressing some of the priority safety issues, is also documented while, where relevant, important benchmarking data that compares Australia's performance with that of the United States and the UK is also included.

Collectively this information is an invaluable resource that we know can play a really important part in helping those charged with managing rail safety make even the most incremental of improvements. Some of these may just be the difference in the operational environment, especially where the Federal, State and Territory Governments are devoting significant resources to major rail projects that will help build Australia out of the COVID-19 downturn.

Only with this commitment to getting better year on year can we ensure we minimise incidents and maintain our enviable international record for safety.

J. Mlany

Sue McCarrey Chief Executive / National Rail Safety Regulator

OUR VISION

SAFE RAILWAYS FUR AUSTRALIA

OUR VALUES

Our values guide and inform the internal culture and external business conduct of ONRSR.

- INTEGRITY
- RESPECT
- INDEPENDENCE
- DILIGENCE
- EXCELLENCE

OBJECTIVES

Under Rail Safety National Law (RSNL)¹, ONRSR's objectives are to:

- > facilitate the safe operations of rail transport in Australia;
- > exhibit independence, rigour and excellence in carrying out its regulatory functions; and
- promote safety and safety > improvement as a fundamental objective in the delivery of rail transport in Australia.

FUNCTIONS

As defined in ONRSR's Statement of Intent², ONRSR's key functions are to:

- improve rail safety for the Australian community;
- decrease the regulatory burden on the rail industry;
- provide seamless national safety regulation; and >
- enforce regulatory compliance.

ROLE

ONRSR performs its functions under a co-regulatory framework in which responsibility for regulation and safety is shared between industry, governments and ONRSR. The principle of shared responsibility is underpinned by specific duties defined under the RSNL. In particular, section 52 states a rail transport operator must ensure, so far as is reasonably practicable (SFAIRP), the safety of its railway operations. This duty is consistent with the principles of safety risk management generally where those responsible for safety risks must ensure all reasonably practicable measures are in place to protect people from the harm that may arise.

REGULATORY APPROACH

ONRSR is a risk-based regulator overseeing the application of a systematic decision-making framework, which prioritises regulatory activities and informs decision outcomes, based on an assessment of risks to rail safety. It involves:

- > developing an understanding of the risks to the safety of railway operations in Australia;
- determining which of these risks ONRSR is able to influence through its regulatory activities; and >
- designing and prioritising regulatory activities and outcomes in a way that best maintains and > improves rail safety.

Applying a risk-based approach to regulation has parallels to the RSNL's requirement for rail transport operators to apply a risk-based approach to safety management. It also enables ONRSR to focus resources on the basis of risk and to improve the effectiveness of regulatory interactions.

The ONRSR Way³ provides further details on the key principles by which ONRSR regulates. This is supported by policies, procedures and guidelines to assist accredited parties to fulfil their obligations.

²Office of the National Rail Safety Regulator, Statement of Intent 2021 to 2024, ONRSR, Adelaide, 2021 ³Office of the National Rail Safety Regulator, The ONRSR Way, Edition 2, ONRSR, Adelaide, 2020

¹RSNL refers to the Rail Safety National Law (South Australia) Act 2012 and Rail Safety National Law (WA) Act 2015

ONRSR's Rail Safety Report provides a summary of rail safety performance in the 2020–2021 financial year. This performance is described in terms of safety statistics based on rail safety occurrences notified to ONRSR, and intelligence gathered through regulatory activities.

This report is designed to consider rail safety from a national perspective rather than to single out individual operators or specific incidents. It is an ongoing function of ONRSR to work with individual rail transport operators on issues that pertain specifically to them. ONRSR does, however, highlight specific examples of incidents where they demonstrate issues considered relevant to the wider industry. ABOUT THIS REPORT

Number of accredited operators is correct as of 5 October 2021. Refer to the National Rail Safety Register at www.onrsr.com.au for a full and up to date list of accredited operators

The significant increase in number of Site Visits reported compared to previous version

to improvements in the system used to capture this information

(SPAD): Signal Passed At Danger without authority (LRTAE): Light Rail or Tram Authority Exceeded

OVERVIEW

A large part of ONRSR's regulatory intelligence is gained from the thousands of rail safety occurrences reported each year. Some of these events lead to an immediate response by ONRSR while others are categorised and analysed over time to build a picture of safety performance in the rail industry. This performance provides insight into which safety areas require focus by ONRSR and which sectors and individual operators should be the subject of this focus.

Notifiable occurrences are an important input to ONRSR's risk-based regulatory approach. The type of events, their frequency and their actual or potential consequences, assist ONRSR in understanding the rail safety risks that exist in the industry. Some events result in more significant consequences or have the potential for greater risk and these events are the focus for presentation of occurrence statistics in this report.

The statistics presented in the following sections focus primarily on the events of the 2020–2021 financial year. The report continues with several charts that have been published in previous years which show the last five years' performance in terms of incident counts and rates. Incident rates provide a more accurate picture of national safety performance than counts alone, by accounting for variations in the scale of railway operations over time.

ONRSR has once again conducted benchmarking against international performance and highlighted selected events it has judged as the more serious of the year.

RAILWAY-RELATED FATALITIES

There were 85 fatalities reported in the 2020–2021 financial year on railways across Australia. These consisted of:

- > a driver of a light locomotive involved in a collision with a stationary freight train;
- > a passenger struck by a train after falling from a station platform;
- > a passenger who suffered a fall on board a moving tram;
- > a pedestrian struck by a train in the vicinity of a level crossing;
- > four occupants of road vehicles involved in collisions with trains at level crossings, with two involving suspected acts of trespass;
- > three pedestrians struck by trains at level crossings, following suspected acts of trespass;
- > a stowaway who fell from a moving train;
- > a worker who suffered a medical episode at a rail construction site;
- a passenger who suffered a fall on an escalator at a train station; >
- > a victim of an alleged assault on a station platform;
- seven fatalities involving railway trespassers struck by trains, not at level crossings; and >
- > 63 fatalities involving suspected suicide.

RAIL SAFE ATISTIC \triangleleft SUMM/

FIGURE 1:

Railway-related fatalities, July 2016 to June 2021

Non-passenger fatalities at level crossings are classified as Public if neither trespass nor suicide is suspected. Suspected suicide at level crossings are coded as Trespasser.

RAIL SAFETY STATISTICAL SUMMARY

A comparison of the rate of fatalities between Australian railways and selected overseas railways is summarised in Table 1. The Australian data in this table is a subset of the fatalities summarised in Figure 1 to align with the overseas data definitions. For example, local data excludes suspected suicide as these are also excluded from overseas data.

The fatality rate for Australia over the five-year period is marginally higher than Great Britain but well below the United States. A review of the US figures by individual incident types suggests the average rate reflects a significantly higher proportion of trespass-related fatalities compared to Australian railways.

TABLE 1:

Railway fatalities - Australia, Great Britain and United States

Fatalities involving passengers, workers, public and trespass (excluding suspected suicide). The annual reporting period for Great Britain runs from April to March. Statistics for the United States exclude fatalities on isolated networks, such as metropolitan transit systems that are not connected to the wider network.

		2016-17	2017-18	2018-19	2019-20	2020-21	5 YEAR
AUSTRALIA	Fatalities	18	18	20	17	22	95
	Train Km (million)	241.5	243.3	242.5	249.1	248.0	1,224
	Rate	0.075	0.074	0.082	0.068	0.089	0.078
GREAT BRITAIN ¹	Fatalities ¹	36	48	44	34	23	185
	Train Km (million)²	555.9	554.1	563.9	584.0	446.0	2,703.8
	Rate	0.065	0.087	0.078	0.058	0.052	0.068
UNITED STATES	Fatalities ³	761	796	882	868	791	4,098
	Train Km (million) ³	1,135.2	1,132.4	1,130.3	996.7	913.1	5,307.7
	Rate	0.670	0.703	0.780	0.871	0.866	0.772

Sources:

¹ Office of Rail and Road, Data Portal, Tables 5220, 5210 and 5230, Mainline fatalities only (accessed 1 October 2021)

² Office of Rail and Road, Data Portal, Tables 1243 and 1333 (accessed 10 September 2021), Mainline freight and passenger train km

³ Federal Railroad Administration Office of Safety Analysis, 4.08 Casualty Summary Tables, online database query (accessed 9 September 2021) http://safetydata.fra.dot.gov.

TABLE 2:

Railway-related fatalities, excluding trespass or suspected

DATE	DESCRIPTION	LOCATION
17/09/2020	A person dancing along a station platform moved too close to the platform edge and fell onto the track into the path of an oncoming train. The person was fatally injured.	Kingswood Station, NSW
19/09/2020	A freight train struck a pedestrian in the vicinity of a level crossing, resulting in fatal injuries.	Port Augusta, SA
12/01/2021	A passenger fell on board a tram as it departed a stop. The onboard emergency alarm was activated and the injured passenger was taken to hospital where they later passed away.	Brighton, SA
23/02/2021	A heavy road vehicle collided with a freight train at a level crossing with passive protection. The driver and a passenger of the heavy vehicle sustained fatal injuries. The heavy vehicle caught on fire following the collision and was destroyed.	Quandialla, NSW
18/03/2021	A passenger fell backwards on an escalator at a train station. Emergency services were notified and station staff provided first aid until the injured person was transported to hospital. The person later passed away.	Epping Station, NSW
4/05/2021	A rail safety worker undertaking work at a rail construction site suffered a medical episode and passed away.	Forrestfield, WA
18/06/2021	A light locomotive collided with the rear of a stationary coal train at Westwood. Three rail safety workers were on board the light locomotive at the time. One worker was fatally injured and a second sustained serious injuries.	Westwood, Qld.
	Further detail on this incident and UNRSR's response is included on page 18.	

d su	icide,	July	2020	to	June	2021
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RAIL SAFETY WORKER FATALITIES 2020–2021

On the morning of Friday, 18 June 2021 a 40-year-old man was fatally injured. He was one of three workers involved in a collision between a light engine locomotive and a coal train at Westwood in Queensland. The two other occupants of the locomotive were injured in the accident.

Immediately following the incident, ONRSR dispatched rail safety officers and investigators to the scene and commenced an investigation focussed on the safety procedures and systems the rail transport operator had in place with the ultimate aim of determining whether or not there had been a breach of the safety duties it has under Australia's Rail Safety National Law.

At the time of writing, both the ONRSR investigation into the accident at Westwood and that of the Australian Transport Safety Bureau remain open and ongoing. ONRSR extends its sympathies to the family and friends of the man fatally injured in the accident.

While any and all safety issues will be addressed by the outcomes of these investigations, the accident did prompt ONRSR to release an industry-wide Safety Alert just four days later, on 25 June. This alert required all rail transport operators and rail infrastructure managers to review the risks associated with the practice of 'long end leading' locomotive operations. Long end leading is the practice of driving a locomotive when the drivers' cab is at the rear of the locomotive relative to the direction of travel. Depending on the size of the locomotive hood, equipment attached to the side of the hood and positioning of the driver's cab, long end leading may result in the driver's forward vision being restricted, leaving the train more susceptible to collision or derailment.

ONRSR's investigations into the two other recent fatal accidents at Wallan, Victoria in February 2020 and at Jumperkine in Western Australia in December 2019 are now in their concluding stages. These and the Westwood investigation are vital to ensuring that the best possible rail safety outcomes are generated.

There were 121 serious injuries reported in the 2020–2021 financial year on railways across Australia, almost half of which were related to slips, trips or falls. This represents a 20% reduction in the number of serious injuries reported in the previous year.

The fall is driven by a drop in passenger slips, trips and falls, likely due to reduced patronage levels as a result of COVID-19 related movement restrictions. The reduction would have been greater had it not been for a relatively large increase in the number of reported work health and safety-related serious injuries to workers in 2020-2021.

Figure 2 presents the number of railway-related serious injuries by person type over the past five years.

RAIL SAFE SUMMA STATISTI

SUMMARY **STATISTICA** RAIL SAFET

FIGURE 2:

Railway-related serious injuries, July 2016 to June 2021

Non-passenger serious injuries at level crossings are classified as Public if neither trespass nor attempted suicide is suspected. Level crossing collision excludes attempted suicide at level crossings, which are classified as Trespasser.

SUMMARY **STATISTICA** RAIL SAFE

TABLE 3:

Selected railway-related serious injuries, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
9/07/2020	A person operating a mobility device fell from a station platform onto the tracks sustaining serious injuries. Trains in the area were stopped and emergency services were notified and transported the person to hospital.	Kirrawee Station, NSW
5/08/2020	A rail safety worker sustained serious facial injuries after being struck by a crane.	Kooragang, NSW
28/08/2020	While a contractor was unloading an excavator from a trailer, the excavator fell off the trailer resulting in serious leg injuries to the operator. A member of the public was able to render immediate assistance.	Callemondah, Qld.
24/09/2020	A person using a mobility device fell from a station platform onto the tracks. The mobility device fell on the person causing serious injuries. Members of the public provided assistance and emergency services transported the injured person to hospital.	Zillmere Station, Qld.
16/10/2020	A rail safety worker sustained a hand injury while using a hand tool at a rail maintenance facility. The worker required surgery.	Near Port Hedland, WA
28/10/2020	While refuelling machinery, a fire started causing serious burn injuries to a worker. Emergency services were notified and the injured worker was airlifted to Brisbane for treatment.	Miles, Qld.
30/11/2020	A worker conducting track maintenance work sustained serious hand injuries while replacing a stock rail and blade. The injury required surgery.	Pilbara, WA
12/01/2021	A road rail vehicle used to unload ballast was travelling in reverse while a worker in the vicinity entered the danger zone resulting in a collision. The worker was taken to hospital for treatment of serious injuries.	Minyip, Vic.
12/01/2021	A rolling stock maintenance worker was inspecting a component on a locomotive in a kneeling position. Upon standing, their radio caught on the handrail resulting in a loss of balance and fall onto the track below. The injured worker was taken to hospital for treatment.	Southern Cross Station, Vic.
19/01/2021	A passenger fell off a station platform onto the tracks. The person sustained serious injuries as a result of the fall.	Claisebrook Station, WA
22/02/2021	A heavy road vehicle collided with a freight train at a level crossing protected by flashing lights. Two train crew suffered serious injuries. The driver of the heavy vehicle received minor injuries. Both vehicles sustained substantial damage.	Kalgoorlie, WA

TABLE 3 (CONT.):

DATE	DESCRI
10/03/2021	A rail maintenance worker was struck by an significant blood loss and serious arm injuri hospital for treatment.
18/04/2021	During a shunting movement, a wagon hand been installed for inspection work. The scaf providing hand shunting signals, resulting ir

PTION

n object while working, resulting in ries. The injured worker was taken to

drail collided with scaffolding that had affolding struck a nearby worker who was in serious injuries. LOCATION

Near Benalla, Vic.

Dry Creek, SA

PASSENGER TRAIN DERAILMENTS

Passenger train derailment risk is characterised by rare events that have the potential to result in catastrophic outcomes, owing to the potentially large numbers of passengers exposed to harm.

There were 10 running line passenger train derailments reported in the 2020–2021 financial year on railways across Australia, eight of which involved tourist and heritage trains. All 10 derailments were relatively minor in nature, with no reports of injuries received.

The eight tourist and heritage train derailments in 2020–2021 represent a return to levels not seen since 2017–2018. While this is partially explained by the resumption of services for the sector following COVID-19 enforced shutdowns, ONRSR has undertaken regulatory activities with the operators involved, leading to corrective actions to help prevent future incidents.

TABLE 4:

Passenger train running line derailments, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
15/07/2020	The wheels on a generator trolley of a tourist and heritage tram derailed as the tram negotiated a sharp curve. A track fault was reported to have contributed.	Launceston, Tas.
29/07/2020	A passenger carriage of a tourist and heritage train derailed at low speed. There were no injuries to passengers.	Moonta, SA
9/10/2020	A wheelset on a locomotive of a tourist and heritage train derailed at low speed as the train approached a station. There were no injuries reported.	Zamia, WA
20/10/2020	Workers attending a level crossing site in response to reports of a signalling fault found evidence of a minor passenger train derailment. Damage indicating train wheels had travelled over the bitumen surface of the level crossing was identified.	Mulgrave, NSW
11/01/2021	Two wheels on a tourist and heritage tram derailed as the tram traversed a set of points at low speed. There were no reports of injuries.	Whiteman Park, WA
3/02/2021	A faulty passenger train being taken out of service passed a signal at danger and travelled over a derailer, resulting in the derailment of two wheels.	Rhodes, NSW
20/03/2021	As a tourist and heritage train traversed a set of points, one bogie on a passenger carriage derailed. The train sustained damage but there were no reports of injuries	Revesby, NSW
13/04/2021	One wheelset of a tourist and heritage tram derailed at low speed. There were no reports of injuries.	Whiteman Park, WA
3/06/2021	A tourist and heritage train traversed a set of points in the trailing position and the wheels of two passenger carriages derailed. There were no reports of injuries.	Whiteman Village Junction Station, WA
12/06/2021	The locomotive of a tourist and heritage passenger service derailed. There were no reports of injuries.	Near Etmilyn, WA

A comparison of the rate of mainline passenger train derailments between Australian railways and the mainline railways of Great Britain and the United States is summarised in Table 5. The Australian data in this table are a subset of the derailments summarised in Figure 3 to more closely align with overseas data definitions. They include derailments involving all in-service heavy rail passenger trains, excluding those involving tourist and heritage passenger trains on isolated lines.

TABLE 5:

Passenger train running line derailments - Australia, Great Britain and United States

Heavy rail in-service passenger trains only, excluding tourist and heritage operations on isolated lines. The annual reporting period for Great Britain runs from April to March. Statistics for the United States exclude derailments on isolated networks, such as metropolitan transit systems that are not connected to the wider network.

		2016-17	2017-18	2018-19	2019-20	2020-21	5 YEAR
AUSTRALIA	Derailments	2	3	0	2	2	9
	Train Km (millions)	118.0	121.5	124.6	128.8	129.1	622.1
	Rate	0.017	0.025	0.000	0.016	0.015	0.018
	Derailments ¹	2	2	1	0	2	7
GREAT BRITAIN	Train Km (millions)²	521.9	521.2	530.3	550.8	416.1	2,540.3
	Rate	0.004	0.004	0.002	0.000	0.005	0.003
	Derailments ³	3	7	2	5	2	19
UNITED STATES	Train Km (millions)⁴	179.9	182.7	183.7	165.2	131.5	843.0
	Rate	0.017	0.038	0.011	0.030	0.015	0.023

Sources:

¹Office of Rail and Road, Data Portal, Table 5260, Mainline derailments (accessed 1 October 2021)

² Office of Rail and Road, Data Portal, Table 1243 (accessed 10 September 2021), Mainline passenger train km

³ Federal Railroad Administration Office of Safety Analysis, Rail Equipment Accidents (6180.54): online database query (accessed 9 September 2021)

⁴ Federal Railroad Administration Office of Safety Analysis, Freight / Passenger Operations Ten Year Overview (1.13): online database query (accessed 9 September 2021)

Tram derailments are generally less severe than passenger train derailments on the heavy rail network due to typically lower operating speeds. However, catastrophic tram derailments can still happen as evidenced by the derailment of a tram in Croydon, London in the UK in November 2016, which killed seven people and left many more injured.

There were seven running line derailments involving passenger trams in the 2020–2021 financial year in Australia with the most common cause being faults with points and crossovers. No injuries were reported as a result of these derailments.

While the longer-term falling trend in tram derailments visible in Figure 4 is likely due to investments in the Melbourne metropolitan tram network, the steep reduction in 2020–2021 corresponds with a drop in the number of collisions between trams and road vehicles (Figure 8). Historically, the most common cause of tram derailments in Australia has been collisions with road vehicles. During 2020–2021 however, exposure to this risk was significantly reduced due to COVID-19 related movement restrictions limiting road vehicle traffic.

RAIL SAFETY STATISTICAL SUMMARY

TABLE 6:

Selected tram running line derailments, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
17/07/2020	A tram derailed as it traversed a crossover. There were no reports of injuries but the tram and track infrastructure sustained damage.	Melbourne, Vic.
9/09/2020	The front bogie of a tram derailed as the tram departed a terminus. There were no injuries or damage reported.	Coburg, Vic.
1/12/2020	The front bogie of a tram derailed on the running line while traversing a crossover. There were no reports of injuries or damage.	Melbourne, Vic.
4/12/2020	As a tram departed a terminus and traversed a crossover, the centre bogie derailed. There were no reports of injuries or damage.	Coburg North, Vic.
2/04/2021	Two bogies on a tram derailed on the running line as it approached a depot. There were no reports of injuries or damage.	Essendon, Vic.
28/04/2021	A tram collided with a road vehicle causing the front bogie of the tram to derail. There were no reports of injuries but the road vehicle and tram were damaged.	Melbourne, Vic.

FREIGHT TRAIN DERAILMENTS

Freight train derailment risk is generally observed to have a higher frequency of occurrence but a lower consequence of event when compared to passenger train derailment. However, derailments of freight trains still expose train crews, recovery teams and, depending on the location of the derailment, members of the public to potential harm.

There were 35 running line derailments involving freight trains in the 2020–2021 financial year, marginally less than the number reported during the previous year. Two of the derailments followed level crossing collisions with road vehicles, resulting in two serious injuries and two minor injuries. No other injuries were reported in relation to these derailments.

RAIL SAFETY STATISTICAL SUMMARY

TABLE 7:

Selected freight train running line derailments, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
10/07/2020	An axle failure resulted in the derailment of two wagons of a freight train. There were no reports of injuries.	Blackwater, Qld.
24/08/2020	A screwed journal on a wagon of a freight train led to the derailment of one wagon, resulting in damage to rolling stock and track. There were no reports of injuries.	Springfield, NSW
25/08/2020	Three wagons of an empty iron ore train derailed on the running line resulting in damage to rolling stock and approximately 200 metres of track.	Pilbara, WA
10/09/2020	A freight train reported losing air while traversing a level crossing. Wagons on the train had derailed and the train had parted. There were no reports of injuries.	Milvale, NSW
22/10/2020	A heavy road vehicle with a trailer was struck by tandem light engines at a level crossing with passive protection. The lead locomotive derailed following the collision and was leaking fuel. One member of the train crew and the driver of the heavy vehicle were taken to hospital for treatment of minor injuries.	Drillham, Qld.
27/10/2020	Thirteen wagons of a freight train derailed due to a shattered wheel. There were no reports of injuries.	Koolyanobbing, WA
15/12/2020	A train crew operating a loaded grain train on a steep grade reported losing brakes and control of the train. The train derailed near Dombarton and parted in three sections. There were no injuries reported but there was significant damage to track infrastructure and most of the train was destroyed.	Dombarton, NSW
19/12/2020	A train travelling to Perth stopped due to losing air. On inspection the train crew identified wheels missing on one end of a double stacked wagon, with the bogie resting on the railhead. Recovery efforts commenced to repair affected track.	Ooldea, SA
30/12/2020	The driver of a loaded fertiliser train noticed debris on track caused by recent flooding. The train was unable to stop and travelled through a track washout resulting in the derailment of 13 wagons. There were no reports of injuries.	Near Charters Towers, Qld.
22/01/2021	A loaded freight train was travelling through a section of track with a speed restriction due to track faults. Despite the train travelling below the restricted speed limit, two wagons at the rear of the train derailed.	Mingela Range, Qld.
22/02/2021	A freight train collided with a heavy road vehicle at a level crossing protected by flashing lights, resulting in derailment of the locomotive. Two train crew suffered serious injuries. The driver of the heavy vehicle received minor injuries. Both vehicles sustained substantial damage.	Kalgoorlie, WA

TABLE 7 (CONT.):

DATE	DESCRIPTION	LOCATION
25/02/2021	A freight train travelling through an area experiencing localised flooding derailed after travelling through a track washout. Two of the three locomotives and 16 wagons derailed. The train had dangerous goods on board which all remained secure. There were no reports of injuries.	Nana Glen, NSW
15/04/2021	A freight train was diverted into a passing loop to enable a passenger service to pass. The freight train passed a signal at danger and travelled over a derailer resulting in two locomotives and three wagons derailing. One member of the crew sustained minor injuries. There was significant damage to track infrastructure.	Bomen, NSW
28/06/2021	Wheels of a lead locomotive of an empty coal train derailed on the running line after travelling over incorrectly set points on approach to a yard.	Koomi, Qld.

TABLE 8:

Freight train running line derailments- Australia, Great Britain and United States

Includes derailments of freight trains on non-running lines affecting the safety of running lines. Excludes uncoupled rolling stock derailments such as those involving only light locomotives and wagons. The annual reporting period for Great Britain runs from April to March.

		2016-17	2017-18	2018-19	2019-20	2020-21	5 YEAR
AUSTRALIA	Derailments	41	43	36	37	35	192
	Train Km (millions)	89.62	87.99	85.12	85.54	83.95	432.2
	Rate	0.457	0.489	0.423	0.433	0.417	0.444
	Derailments ¹	3	3	9	9	9	33
GREAT BRITAIN	Train Km (millions)²	33.98	32.88	33.62	33.15	29.85	163.5
	Rate	0.088	0.091	0.268	0.271	0.302	0.202
	Derailments ³	281	279	303	270	266	1,399
UNITED STATES	Train Km (millions)⁴	813.5	808.6	807.5	705.9	665.3	3,800.8
	Rate	0.345	0.345	0.375	0.383	0.400	0.368

Sources:

² Office of Rail and Road, Data Portal, Table 1333 (accessed 10 September 2021), Mainline freight train km

³Federal Railroad Administration Office of Safety Analysis, Rail Equipment Accidents (6180.54): online database query (accessed 9 September 2021) ⁴Federal Railroad Administration Office of Safety Analysis, Freight / Passenger Operations Ten Year Overview (1.13): online database query (accessed 9 September 2021)

Collisions involving trains have the potential to be catastrophic rail safety events. The likelihood and consequences of collisions vary according to factors such as the systems used to manage train movement, the types of trains involved and the speed the trains were travelling at the time of the collision. A major determinant of risk is the involvement of a passenger train because of the potential exposure of large numbers of passengers to harm.

There were five running line collisions between trains and with rolling stock in the 2020–2021 financial year, one of which was the fatal incident at Westwood outlined on page 18.

FIGURE 6:

Running line collisions between trains and with rolling stock, July 2016 to June 2021

Includes collisions on nonrunning lines affecting the safety of running lines. Excludes commercial light rail operations. Excludes trains striking or being struck by out of gauge equipment on trains on adjacent lines. Rates are expressed using total train km for the sectors represented in each reporting category.

RAIL SAFETY STATISTICAL SUMMARY

¹ Rail Safety and Standards Board, Annual Health and Safety Report 2020/21, Freight, RSSB, UK, 2020, Mainline derailments

TABLE 9:

Selected collisions involving trains, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
21/07/2020	An air filter hatch on a locomotive of a freight train had opened and was fouling the adjacent track. While the freight train was stationary near Loftus Station, a passenger train travelling in the opposite direction on the adjacent line collided with the hatch. There were no reports of injuries. The driver of the passenger train stopped the train at Loftus Station. The freight train was diverted to a siding to inspect the fault.	Loftus, NSW
29/07/2020	A loaded coal train collided with the rear of a stationary coal train at an unloading terminal. The locomotive of the train at the rear derailed and collided with two trains on the adjacent tracks. Two wagons of the train at the front also derailed and collided with trains on the adjacent tracks. The driver of the train at the rear sustained minor injuries. There was substantial damage to track infrastructure and rolling stock.	Kooragang, NSW
10/08/2020	A ballast regulator was travelling as lead in a convoy with a tamper when the track machine lost drive and started to slow. The tamper was unable to stop in time and collided with the rear of the ballast regulator at low speed. There were no reports of injuries and some damage to both vehicles. Post incident drug and alcohol testing of the workers involved resulted in a reportable alcohol or drugs irregularity.	Sunshine, Vic.
4/09/2020	A rake of wagons was being unloaded at a facility with a rail indexer while a train was being refuelled nearby. The unloading cycle was continued in error, resulting in the rake of wagons colliding with the wagons of the stationary train. There was damage to three wagons.	Weipa, Qld.
30/09/2020	A freight train crew observed two people gesturing for attention in the rail corridor, near a utility vehicle which was fouling the track. The train crew applied emergency brakes but were unable to avoid a collision with the vehicle. While there were no reports of injuries, there was extensive damage to both the utility vehicle and the front end of the locomotive.	Near Brimbago, SA
2/10/2020	An elevated work platform was used by workers in the rail corridor to conduct surveying work for a bridge upgrade. A protection officer requested and received a track occupancy authority, which was required to be fulfilled within approximately 30 minutes. The protection officer fulfilled the authority stating that the track was fit for service and all people and plant were clear of the track. A coal train was then given authority to travel through the section, subsequently colliding with the elevated work platform which was still fouling the track. Workers were able to clear the track on sighting the train. There were no injuries reported.	Newlands, Qld.

TABLE 9 (CONT.):

DATE	DESCRIPTION	LOCATION
2/10/2020	After colliding with an animal, a freight train lost air and stopped. The crew restored air and continued approximately 90 kilometres enroute to their destination, where it was identified that four wagons from the rear of the train were unaccounted for. The wagons had parted from the front portion of the train and were found occupying an unprotected section of track near where the train had stopped earlier. Recovery operations commenced and further inspection identified a deceased kangaroo between the last two wagons.	Kaleentha, NSW
17/12/2020	A stolen road vehicle was driven through fencing and abandoned on track. A passenger train travelling out of service approached the location and was unable to stop resulting in a collision. There were no reports of injuries.	Maddington, WA
13/03/2021	A train driver observed sparks from the last wagon of a freight train travelling through a station on the adjacent line. The train was stopped and inspected. A wagon was suspected to have encountered a load shift and collided with the platform. The wagon was detached at a siding for inspection.	Parkes, NSW
18/04/2021	During a shunting movement to prepare rolling stock for maintenance, a wagon handrail collided with scaffolding which had been installed for inspection work. The scaffolding struck a worker who was providing hand shunting signals, resulting in serious injuries.	Dry Creek, SA
18/06/2021	A light locomotive collided with the rear of a stationary coal train at Westwood. Three rail safety workers were on board the light locomotive at the time. One worker was fatally injured and a second sustained serious injuries. Further detail on this incident and ONRSR's response is included on page 18.	Westwood, Qld.
29/06/2021	A train yard was under a closure for track works to replace rail sleepers. Following delays to completion of the work, a track authority was fulfilled and the track certified fit for service without a speed restriction in place. A fertiliser train was given authority to travel through the section. While travelling, the driver determined the track was not fit for yard limit speed and reduced speed. Workers in the area observed wagons on the train colliding with a platform. Approximately 15 wagons of the train struck the platform resulting in minor damage.	Richmond, Qld.
	platform resulting in minor damage.	

Collisions involving trams, particularly with road vehicles and pedestrians are more common than in the heavy rail sector due to the sharing of public roadways in light rail operations. As a result of the typically lower operating speeds and lighter rail vehicles involved however, such collisions tend to be less severe in consequence.

Excluding out of gauge mirror strikes, there were six running line collisions between trams reported in the 2020–2021 financial year. No fatalities or serious injuries were reported as a result of these collisions. It is suspected that the downward trend in the number of tram collisions observed in Figure 7 is linked to investments in the Melbourne metropolitan tram network, predominantly the phased introduction of more modern trams since 2013–2014.

There were 612 collisions reported between a tram and a road vehicle and 23 between a tram and person in the 2020–2021 financial year. This represents a 38% and 51% reduction in collisions respectively compared to the previous year, driven by reduced pedestrian and road vehicle traffic as a result of COVID-19 movement restrictions, particularly in Melbourne. There were 10 serious injuries reported as a result of these collisions, seven to road vehicle occupants and three to pedestrians.

Running line collisions between trams, July 2016 to June 2021

Includes collisions on non-running lines affecting the safety of running lines. Excludes trams striking or being struck by out of gauge equipment on trams on adjacent lines.

RAIL SAFETY STATISTICAL SUMMARY

TABLE 10:

Selected collisions involving trams, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
14/08/2020	An ambulance crossed onto the tram line in the path of a tram. The tram driver applied emergency braking but was unable to avoid a collision. There were no injuries and only minor damage to both vehicles.	Thebarton, SA
24/08/2020	A tram overran the section of track at a terminus and collided with end of line infrastructure. There were no reports of injuries. There was extensive damage to the end of line infrastructure and the front of the tram.	Bundoora, Vic.
29/08/2020	A tram collided with a road vehicle, with the driver of the road vehicle transported to hospital for treatment of serious injuries. There were no other reports of injuries. The road vehicle sustained extensive damage and the front of the tram was damaged.	Bundoora, Vic.
14/10/2020	A tram collided with a road vehicle, with the driver of the road vehicle taken to hospital for treatment of serious injuries. There were no other injuries reported.	Hawthorn, Vic.
19/01/2021	A pedestrian was not aware of an approaching southbound tram and was looking the other way before crossing the tracks. The driver of the tram sounded the bell and applied emergency brakes but was unable to avoid a collision. The pedestrian was taken to hospital with serious injuries.	Melbourne, Vic.
20/01/2021	A tram collided with the rear of another tram. One of the tram operators and seven passengers were taken to hospital for treatment of minor injuries. Both trams sustained significant damage.	Melbourne, Vic.
2/03/2021	A cyclist made a sudden right hand turn into the path of a light rail vehicle resulting in a collision. Members of the public provided immediate assistance to the cyclist and notified emergency services. The cyclist sustained minor injuries.	Surry Hills, NSW
6/03/2021	A light rail vehicle travelling out of service passed a signal displaying a stop aspect and entered an intersection. A road vehicle entering the intersection collided with the side of the light rail vehicle. There were no reports of injuries. The road vehicle sustained significant damage.	Surry Hills, NSW
29/03/2021	A tram collided with the side of another tram while turning. There were no reports of injuries. There was minor damage to both trams.	Moonee Ponds, Vic.

TABLE 10 (CONT.):

DATE	DESCRIPTION	LOCATION
6/04/2021	A tram proceeded straight at automatic points rather than turning left, resulting in a collision with the side of a tram on the adjacent track. There were no injuries reported, while both trams sustained minor damage.	Maribyrnong, Vic.
1/05/2021	A tram collided with the rear of another tram. There were no reports of injuries, while both trams sustained minor damage.	Melbourne, Vic.
5/06/2021	During a shunt movement a tram that was returning out of service to the depot collided with a stationary tram at a terminus. There were no passengers on board either tram. Both trams sustained minor damage.	Balwyn North, Vic.

Instances of trains exceeding the limit of their authorised movement are considered important precursors to collisions and derailments. On heavy rail signalled systems these occurrences are notified as a Signal Passed At Danger without authority (SPAD). On light rail networks, they are notified as a Light Rail or Tram Authority Exceeded event (LRTAE).

Figure 9 depicts a rising trend in SPADs involving commercial passenger trains, where the limit of authority was missed by train crew, culminating in a five-year high 269 SPADs during 2020–2021. The trend is predominantly driven by SPADs involving urban passenger trains, leading ONRSR to increase its focus on SPAD management with metropolitan passenger train operators in 2020–2021. Regulatory activities have been undertaken in areas such as driver competency, infrastructure and signalling.

The increase in light rail authority exceedances since 2018–2019 depicted in Figure 9 is largely explained by the testing and commissioning of new light rail networks, the expansion of existing networks, and the introduction of new reporting requirements which came into effect on 1 July 2018.

FIGURE 9:

Signals passed at danger / Authorities exceeded, July 2016 to June 2021

Data shown is for occurrences classified as sub-category SPAD A1: Limit of authority missed by train crew, LRTAE A2: Light rail / tram signal passed without authority, and LRTAE A4: Limit of authority missed by light rail / tram crew, as defined in the Reporting Requirements for Notifiable Occurrences⁶. Rates are expressed using train km for the sectors represented in each reporting category.

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There were 101 fires on freight or passenger trains and trams reported in 2020–2021, which represents an increase of approximately 15% on the previous year. The rise was driven by a more than 30% increase in fires on freight trains, accounting for 52 of the 101 fires reported. Freight train fires in 2020–2021 were predominantly associated with locomotive and rolling stock faults.

Fires on passenger trains accounted for 41 of the 101 occurrences reported, representing a slight drop on the previous year. These fires were primarily due to a mix of rolling stock faults and arson.

There were no fatalities or serious injuries reported as a result of these fires.

FIGURE 10:

Fires on trains, July 2016 to June 2021

Reported fires on maintenance trains and road rail vehicles are excluded. Rates are expressed using train km for the sectors represented in each reporting category.

TABLE 11:

Selected occurrences involving fire, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
13/10/2020	The crew of a regional passenger train reported a small fire underneath a power car. The train crew inspected the train, reporting it was due to a collapsed bearing on the lead bogie of the power car. Passengers were evacuated from the train and emergency services attended to extinguish the fire. There were no reported injuries but minor damage to the rolling stock.	Yerrinbool, NSW
20/11/2020	The crew of a freight train reported a fire on the lead locomotive. The crew evacuated and secured the train while emergency services attended. A fault with the dynamic brake on the locomotive was reported as a possible cause.	Wycarbah, Qld.
4/02/2021	The crew of a freight train stopped the train on noticing a wagon at the rear of the train had caught fire. Emergency services attended and extinguished the fire. The wagon that caught fire and the adjacent wagon, which contained dangerous goods, were detached and secured until they could be recovered.	Hornsby, NSW
23/02/2021	An overheated axle led to smoke and flames on a regional passenger train, which was reported while the train was stopped at a station. Passengers were evacuated and the train was moved to a yard where the faulty passenger carriage was detached.	Moss Vale, NSW
2/04/2021	The train crew on a freight train noticed smoke rising through the dynamic brake grid. The train was stopped and emergency services were called to extinguish a fire that had started on the locomotive. There were no reports of injuries.	West Kalgoorlie, WA
24/04/2021	The driver of a light rail vehicle reported smoke emerging from the top of the vehicle while it was stationary at a terminus. It was identified that a battery compartment on the roof had caught fire for approximately ten seconds. The driver lowered the pantograph, technicians were tasked to inspect the vehicle and it was returned to the depot out of service.	Randwick, NSW
15/05/2021	While stopped at a station the train crew of a passenger train observed smoke emitting from the roof of a carriage. Emergency services were notified, the train crew evacuated the passengers onto the platform, and the train was returned out of service to the depot. There were no reports of injuries.	Kensington, Vic.
12/06/2021	A passenger on board a train observed smoke entering through a floor hatch and activated an alarm to notify the train driver. Passengers used fire extinguishers on the source of the smoke. The driver observed on inspection that the brakes were overheated. Emergency services attended and assisted staff to evacuate the area. The train was taken out of service for inspection.	Perisher Valley, NSW

OTHER NOTEWORTHY OCCURRENCES

TABLE 12:

Other noteworthy occurrences, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
28/07/2020	A freight train was in a passing loop to enable a road rail vehicle to pass in the opposite direction. The driver of the freight train had stopped next to a trackside information sign advising to stop at the location unless holding direct traffic control authority. The driver believed the train was clear of the track section to the rear and contacted train control and provided a release code. The train controller then gave authority to the road rail vehicle to pass. While passing the freight train, the operator of the road rail vehicle noticed that two wagons were fouling the track ahead and brought the vehicle to stop to prevent a collision.	Sellheim, Qld.
29/09/2020	Workers at a freight terminal identified that a rail wagon containing dangerous goods was leaking. Emergency services were notified and attended the scene. There were no reports of any injuries.	Strathfield, NSW
23/11/2020	A passenger train travelling to Ballarat passed a signal displaying a red stop aspect while another passenger train was approaching a possible conflict point. A signaller was notified by a SPAD alarm and made emergency contact via radio to both trains which were able to stop and prevent a collision.	Docklands, Vic.
6/01/2021	A contractor working near track noticed a wagon of a passing freight train dragging on the rail. The train crew was notified, brought the train to a stop and inspected the train. It was found a wagon frame had cracked and wagon components were dragging on the rail. Recovery efforts commenced to clear the site and inspect and certify the track as operational.	Near Kiacatoo, NSW
3/02/2021	An error with the details of a track recording vehicle enabled the signalling system to clear a path which allowed the vehicle to transition from live energised track to an isolated section. This resulted in the trip of the overhead line equipment. There were no injuries and minor damage was reported to the vehicle's pantograph.	South Gladstone, Qld.
9/02/2021	The incorrect application of a manual block resulted in a road rail vehicle being inadvertently placed in the path of a coal train. On identifying the error, the network controller made an emergency broadcast to the coal train. The driver was able to stop the train approximately 190 metres behind the road rail vehicle.	Bluff, Qld.

TABLE 12 (CONT.):

DATE	DESCRIPTION	LOCATION
3/03/2021	The driver of a passenger train passed a signal at stop by approximately 150 metres, entering a section of track occupied by another train. A SPAD alarm activated at the network control centre. The train controller made an emergency broadcast and the train was able to stop and avoid a collision. The train that passed the signal at stop traversed through a set of points that was not set for the movement, causing damage to track infrastructure. Passengers were safely evacuated and the track was repaired and cleared for services to resume.	Northgate, Qld.
11/03/2021	Two track machines were travelling under a train authority between signals. A freight train was cleared with a proceed signal to enter the same section of track creating a conflict. The network controller identified the error and made an emergency broadcast to the freight train which stopped. There was no collision or injuries.	Gillman, SA
5/05/2021	Passengers on board a train service notified staff that two passengers were observed writing bomb threat notes and placing them on a seat and window before alighting at Town Hall Station. Police were notified and searched the train and area. The notes were found but no other suspicious items were located. The site was cleared for services to resume.	Town Hall Station, NSW
14/05/2021	A damaged signalling cable was suspected to have caused a signalling system to lose power resulting in four signals extinguishing. A regional passenger train entered the section of track and passed all four non-operational signals. The driver stopped shortly after the fourth signal and contacted the signaller. The signaller alerted the driver of another train that had just departed a nearby station to stop, and a collision was avoided.	Seymour, Vic.
27/06/2021	As a tourist and heritage passenger service departed a station, the train guard slipped between the train and platform and was dragged along the surface. Platform staff were able to direct the train driver to stop after a short distance. The guard received minor injuries.	Menzies Creek Station, Vic.

RAIL SAFETY STATISTICAL SUMMARY

LEVEL CROSSING EQUIPMENT Failures / Defects

FOCUS AREAS

- ONRSR delivered the National Level Crossing Portal (NLXP) on behalf of the National Level Crossing Safety Committee, to meet the information needs of a range of level crossing stakeholders.

- ONRSR is working with the Australasian Centre for Rail Innovation (ACRI) and TrackSAFE to research ways of improving the visibility of trains at level crossings.

- ONRSR is working with the National Heavy Vehicle Regulator to tackle the over-representation of heavy road vehicles in level crossing occurrences.

LEVEL CROSSING NEAR MISSES With Person of Road Vehicle (PASSENGER / FREIGHT TRAIN)

owners that critical safety controls are implemented

- ONRSR has incorporated the assessment of operator's control assurance performance into ongoing regulatory

- ONRSR is developing control assurance education material for the tourist and heritage sector and other A national priority for ONRSR is defined as a rail safety area of regulatory focus that applies to multiple jurisdictions and operators and warrants a sustained period of regulatory attention. ONRSR targets its priority areas using tailored regulatory solutions, typically through operator-centric national compliance projects or industry-wide, education and information sharing programs.

This section of the report covers ONRSR's current national priorities:

- Level Crossing Safety
- Track Worker Safety >
- Contractor Management
- Control Assurance >

LEVEL CROSSING SAFETY

There are more than 20,000 level crossings in Australia and at all of them there exists a level of risk to safety - indeed, other than suicide and trespass, accidents at level crossings are the primary cause of railway related fatalities among the general public.

There were 34 level crossing collisions between a passenger or freight train and road vehicle reported in the 2020–2021 financial year, resulting in four fatalities and four serious injuries:

- all four of the fatalities were road vehicle occupants; >
- of the four serious injuries, two were train crew and two were road vehicle occupants;
- almost 60% of the collisions involved a freight train; >
- 53% of the collisions occurred at crossings protected by passive controls, such as give way signs > and stop signs, up from 40% last year; and
- over 35% of the collisions involved a heavy road vehicle, despite these vehicles representing only > 2.3% of total road vehicles registered in Australia⁷.

There were five level crossing collisions between a freight train, passenger train or tram and person reported in the 2020–2021 financial year, resulting in four fatalities to pedestrians. Four of the five collisions took place at crossings protected by active control devices, such as automatic gates, visual alarms or adjacent active road crossing controls.

All rail safety stakeholders, rail operators, governments and the general public, have a role to play in improving safety at level crossings and ONRSR continues to advocate for improvements to help reduce the rate of fatalities and serious injuries. ONRSR also continues to support the work being done by governments and industry to remove level crossings and their commitment to a policy of no new level crossings wherever possible.

NATIONAL PRIORITIES

ONRSR'S FOCUS

The increase in the proportion of collisions at level crossings with passive protection was a contributing factor in ONRSR's decision to progress the Train Lighting and Visibility Project. The objective of this project is to form a national view on whether further improvements can be made to rail safety at level crossings through train conspicuity. As part of the project, ONRSR is working with the Australian Centre for Rail Innovation to review international research and make recommendations to improve train conspicuity. This work is being supported by the rail industry and this should help with the adoption of improvements identified.

The results of this research review will feed into work being done across the country, coordinated by the National Level Crossing Safety Committee (NLCSC). ONRSR attends meetings of the NLCSC and works with all stakeholders to ensure a national approach to level crossing safety that will ultimately lead to improvements in safety procedures and changes to ONRSR's regulatory focus.

Further work is also underway with the National Heavy Vehicle Regulator in relation to the over representation of heavy vehicles in level crossing occurrences.

THE NATIONAL LEVEL CROSSING PORTAL

To coincide with Rail Safety Week 2021, ONRSR officially launched the National Level Crossing Portal (NLXP) it had been developing on behalf of the National Level Crossing Safety Committee. Close to 200 representatives from operators, level crossing committee and industry associations have now registered to use the NLXP and initial feedback has been very positive. This initiative allows for level crossing safety data to be available on demand through a self-serve online portal. The portal comprises a series of predefined, user-friendly reports - in detail or aggregate form - that draw together level crossing occurrence data with an agreed subset of Australian Level Crossing Assessment Model (ALCAM) data. Extracts from the extensive data sets the NLXP contains can be used to support evidence-based analysis.

The NLXP was developed following widespread consultation with rail safety stakeholders. To protect the integrity of the data, its use is governed by terms and conditions and prospective users must register for access via the NLXP website at www.nlxp.com.au. Currently, access to the NLXP is limited to approved rail infrastructure managers, rolling stock operators, national and state level crossing committees, industry associations and ONRSR users.

LEVEL CROSSING EQUIPMENT FAILURES AND DEFECTS

ONRSR was notified of a five-year low 132 level crossing equipment failures and defects during 2020–2021. ONRSR's risk-based analysis of these occurrences is presented in Figure 13, which highlights the higher risk occurrences that accounted for almost 26% of all failures and defects reported. These involve equipment failures or defects resulting in:

- complete failure of active warning devices;
- late activation of warning devices; or >
- premature deactivation of warning devices. >

Examples of other level crossing equipment failures and defects reported to ONRSR include:

- failure of road boom(s) to fully lower but other active warning devices operational; >
- failure of pedestrian gate(s) to close or boom(s) to lower; >
- > partial failure of flashing lights (individual lamp failures);
- > failure of audible warning devices (bells, sirens);
- > damaged / missing passive warning devices (e.g. signs);
- > defective locking mechanism on emergency escape gates; and
- > failure of pedestrian 'don't walk' warning light(s).

NATIONAL PRIORITIES

FIGURE 11:

Level crossing collisions between train and road vehicle, July 2016 to June 2021

Rates are expressed using train km for the sectors represented in each reporting category. Includes collisions reported at both public and private access road crossings.

PASSENGER AND FREIGHT

FIGURE 13:

Level crossing equipment failures and defects, July 2016 to June 2021

TABLE 13:

Selected level crossing-related occurrences, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
17/07/2020	A person bypassed active protection at a pedestrian crossing and was struck by a train departing a station. The driver of the train sounded the horn and applied emergency braking. The person was fatally injured.	Thomastown, Vic.
24/09/2020	A road vehicle collided with a freight train at a level crossing with passive protection. On sighting the vehicle approaching the crossing, the train crew applied emergency brakes but were unable to avoid a collision. The sole occupant of the road vehicle sustained minor injuries and was transported to hospital as a precaution. The road vehicle was destroyed.	Inverleigh, Vic.
22/10/2020	A heavy road vehicle with a trailer collided with tandem light engines at a level crossing with passive protection. The lead locomotive derailed following the collision and was leaking fuel. One member of the train crew and the driver of the heavy vehicle were taken to hospital for treatment of minor injuries.	Drillham, Qld.
4/12/2020	Level crossing protection failed to activate for the passage of a freight train on standard gauge track. The train crew activated emergency brakes and stopped the train over the crossing. Road vehicles had traversed the crossing just prior to the approach of the train, narrowly avoiding a collision. Prior to the incident, the adjacent broad gauge lines had been taken out of operation for level crossing removal works. The works erroneously involved the removal of fuses linking the standard gauge interface to three level crossings causing the failure.	Cherry St, Werribee, Vic.
7/12/2020	A freight train traversed a level crossing with active protection which failed to operate. The driver of the train applied emergency brakes and sounded the horn as the train passed through and stopped approximately 300 metres past the crossing. There were no collisions or injuries. At the time, contractors were conducting works on the adjacent broad gauge lines under a local possession authority. The level crossing equipment was isolated in error.	Torrens Road, Ovingham, SA
19/01/2021	A freight train traversed a level crossing with active protection which failed to activate. The train driver immediately notified train control. There were no collisions or injuries. The level crossing protection had been isolated for adjacent track works however it had not been correctly reinstated.	Spreyton, Tas.
22/02/2021	A heavy road vehicle collided with a freight train at a level crossing protected by flashing lights, resulting in derailment of the locomotive. Two train crew suffered serious injuries. The driver of the heavy vehicle received minor injuries. Both vehicles sustained substantial damage.	Kalgoorlie, WA

TABLE 13 (CONT.):

Selected level crossing-related occurrences, July 2020 to June 2021

		LOCATION
23/02/2021	A heavy road vehicle collided with a freight train at a level crossing with passive protection. The driver and a passenger of the heavy vehicle sustained fatal injuries. The vehicle caught on fire following the collision and was destroyed.	Quandialla, NSW
26/02/2021	A road vehicle turned right at a T-intersection and entered a level crossing with active protection. A non-revenue express train was approaching the crossing and was unable to avoid a collision. The sole occupant of the road vehicle was fatally injured.	Wynnum West, Qld.
9/04/2021	A person was struck by a train and fatally injured while walking across a road level crossing.	Midland, WA
27/04/2021	Two heavy road vehicles approached a level crossing with passive protection in the form of stop signs as a tourist and heritage passenger service was also approaching. The first of the heavy road vehicles stopped and then crossed. The driver of the train sounded the whistle and commenced braking. The second heavy road vehicle attempted to cross and collided with the locomotive of the train resulting in a derailment of the locomotive and the heavy road vehicle tipping over onto its side. Three of the train crew and the truck driver sustained minor injuries. There were no reports of injuries to passengers.	Tharbogang, NSW
30/04/2021	A freight train was traversing a level crossing with active protection. A road vehicle approached and entered the level crossing, colliding with the side of the train's locomotive. The driver of the road vehicle was transported to hospital for treatment of minor injuries.	Rosella, Qld.
1/05/2021	The driver of a road vehicle entered a level crossing with active protection and collided with a passenger train. The driver of the road vehicle sustained fatal injuries.	Beckenham, WA
25/05/2021	A loaded grain truck hauling a trailer had stopped at an intersection preparing to turn. The trailer was fouling a level crossing with passive protection. A freight train was on approach and collided with the trailer. One of the train crew was taken to hospital for treatment of minor injuries. There was extensive damage to the locomotive and truck trailer.	Vite Vite, Vic.
22/06/2021	A road vehicle with three occupants collided with a regional passenger train at a level crossing with passive protection. Two occupants of the road vehicle were seriously injured. The third occupant of the road vehicle sustained minor injuries. There were no injuries to the train crew or passengers.	Wallarobba, NSW

TRACK WORKER SAFETY

There were no instances of track workers being fatally struck by trains as a result of worksite protection breaches on railways across Australia in 2020–2021. However, ONRSR was notified of 443 occurrences involving breaches of worksite protection rules and procedures, which represents a 16% reduction on the previous year.

As in past years the breaches notified in 2020–2021 represented a wide range of circumstances in terms of the nature of failures and the potential for harm. Pleasingly, ONRSR's analysis of the breaches indicates a 20% reduction in the more serious types of incidents, examples of which are summarised in Table 14.

Despite a steady reduction in the number of track worker safety occurrences reported to ONRSR since 2018–2019, this remains an area of concern and regulatory focus.

ONRSR'S FOCUS

In 2020–2021 ONRSR focussed its compliance and enforcement efforts through a series of key regulatory activities. In field inspections were conducted in every state and territory, either as scheduled activities or in response to regulatory intelligence, with each ONRSR office conducting at least one such inspection on a weekly basis.

Regulatory activities were complemented by the analysis of occurrence data collected from rail infrastructure managers for a 12-month period with this information then collated and provided to industry through a targeted safety message to help inform ongoing education and engagement strategies with operators. On occurrences specifically, ONRSR has established a track worker safety workgroup to conduct closer analysis of relevant notifiable occurrences that have been the subject of follow up activity and to share any additional findings across the organisation.

Elsewhere, a series of audits, scoped to include examinations of rail transport operators' risk assessments and controls, and their self-assurance measures are being undertaken on 10 key operators around Australia over the next 18 months. A selected team of rail safety officers will undertake the audits for consistency and will focus on a range of track worker safety relevant topics including monitoring of incidents, technology considerations, interface agreements, management of change and reviews of safety management systems.

NATIONAL PRIORITIES

FIGURE 14:

Track work safeworking rule and procedure breaches, July 2016 to June 2021

TABLE 14:

Selected track work procedure / rule breaches, July 2020 to June 2021

DATE	DESCRIPTION	LOCATION
14/07/2020	A work group was conducting rail maintenance work in the vicinity of a level crossing with active protection. The level crossing booms were locked in the upright position and traffic management was in place to enable road traffic to pass. On completion of the works the crew handed the track back to train control. A freight train crossed the level crossing and the boom gates failed to lower, despite the lights and bells working correctly. The driver of the train reported the issue to train control. The work group inspected the site and found the level crossing boom gates were still locked in the upright position.	Midland, WA
6/11/2020	Two rail safety workers using absolute signal blocking as protection were conducting inspections on track. A train service travelling at line speed rounded a bend and narrowly avoided a collision with the track workers. It was identified that the incorrect signals were blocked and there were deficiencies in safety critical communication between the protection officer and train controller.	Joondalup, WA
11/11/2020	A train driver reported a near miss of approximately 50 metres with a work group on track using lookout protection.	Sunshine, Vic.
8/01/2021	A loaded grain train failed on a steep section of track. Arrangements were made to propel the train back to a refuge siding to clear the track for a passenger service. The driver contacted train control to place a block on the adjacent track to protect the crew while they walked to the rear of the train to supervise the movement. While walking on the adjacent track, a passenger train approached. The workers were able to clear the track.	Hawkesbury River, NSW
17/05/2021	Workers conducting an incident investigation accessed the track and entered the danger zone without track protection.	Kenwick, WA
10/06/2021	A protection officer for a workgroup using an ultrasonic inspection vehicle obtained authority to conduct work on a section of track. The vehicle was placed on track and commenced travelling. The protection officer then contacted network control to advise a set of points were incorrectly set for their movement. It was identified the vehicle was placed on track approximately three kilometres outside the limits of the authority. Blocking was applied and the vehicle cleared the track.	Near Crystal Brook, SA
29/06/2021	A protection officer made an emergency call to network control to notify that a necessary speed restriction had not been advised following the completion of track repairs. A track speed restriction of 40km/h was applied for the affected section of track. A regional passenger train had already traversed that section with a speed limit of 115km/h. There were no reports of any injury or damage.	Harefield, NSW

ONRSR is using a four-phase approach to address the safety issues it has identified in relation to contractor management in the Australian rail industry. These four phases are:

- Contractor information >
- Contractor engagement >
- Operator engagement >
- Compliance >

Throughout 2020–2021 phase 1 (contractor information) was finalised with more than 2,000 contractors identified as working within the rail industry throughout Australia. A review of these contractors identified those with the most reach and impact on industry - approximately 150 in total.

ONRSR's dedicated project team also made significant progress through phase 2 (engagement), which commenced in January 2021 and involved the engagement of these contractors by ONRSR rail safety officers (RSOs) who invited the contractors to discuss a range of issues and concerns. The meetings also served as an opportunity to educate industry with recently published information sheets - "contractors in the rail industry", which were developed as an integral part of the contractor engagement phase.

Responses and feedback received from contractors during phase 2 have been overwhelmingly positive with most demonstrating a willingness to participate and viewing the strategy as an excellent safety initiative. While this phase of the project is ongoing, a valuable exchange of information has occurred that has resulted in a number of safety themes already being identified. These themes will assist ONRSR to scope the remainder of the project, specifically with regards to the engagement and education of operators during phase 3.

Phase 3 of the project is to commence in early 2022, which will see RSOs approach operators and share the information and safety themes identified. It is ONRSR's expectation that operators will view this as an opportunity to use the information as an input into their ongoing approach to contractor management matters and risk management processes, which will then be the subject of ongoing ONRSR compliance activities.

CONTROL ASSURANCE

ONRSR's focus on control assurance recognises its criticality as a part of effective risk management and that failure to apply it in an operational environment can be a contributing factor to recurring incidents. Encouragingly, ONRSR's work on this priority issue, which has included more than 100 interactions with freight, passenger and tourist and heritage operators over the last 12 months, has not revealed widespread or systemic issues among rail transport operators.

ONRSR is now concentrating its effort on ensuring that all rail transport operators develop a control assurance strategy that clearly outlines what assurance activities will be undertaken to assess if the risk controls are being implemented and are working effectively. The assurance strategy should be supported and implemented throughout all levels of the organisation to allow risk owners to monitor and review the key risks and key controls within the organisation and take appropriate and decisive corrective action when necessary.

In the meantime, ONRSR has moved to incorporate assessments of control assurance performance into ongoing regulatory activities and to further enhance strategies for collecting control assurance data and information.

While to date the project work undertaken indicates that industry performance is generally sound, there does remain room for improvement and greater awareness in some sectors, particularly in the tourist and heritage space. ONRSR is working to further develop specific educational material for the tourist and heritage sector and other less complex operators. Any such material will be tailored to the sector in question and make use of the most effective and relevant communication channels.

NATIONA RIORITI

The statistics and summaries presented in the previous chapters provide a snapshot of the rail industry's safety performance over the last financial year. This information is important for monitoring and reporting safety performance across the rail industry, acting as a key source of regulatory intelligence used to direct ONRSR's resources and attention. This chapter continues the series of articles presented in previous issues of the ONRSR Rail Safety Report, providing an update on ONRSR's progress to further enhance the data-driven element of its risk-based approach to regulation.

NATIONAL RAIL SAFETY DATA STRATEGY

The National Rail Safety Data Strategy 2018 – 2022 has been developed as a partnership between ONRSR, the Australasian Railway Association (ARA) and rail industry representatives to achieve a relevant, consistent and quality national rail safety data set that is readily available to stakeholders to inform rail safety decisions.

Following extensive consultation throughout 2020–2021, a national dataset and associated reporting requirements have been agreed. The dataset was developed following a review of current legacy reporting requirements and the data needs of industry stakeholders. It comprises:

- a more focussed, richer set of notifiable occurrence data; >
- > an updated set of rail operations activity data; and
- > a new set of network and railway operations data.

When considered collectively, this information will:

- > enable ONRSR to more effectively monitor the safety performance of operators and the industry, improving the identification of regulatory risks and treatments, and underpinning its risk-based approach to regulation;
- allow ONRSR to more effectively respond to notifiable occurrences; >
- provide operators with a new data source to support risk assessments; >
- enable operators to benchmark their performance against similar operators; >
- assist operators in the preparation of more valuable Safety Performance Reports; and >
- > assist other industry stakeholders, particularly those that can influence or are involved in safety investment decision making, to inform themselves of rail safety performance.

Draft documentation to define the new dataset and associated reporting requirements is available at www.onrsr.com.au. The documentation and required changes to the RSNL Regulations are scheduled to be considered by Transport Ministers in December 2021. If approved, the target commencement data for the new reporting arrangements is 1 July 2022.

To support the target commencement date, ONRSR's focus has now shifted to:

- > working with operators to ensure they are prepared to comply with the new reporting requirements;
- > developing the systems required to collect and manage the new dataset; and
- > considering appropriate mechanisms for making the new dataset available to industry stakeholders on demand.

DATA-DRIVEN NTELLIGEN

INVESTIGATIONS ANALYSIS PROJECT

Together with the observations, knowledge and experience of regulatory staff, rail safety data is a critical input into ONRSR's decision making. In 2020–2021 ONRSR took another important step in the development of its data-driven intelligence capabilities with delivery of the Investigations Analysis Project.

The objective of this project was to build a function to routinely capture findings on the contributing factors to rail safety incidents, as described in rail safety investigation reports. ONRSR receives many investigation reports as part of its day-to-day regulatory function, and the aggregation and analysis of findings across these reports provides an opportunity to learn about the deeper, systemic contributing factors that are often the focus of comprehensive incident investigations.

A key requirement of the Investigations Analysis Project was the use of a systems-based model to represent the contributing factors to railway incidents. This approach recognises that the underlying causes of many accidents lie beyond the immediate or 'sharp-end' technical failures and front-line worker actions, and instead reside within a broader set of organisational and societal controls that shape human behaviour and system performance.

The Investigations Analysis Project ran for almost 12 months and was successfully completed in June 2021. The centrepiece of the new approach is a graphical technique, AcciMap, which shows how conditions, events and decisions across all levels of a socio-technical system interact to produce incidents. The broader function is supported by a range of tools including a standard set of defined factor types, mapping software and user guidance to ensure consistent and accurate coding.

A small team drawn from across ONRSR will deliver the new analysis function. Based on results of an earlier pilot exercise using a similar systems approach, ONRSR is confident the new process will, over time, provide an important source of intelligence to enhance safety outcomes by:

- > providing the ability for regulatory staff to quickly access, aggregate and analyse coded findings across a range of investigations to identify patterns and trends in the systemic contributors to adverse events across rail operations;
- complementing other sources of regulatory information available to ONRSR to build a more > comprehensive picture of hazardous events and their causes to inform risk-based regulatory decisions; and
- > enabling ONRSR to communicate important lessons about system safety back to industry to help prevent reoccurrence of serious incidents.

AUSTRALIAN RAIL RISK MODEL (ARRM)

Launched by the Rail Industry Safety and Standards Board (RISSB) in November 2017, ARRM is an objective, quantitative tool that provides the rail industry with a comprehensive picture of safety risk.

Now at version 5, ARRM provides a more robust set of risk estimates for over 100 rail safety risks. It supports several ways to analyse the risk estimates, including exploring precursors and escalation factors, querying risk by exposed person type, or by the degree of possible harm risks give rise to.

With ARRM having now analysed over 250,000 occurrence records supplied by ONRSR for incidents since July 2015, it has become a valuable tool to help operators understand and manage their risk profile. Evidence of this can be seen in the 20% year-on-year growth in its user base, with around 450 registered users at the last count.

ONRSR continues to support the development of ARRM and encourages operators to utilise the model as an additional and vital source of risk information to inform safety investment decisions. Visit www.arrm.org.au to register your interest.

FIGURE 15:

Commercial passenger and freight train kilometres, July 2016 to June 2021

The rising trend in heavy rail passenger train kilometres is primarily due to the growth of metropolitan passenger train services on existing networks around Australia and the introduction of new systems such as the Sydney Metro, which began operations in May 2019.

FIGURE 16:

Tourist and heritage passenger train kilometres, July 2016 to June 2021

The reduction in tourist and heritage passenger train kilometres reported in the 2019–2020 and 2020–2021 financial years is due to COVID-19 restrictions, which led to the suspension of several operations. Passenger train kilometres reported by tourist and heritage operators in Victoria that transitioned under ONRSR's regulatory oversight on 2 December 2019 are included from December 2019 only.

FIGURE 17:

Maintenance vehicle kilometres, July 2016 to June 2021

Accredited operators are required to provide monthly reports of the total kilometres travelled by any self-propelled infrastructure maintenance vehicles such as a track maintenance train or road rail vehicle. Maintenance vehicle kilometres reported by tourist and heritage operators in Victoria that transitioned under ONRSR's regulatory oversight on 2 December 2019 are included from December 2019 only.

FIGURE 18:

Track kilometres, July 2016 to June 2021

Accredited operators are required to provide monthly reports on the length of track over which they have effective management and control. This chart depicts the total length of track reported for the month of June in each financial year. Track kilometres reported by tourist and heritage operators in Victoria that transitioned under ONRSR's regulatory oversight on 2 December 2019 are included from 2019–2020 period only.

APPENDIX A: NETWORK STATISTICS

The scope and methods used for the presentation of data in this report are described below.

REPORTING PERIOD

Where available, statistical trends of incident counts and rates are presented over a five-year period, from 1 July 2016 to 30 June 2021. The incident descriptions summarised in this report apply to the period 1 July 2020 to 30 June 2021.

GEOGRAPHIC COVERAGE

Descriptions and statistics in this report cover all railway operations in Australia.

DATA SOURCES

The information presented in this report is principally based on notifiable occurrences — the initial written advice of a rail safety incident that a rail transport operator submits to ONRSR in accordance with section 121 of the RSNL.

Activity data (for example, train kilometres travelled) is based on monthly returns supplied by rail transport operators in accordance with section 120(3) of the RSNL. The specific information to be provided is defined in clause 56 of the National Regulations.

Consistent activity data for tourist and heritage operators in Victoria (Vic.) that transitioned under ONRSR's regulatory oversight on 2 December 2019 is unavailable prior to this date. Exclusion of this data has no material effect on the statistics presented within this report as it is expected to comprise only three tenths of one percent of total activity data over the missing period.

Data collected by previous state regulators prior to ONRSR and used in this report were collected under different legislative regimes. A review of this data was undertaken to ensure comparability with ONRSR collected data. This applies to the data outlined below:

- > Qld. Notifiable occurrence and activity data from 1 July 2016 to 30 June 2017 was collected by the Qld. Department of Transport and Main Roads.
- Vic. From 1 July 2016 to 1 December 2019, the following data was collected by Transport Safety > Victoria: notifiable occurrence and activity data for the Melbourne metropolitan tram network; and notifiable occurrence data for tourist and heritage operators that transitioned under ONRSR's regulatory oversight on 2 December 2019.

DEFINITIONS

Statistics are predominantly based on the incident definitions of the national occurrence classification guideline which is date dependent. For data collected between 1 July 2016 to 7 June 2017 incident definitions are based on those in the Occurrence Classification Guideline (OC-G1), 2013⁸. For data collected since 8 June 2017, and for all SPAD/LRTAE data, incident definitions are based on the Reporting Requirements for Notifiable Occurrences9.

Some of the statistics presented are based on definitions specific to this report to support a more meaningful risk-based analysis of critical events. In such cases these definitions are presented in the body of the report.

⁸Office of the National Rail Safety Regulator, Classifying Notifiable Occurrences. Occurrence Classification Guideline (OC-G1), Version 1.1, ONRSR, Adelaide, March 2013.

APPENDIX ш COP ш S

DISCLAIMER

ONRSR advises the following:

Internal consistency

Statistics for a given incident category may differ between sections of this report because definitions and top-event conventions vary according to need. For example, international benchmarking statistics have different definitions to ONRSR and hence the scope of ONRSR incidents used in these comparisons have been aligned to the benchmarking definitions.

Data comparability

Issues of consistency are relevant both within the report and between this report and other information products.

The statistics in this report may differ to other sources that utilise the same data and coding specifications. This will be due in part to the data collection and preparation methods used to generate the tables and charts in this report which included identification and correction of errors in historical data.

Past and future releases

The statistics presented in this report are subject to review and amendment as more information becomes available through investigation or inquiry or as ONRSR refines its systems for data capture, validation and reporting. This may result in variation between historical and future reports.

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