Australian Government
Australian Transport Safety Bureau

Loading irregularity on train 2BM9

Maitland, New South Wales on 16 January 2018

ATSB Transport Safety Report
Rail Occurrence Investigation
RO-2018-003
Final – 5 March 2019

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

Publishing information

Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 4150 (24 hours)
Accident and incident notification: 1800 011 034 (24 hours)
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

Addendum

Page	Change	Date
5	Figure 5 replaced	8 March 2019

Loading irregularity on train 2BM9 Maitland, NSW

What happened

On 16 January 2018, a container on freight train 2BM9 collided with station infrastructure at Maitland, New South Wales (NSW). The collision damaged gutter retaining brackets on platform 1 at Maitland Railway Station. Train 2BM9 continued its journey with the crew unaware of the incident, until contacted by the network control officer.[1]

Train 2BM9 was a scheduled service owned and operated by SCT Logistics (SCT) and was transporting general freight and containerised freight from Brisbane, Queensland (QLD) to Melbourne, Victoria. The train consisted of two locomotives hauling 18 single and multi-platform wagons, and it was 795 m long with a total mass of 1,690 t. The train manifest recorded that 23 containers on this train were empty, including the container involved in this incident (MGCU7810161), which was loaded on the 18th wagon (PQQY50015).

Train 2BM9 was marshalled, loaded and examined in the SCT Terminal at Bromelton, QLD. The train examination[2] certificate was recorded as completed at 1745 on 15 January 2018, the day of departure, and did not record any anomalies.

At about 1901[3] train 2BM9 departed SCT Terminal at Bromelton. The train travelled on the ARTC[4] North Coast rail network from Bromelton to Maitland, NSW. The journey included crosses[5] with other rail services at Glenapp, Kyarran, Kungala, Nana Glen, Nambucca Heads, Stroud, and Dungog (Figure 1). This journey took place without incident or out-of-gauge[6] advice from crossing train crews undertaking roll-by[7] inspections of 2BM9.

---

1 The person responsible for managing train paths and issuing occupancy authorities. *Source: RISSB Glossary of Rail Terminology, Version 1, 3 December 2010.*

2 Full Train Examination – Performed by examining staff after marshalling of non-tested loading, prior to commencement of journey consisting of: full mechanical examination; complete air brake test; brake pipe leak test; issue of a train examiners certificate for interstate freight trains. *Source: RISSB Glossary of Rail Terminology, Version 1, 3 December 2010.*

3 EDT – Eastern Daylight-savings Time. Note that ARTC network operations in Queensland use New South Wales time zone.

4 ARTC – Australian Rail Track Corporation.

5 A cross is the passing of two trains travelling in opposite directions at a crossing loop on a single track, *Source: RISSB Glossary of Rail Terminology, Version 1, 3 December 2010.*

6 Any vehicle that does not conform to a reference rolling stock outline applicable to a particular route. *Source: RISSB Glossary of Rail Terminology, Version 1, 3 December 2010.*

7 A visual inspection of a train to identify equipment, loading security or other defects or failure whilst the train is moving. *Source: RISSB Glossary of Rail Terminology, Version 1, 3 December 2010.*

Figure 1: ARTC North Coast rail line between Maitland and Bromelton

Image shows ARTC North Coast rail line between Bromelton and Maitland shown in red. Locations between Bromelton and Maitland where freight train 2BM9 passed other rail services are also indicated. Source: ARA Railways of Australia Map 2014, annotated by ATSB.

Train 2BM9 passed through Maitland Railway Station at approximately 0748 on 16 January 2018. At about this time, the trailing edge of container MGCU7810161 placed on the fifth platform of PQQY50015 collided with the verandah gutter mounting brackets on platform 1 at Maitland Railway Station (Figure 2).

Figure 2: Maitland Railway Station layout

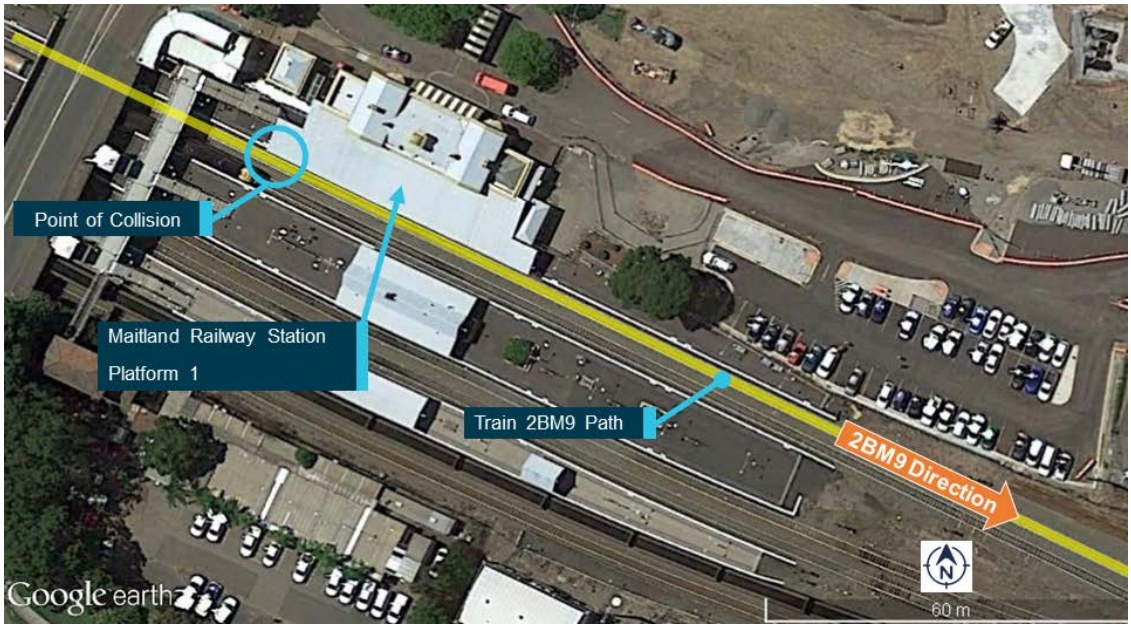


Image shows Maitland Station Platform 1 with 2BM9 path shown by yellow line, point of collision with station infrastructure, and train 2BM9 direction of travel. Source: Google Earth annotated by ATSB.

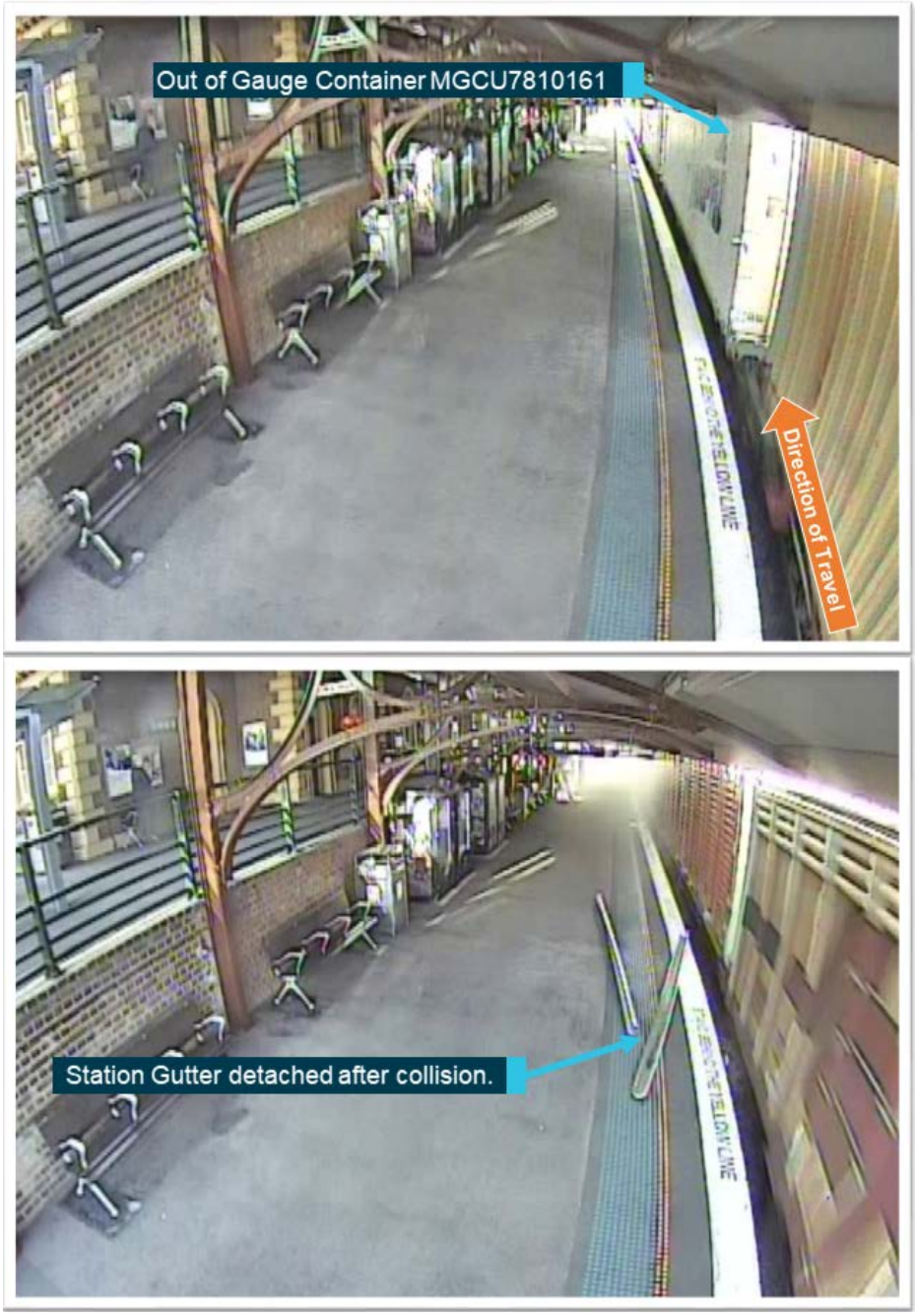
At 0753, the Sydney Trains Station Master at Maitland reported the collision to the ARTC network control officer. The network control officer contacted the 2BM9 train crew at 0755 and organised for them to undertake an inspection of their train at Hexham, NSW. The train crew confirmed at 0829 that a container on wagon PQQY50015 was not secured by the two trailing twist locks (see *Load restraint* below) and was out of gauge (Figure 3).

Figure 3: Out of gauge container MGCU7810161 placed on wagon PQQY50015

The left Image shows out of gauge Container MGCU7810161 on wagon PQQY50015. The right image shows the miss-located twist lock. Photos taken at Hexham siding NSW, shortly after collision. Source: SCT, annotated by ATSB.

As a result of the collision, two lengths of the verandah gutter dropped to the surface of platform 1 at Maitland Railway Station (Figure 4). Although there were some people on the platform at this time, the immediate area of the collision was unoccupied, and no injuries were reported.

Figure 4: CCTV event recordings from Maitland Railway Station at the time of collision



The first image shows container MGCU7810161 out of gauge prior to the collision and the gutter collapsing. The second image shows the detached guttering shortly after the collision prior to 2BM9 departing the scene. Source: Sydney Trains annotated by ATSB.

Context

Train handling

The ATSB explored the possibility that train handling had contributed to this incident. To establish this, a review of the lead locomotive (SCT014) event recorder was undertaken. The ATSB concluded that train 2BM9 was handled in a manner consistent with normal train operations. There was no evidence to suggest that train handling contributed to the two twist locks on wagon PQQY50015 releasing container MGCU7810161.

Track infrastructure

ARTC manage the standard gauge rail infrastructure between Bromelton and Maitland. The ATSB undertook a review of ARTC's track condition and track defect records to determine if the rail infrastructure condition may have contributed to the load shift of container MGCU7810161. The review also considered the amount of rail infrastructure geometry deviation needed to create the forces required to release a container from a TFAD automatic twist lock. The ATSB found no evidence of track geometry with sufficient deviation to dislodge a properly secured container. Consequently, the ATSB concluded it was unlikely that track condition contributed to the two twist locks releasing container MGCU7810161.

Rolling stock

Freight wagon

The wagon involved in this incident, PQQY50015, is a 5-pack[8] wagon designed to carry containerised freight. The PQQY class wagons were manufactured by CSR[9] in 2014.

The last maintenance inspection on wagon PQQY50015 was a scheduled inspection undertaken on 23 November 2017. The maintainer undertaking this inspection recorded that no repairs were required. The ATSB found that there was no evidence to suggest that the wagon condition contributed to the incident.

Load restraint

The fifth platform of wagon PQQY50015 was fitted with four TFAD type automatic twist lock load restraints manufactured by Celtec Rail Pty Ltd (Figure 5).

Figure 5: TFAD automatic type twist lock

Photo shows an automatic TFAD type twist lock, the same type as in use on platform 5 of wagon PQQY50015 at the time of this incident.
Source: Celtec Rail Pty Ltd.

[8] 5-Pack – Refers to an articulated wagon comprising five platforms, with the adjacent ends of individual units being supported on a common bogie and permanently connected by a device, which permits free rotation in all planes. Source: *RISSB Glossary of Railway Terminology, Version 1 dated 3 December 2010*.

[9] China Southern Railways.

The twist lock's purpose is to restrain freight containers to a rail wagon. The twist lock works by the twist lock head turning within an elongated corner casting on a freight container, thereby restraining the container by its corner casting. The automatic type twist lock applies a spring force to the twist lock head. As the container is lowered onto the rail wagon, the downward force turns the twist lock head, which springs back into its initial position to automatically restrain the container. Conversely, the lifting of the container applies an upward force to release the twist lock from the container corner casting.

The scheduled maintenance inspection of wagon PQQY50015 (23 November 2017) included checks of the twist locks for correct operation, and wear or damage. The maintainer undertaking this inspection recorded that no repairs were required.

After the infrastructure collision at Maitland, train 2BM9 was directed into a siding so that container MGCU7810161 could be re-secured to platform 5 of wagon PQQY50015. The container was re-secured to the wagon without a need to replace the twist locks. Train 2BM9 continued its journey to Melbourne without incident.

Upon arrival in Melbourne an inspection was undertaken on the twist locks. This inspection reported that:

- all containers on wagon PQQY50015 were positioned correctly and securely locked with twist locks
- all four automatic twist locks on container MGCU7810161 were securely locked
- there were no gaps present between container MGCU7810161 and the twist locks
- there were no abnormalities in the removal process of container MGCU7810161.

Considering the performance of the twist locks after the collision, the ATSB concluded that a mechanical failure of the twist locks was unlikely to have been the reason container MGCU7810161 shifted on its wagon and collided with the Maitland Railway Station verandah.

Environmental conditions

In the days preceding the journey of 2BM9, high winds had been forecasted between Bromelton and Maitland.

Weather station data was obtained from the Bureau of Meteorology (BOM) for nine weather station sites adjacent to the ARTC rail network between Bromelton and Maitland.

The ATSB examined the weather station data for 15 and 16 January 2018 during the times 2BM9 travelled through the area. The ATSB compared the data with the calculated wind severity required to provide sufficient lifting force to release an empty 48-foot container secured with twist locks. The ATSB analysis concluded that the recorded wind speeds were unlikely to have been of sufficient magnitude to lift container MGCU7810161 from its twist locks.

In addition, there was no evidence of twist lock release for any other empty containers loaded on 2BM9. The ATSB found that it is unlikely that environmental conditions were severe enough to have released container MGCU7810161 from its twist locks.

Train loading and examination

SCT is required to have systems in place to manage the hazards associated with its rail operations. One of the hazards that SCT has identified is equipment/freight falling from a train due to an unsecured load. The SCT risk assessment had identified wagon specific loading instructions, the training of these instructions to loader operations staff, and qualified train examiners as controls for managing this hazard.

Container loading

The loading operator stated that his duties while loading train 2BM9 involved the loading and unloading of containers from trucks, and the loading of containers on to train 2BM9. These duties included applying checks to ensure that containers were square to the wagon when loading and

unloading. The loading operator did not observe any issues or malfunctions in the process of loading container MGCU7810161 onto wagon PQQY50015.

In accordance with SCT's training needs analysis, the loading operator held the required SCT competencies for the task of loading containers onto rail wagons.

The ATSB reviewed the SCT risk controls, namely, wagon specific loading instructions and their training arrangements with respect to the loading checks expected from SCT loading operators.

SCT had established a loading instruction WI 048 for its PQQY class wagons. This instruction provided guidance on the loading requirements and limits. However, it did not specify any loading checks required from loading operations staff when securing containers to wagons. Further to this, the SCT training materials also did not specify any loading checks expected from loading operations staff.

From this, although it is likely that the requirement for loading checks was informally communicated to the loading operator involved in this incident, the ATSB found that SCT had not documented its process for loading checks expected from SCT loading operations staff when securing containers to wagons.

Train examination

The pre-departure train examination of SCT trains from an originating terminal required a full mechanical examination in accordance with ROA Section 5.[10] The ROA Section 5 full mechanical examination, with respect to this incident, included a visual examination of twist locks, plus checks that loads were secured and within gauge.[11]

The train examiners reported that, when 2BM9 departed Bromelton on 15 January 2018, all wagons and containers were within specifications, secured, and safe to travel towards Melbourne.

The train examiners involved in the pre-departure and roll out examination of train 2BM9 held current competencies for this task.

Station infrastructure

ATSB investigators noted that the platform 1 verandah at Maitland Railway Station verandah protruded further into the rail corridor than the station platform, potentially increasing the possibility of collision. Consequently, the ATSB examined the design and actual clearances between rolling stock and infrastructure at Maitland Railway Station.

ARTC has defined maximum loading dimensions and outlines[12] for their rail network to ensure adequate clearances and prevention of collisions between rolling stock and static trackside infrastructure. The clearance standards take into consideration infrastructure conditions such as track curvature and track geometry tolerances, plus allowances for the dynamic movement of rolling stock.

The ARTC documentation defines the following:

- *Maximum container loading* – the maximum container loading dimensions inclusive of rail vehicle that are permitted on a defined corridor.
- *Structure outline* – the outline that determines which structures on a line section should be included in a clearance register, and become subject to maintenance intervention.
- *Static rolling stock outline* – the cross-sectional outline of a maximum sized rail vehicle at rest, and the base point for determination of the dynamic or kinematic rolling stock outline. ARTC

---

10 ROA - *Railways of Australia Manual of Engineering Standards and Practices – Section 5 – Standard Train Examination Procedures*.

11 Gauge – In this context, refers to train clearance outline applicable to the rail corridor that the train is destined to travel on.

12 *The ARTC Route Access Standard – General Information*, Version 1.7 dated November 2017, and ARTC Engineering (Track & Civil) Code of Practice – Section 7 – Clearances. Source ARTC.

documentation specifies a number of static rolling stock outlines for various rolling stock loadings, including the network routes that each static rolling stock outline is permitted.

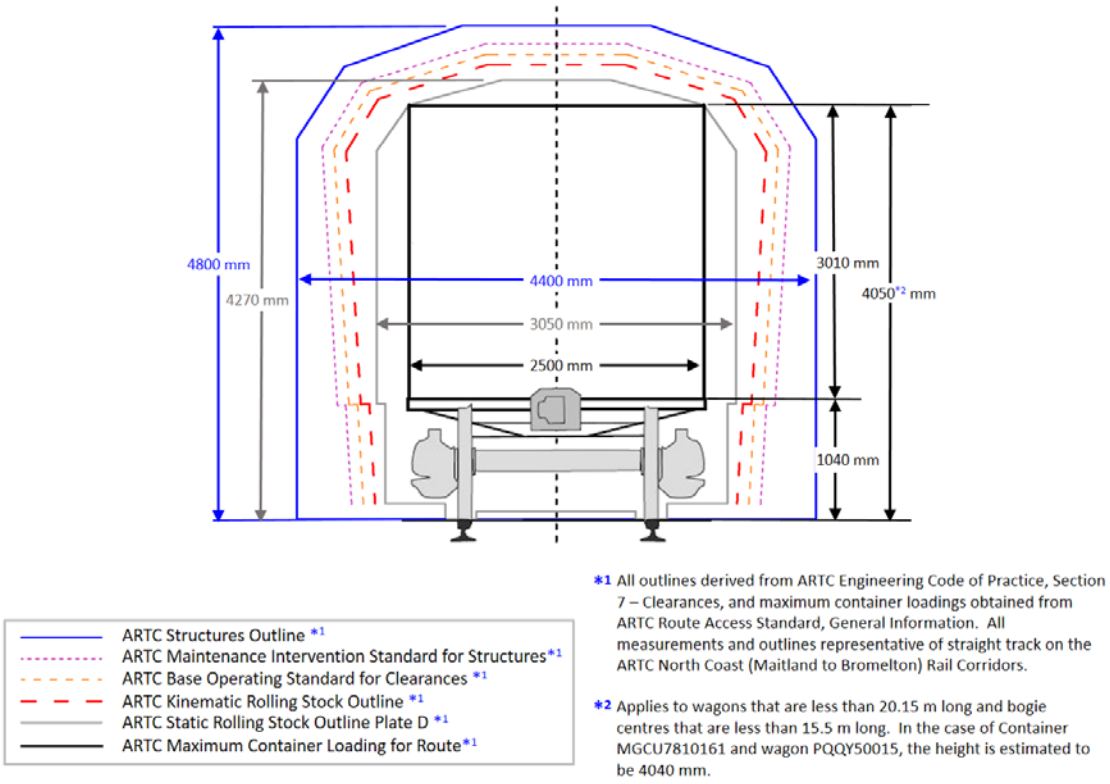
- *Kinematic rolling stock outline* – the outline that includes the effects of rail vehicle centre and end throw, track curvature and geometric tolerances and dynamic rolling stock limits on the static rolling stock outline. An infringement of this outline is treated as a track obstruction.
- *Base operating standard for structures* – the outline derived from a 100 mm increase from the kinetic rolling stock outline. This outline may be infringed only in special circumstances and subject to there being no exceedance of the appropriate track tolerances.
- *Maintenance intervention standard for structures* – the outline derived from a 200 mm increase from the kinetic rolling stock outline. This outline provides the first limit where maintenance intervention will be required for structures that infringe.

The ARTC documentation considers an infringement of the kinematic rolling stock outline to be a track obstruction. As the normal practice is to locate platforms as close as possible to the train for passenger safety, ARTC requires that, subject to approvals, new platforms may be built to the kinematic rolling stock outline defined for that route. From this, it is reasonable to conclude that the kinematic rolling stock outline is the absolute boundary for any station infrastructure.

The maximum container loading permitted for travel between Bromelton and Maitland has a height limit of 4,050 mm and width of 2,500 mm. For train 2BM9, container MGCU7810161 on wagon PQQY50015 had an estimated height of 4,040 mm and a width of 2,500 mm. To examine clearance conditions at Maitland station, the ATSB overlayed these dimensions on to the largest static rolling stock outline that ARTC has permitted for travel on that corridor, rolling stock outline plate D[13] (Figure 6).

[13] Rolling Stock Outline Plate D, as defined in *ARTC Engineering (Track & Civil) Code of Practice – Section 7 – Clearances*. Source ARTC.

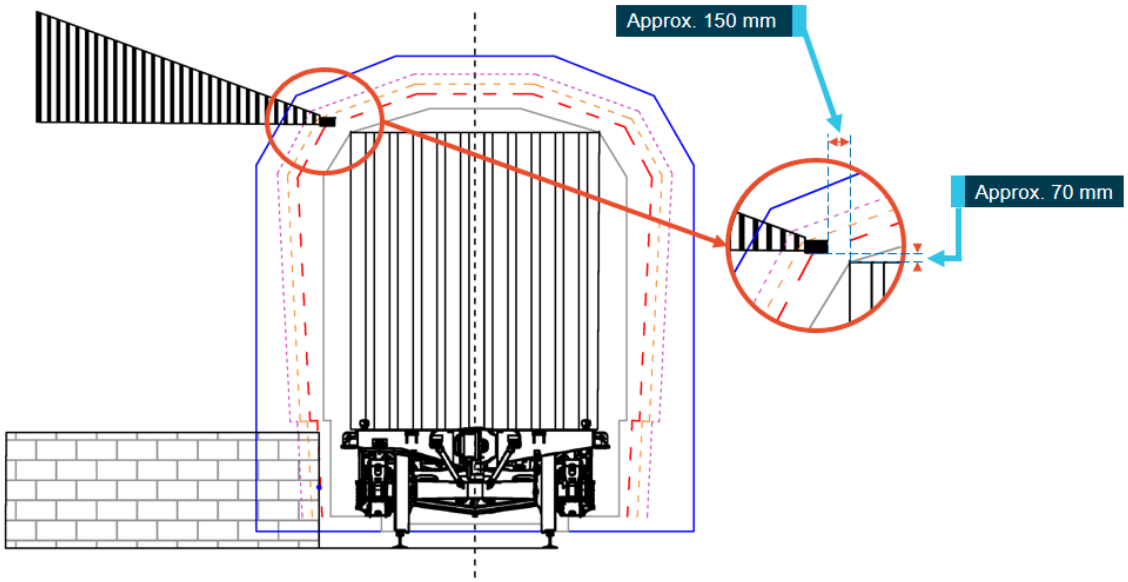
Figure 6: Clearance outlines for ARTC rolling stock outline type D to track side infrastructure for straight track between Bromelton and Maitland rail corridor



The image compares the applicable clearance outlines for trains hauling containerised freight between Bromelton and Maitland on straight track. Source: ARTC Route Access Standard – General Information, and ARTC Engineering (Track and Civil) Code of Practice – Section 7 Clearances, annotated by the ATSB.

When including the rail infrastructure design for platform 1 at Maitland Railway Station, it can be seen that the verandah gutter coincides with the kinematic rolling stock outline. For a maximum container loading, this provides for a vertical design clearance of approximately 70 mm and a horizontal design clearance of approximately 150 mm (Figure 7).

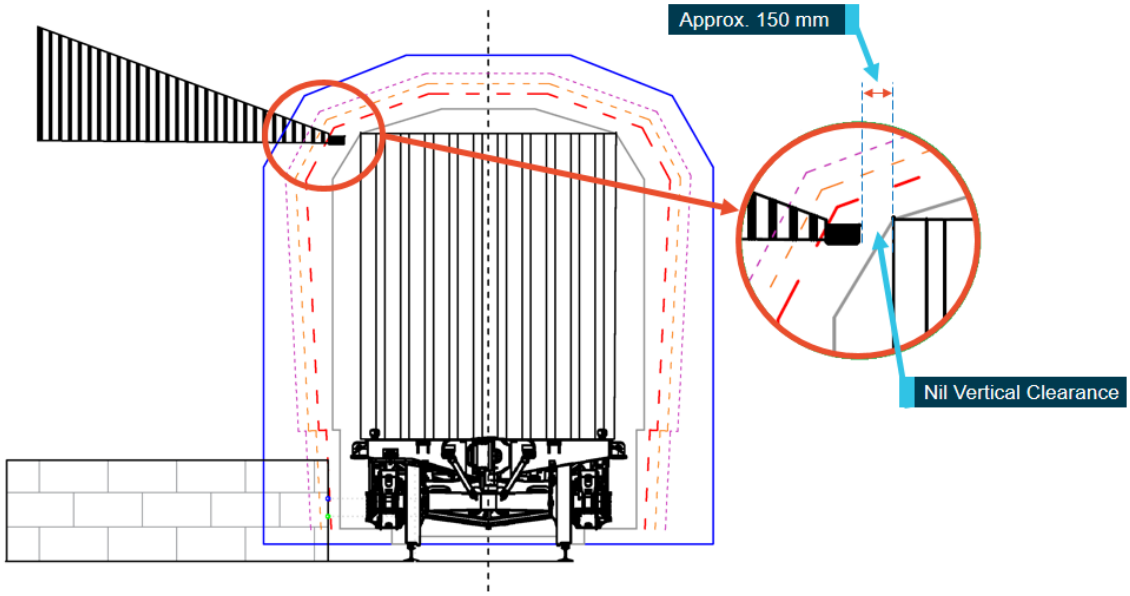
Figure 7: Maitland Railway Station Platform 1, designed clearance outlines.



The image depicts the design clearance outlines for platform 1 at the Maitland Railway Station for a correctly secured container loaded on a PQQY class wagon. Note that verandah height is above container. Source: ATSB.

However, post-collision measurements showed that the measured track height through platform 1 had increased from the design height. Because of the change in track height, the station verandah encroached on the kinematic rolling stock outline, effectively becoming a track obstruction. With respect to a correctly secured container load, the change in track height removed the vertical clearance (previously 70 mm), with the remaining safety margin only provided by the horizontal clearance of approximately 150 mm (Figure 8).

Figure 8: Maitland Railway Station platform 1, actual clearance outlines



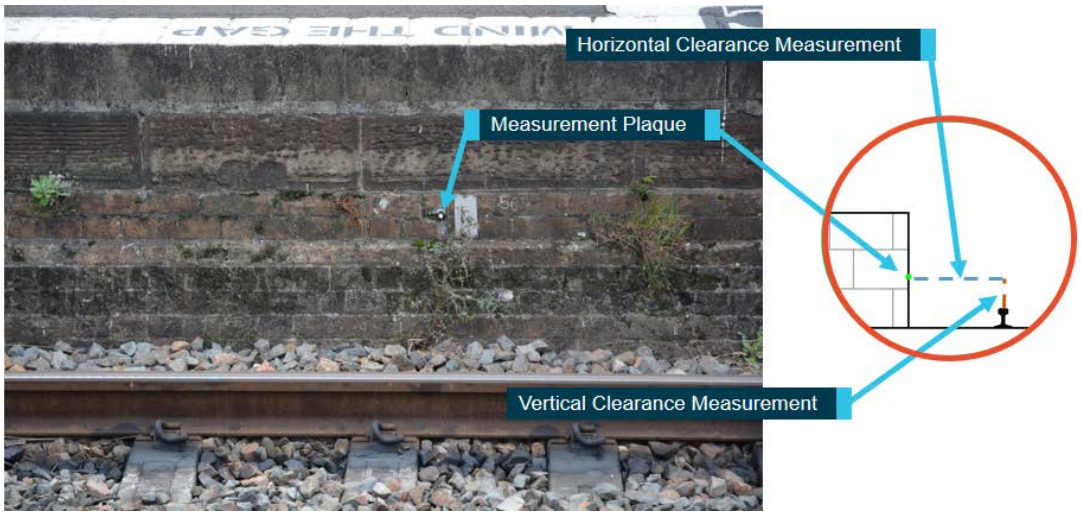
The image depicts the measured clearance outlines for platform 1 at the Maitland Railway Station for a correctly secured container loaded on a PQQY class wagon. Note that verandah height is now at same height as container, and infringing on kinematic rolling stock outline. Source: ATSB.

Track inspection and maintenance

It is common practice for rail infrastructure managers to monitor track movement adjacent to fixed structures such as railway station platforms, to ensure compliance with design clearances and ultimately control infrastructure collision hazards. The ATSB examined the ARTC inspection and assessment arrangements adopted for managing clearances at platform 1 of Maitland Railway Station.

The ARTC had scheduled and undertaken inspections of clearances for the railway station on a yearly cycle prior to this incident. These inspections required the measurement of the vertical and horizontal clearance between the closest rail and physical measurement plaques fitted to the platform wall (Figure 9).

Figure 9: Maitland Railway Station, platform 1 track clearance measurement plaque



The image shows a measurement plaque on the Maitland Railway Station platform 1 wall, with inset graphic showing where scheduled clearance measurements were undertaken prior to the collision. Source: ATSB.

The horizontal and vertical clearance inspection records for platform 1 at Maitland showed that over time the vertical clearance measurement had reduced due to an increase in the track height through platform 1. The change in vertical clearance exceeded the limits defined by the ARTC management of clearance specification, and the platform 1 design measurements.

The increased track height and consequential decrease in vertical clearance measurement at Maitland railway station was not identified (or corrected) by ARTC.

Safety analysis

Train loading and examination

The container fitted to wagon PQQY50015 was an empty container. It is known that a downward force is required to overcome the spring tension on an automatic twist lock to effect the securing of a container. In consideration of this, and the absence of a more probable reason, it is possible that there was not enough downward force applied to container MGCU7810161 to overcome the twist lock spring tension to effect load restraint on wagon PQQY50015.

In further support of this, the ATSB explored train handling, track condition, rolling stock/twist lock serviceability, and environmental conditions as potential contributing factors to this incident. From this, the ATSB concluded that it is likely that none of these contributed to the incident. Therefore, the ATSB considers it reasonable to conclude that:

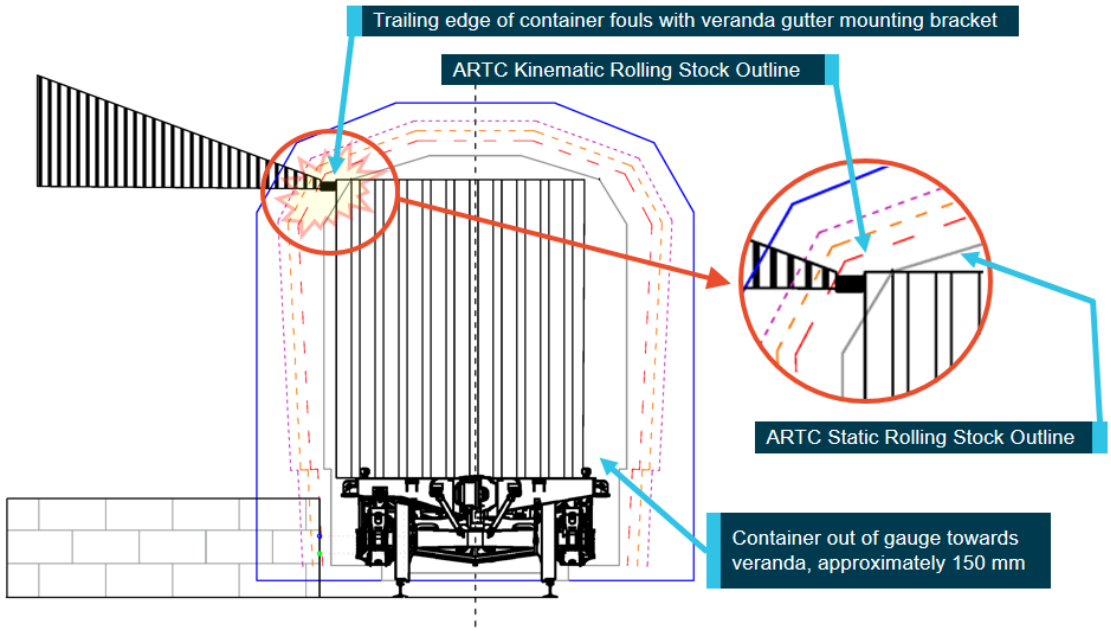
- It is likely that container MGCU7810161 was not secured to the two trailing twist locks of wagon PQQY50015 correctly at Bromelton.

- It was almost certain that the departing train examination at Bromelton did not detect the partially unsecured container MGCU7810161.

Maitland Railway Station infrastructure

On 16 January 2018, container MGCU7810161 had shifted laterally on wagon PQQY50015 by approximately 150 mm, exceeding the permissible ARTC static rolling stock outline for that rail corridor. The ATSB found that the reduction in structure clearances due to the raised track height (relative to the documented design for platform 1), combined with the out-of-gauge container on wagon PQQY50015, contributed to the collision with the Maitland Railway Station verandah. (Figure 10).

Figure 10: ARTC rolling stock clearance outline in respect to Platform 1 at Maitland Railway Station, with container load shifted towards station verandah



The image depicts the dimensions of the rolling stock, with an estimated amount of load shift based on witness observations. Note that the magnified portion of graphic shows the container infringing on the ARTC Rolling Stock Outline, and station verandah infringing on the ARTC Kinematic Rolling Stock Outline. Source: ATSB.

The horizontal and vertical clearances of the track at Maitland were inspected yearly to ensure compliance with limits. However, although the vertical clearances had reduced over the years, it had not been recognised that they had exceeded both the ARTC management of clearance specification, and the platform 1 design measurements.

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- It is likely that container MGCU7810161 was not secured to the two trailing twist locks of wagon PQQY50015 correctly prior to its departure from Bromelton, Queensland.
- SCT had not documented its process for loading checks expected from SCT loading operations staff when securing containers to wagons.
- It was almost certain that the departing train examination at Bromelton, Queensland did not detect any partially unsecured containers on train 2BM9.
- The reduction in structure clearances due to the raised track height, combined with the out-of-gauge container on wagon PQQY50015, contributed to the collision with the Maitland Railway Station verandah.

- The increased track height and consequential infringement on both the ARTC management of clearance specification, and the platform 1 design measurements at Maitland Railway Station, was not identified and corrected by ARTC.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

SCT Logistics

As a result of this incident, SCT has advised the ATSB that it is taking the following safety actions:

- SCT published a National Safety Alert advising terminal staff of the SCT protection process to be employed when checking that containers are correctly secured to rail wagons.
- SCT counselled the loader operator involved in loading train 2BM9 and arranged for further training.
- SCT consulted with loading, shunting, and train examination personnel in the development of a documented procedure to describe SCT expectations in relation to inspections and checks that are to be undertaken when loading containers on to rail wagons.

Australian Rail Track Corporation

As a result of this incident, ARTC has advised the ATSB that it is taking the following safety actions:

- ARTC have communicated to all ARTC teams that no further work is to occur at Maitland Railway Station which will impact on track geometry.
- ARTC has installed new physical plaques at Maitland Railway Station and amended track design documentation to indicate that track height must not be raised at this location.
- ARTC has undertaken a detailed survey of the clearance at platform 1, Maitland Railway Station.
- ARTC has committed to lowering the track height through Maitland Railway Station back to the design levels. An interim 20 km/hour speed restriction will apply for coal and freight traffic until this work is completed.

Safety message

Rail infrastructure managers and maintainers must satisfy themselves that maintenance activities and subsequent infrastructure clearance inspection results are properly analysed against design specifications, and that appropriate corrective action is taken when infrastructure clearance inspection measurements exceed design specifications.

Rail operators should satisfy themselves that the human reliant risk controls for ensuring that loads are secured have been documented, communicated and understood by workers required to implement them.

Rail safety workers involved in the loading and examination of train services are reminded of their responsibilities for ensuring loads are secured to their respective wagons before the transit of trains.

General details

Occurrence details

Date and time:	16 January 2018, 0750 EDT	
Occurrence category:	Incident	
Primary occurrence type:	Loading Irregularity	
Location:	Maitland Railway Station, NSW, 192.560 Km	
	Latitude: 32° 44.268' S	Longitude: 151° 33.132' E

Train details

Line Operator:	Australian Rail Transport Corporation (ARTC)	
Station Operator:	NSW Trains/Sydney Trains	
Train Operator:	SCT Logistics (SCT)	
Registration:	2BM9	
Type of Operation:	Container Freight	
Persons on board:	Crew – 2	Passengers – N/A
Injuries:	Crew – nil	Passengers – N/A
Damage:	Minor damage to station infrastructure.	

About the ATSB

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 Commonwealth 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.