



Report 98-108

Train 31

collision between carriages and detached engine

Pukeoware, near Pukekohe

17 May 1998

Abstract

On Sunday 17 May 1998, at 1530 hours, the carriages of Glenbrook Vintage Railway Train 31 ran away down a grade and collided with the engine which had been detached for coaling during a scheduled stop at Pukeoware. One minor injury occurred to a passenger as a result of the low-speed collision.

Safety issues identified were the suitability of the rules for detachment of engines, compliance with the rules and the suitability of the procedures for on the job training of the voluntary staff.

Transport Accident Investigation Commission

Rail Incident Report 98-108

Train type and number:	Passenger 31
Date and time:	17 May 1998, 1530 hours
Location:	Pukeoware, near Pukekohe
Type of occurrence:	Collision
Persons on board:	Crew: 3 Passengers: 12
Injuries:	Passengers: 1 minor
Damage:	Minor
Investigator-in-Charge:	R E Howe

1. Factual Information

1.1 Narrative

- 1.1.1 The Glenbrook Vintage Railway (GVR) is a charitable trust which owns and operates a preserved line between Glenbrook and Fernleigh on the old Waiuku branch line near Pukekohe, South Auckland. The GVR is open to the public on Sundays and holidays between October and June when regular steam trains are operated on the 5.8 km section of line by volunteer staff.
- 1.1.2 On Sunday 17 May 1998 GVR was operating a normal single train passenger rail service between Glenbrook and Fernleigh.
- 1.1.3 The timetable being operated involved an hourly service from Glenbrook to Fernleigh and return. The return trip included a 10 minute stop at Pukeoware where passengers could disembark to view the GVR depot facilities.
- 1.1.4 Train 31 departed Fernleigh at 1520 hours for Pukeoware. The consist was steam engine C847 and four restored carriages made up of an open carriage leading, two closed carriages and a partly open carriage/van at the rear.
- 1.1.5 Recently introduced procedures specified that the scheduled stop at Pukeoware between 1525 hours and 1535 hours would be a coaling stop for the steam engine. This required the engine to be detached from the train and moved to the coaling point some 45 m ahead.
- 1.1.6 At approximately 1525 hours Train 31 arrived at Pukeoware. The engine was being driven by the fireman who had been at the controls since the 1500 hour departure from Glenbrook. The rostered enginedriver and the fireman had alternated at the controls on each departure from Glenbrook to allow the fireman to gain experience driving steam engines and thus assist in his eventual certification as steam enginedriver.
- 1.1.7 The fireman stated he brought the train to a stop on the 1 in 100 downgrade by using the automatic train brake. He then applied the engine brake, and released the train brakes. The Pukeoware stopping point was defined for enginedrivers by a brick at the side of the track. An accurate stop ensured steps were aligned with carriages. Staff commented on the friendly banter among operating staff as to the accuracy achieved by individual enginedrivers. On the day the fireman stated he stopped short by “half a carriage” and did not attempt to correct his short stop.
- 1.1.8 Most passengers disembarked to view the depot facilities using steps positioned by the on-board GVR staff after the train had stopped. Their reports confirmed the train had stopped slightly short of its ideal stopping position, one describing it as “a six out of ten stop”.
- 1.1.9 As passengers were disembarking the enginedriver (carrying out the fireman’s duties) proceeded to detach the engine. Part of these duties included applying the handbrake on the leading carriage.
- 1.1.10 A youth who was a GVR member and had been travelling in the cab assisted with the engine detachment by applying the handbrake on the leading carriage using the wheel control on the leading right corner. To apply the brake he stood on the shunters’ footstep. The enginedriver personally checked the handbrake application by turning the wheel a further quarter turn from the same position before returning to the cab.

- 1.1.11 The guard at the rear of the train was aware that Pukeoware was a coaling stop on that particular service, and that this meant he was required to apply the handbrake on the rear carriage immediately the train came to a halt. However on this occasion he alighted to assist passengers to disembark without applying the handbrake.
- 1.1.12 The engine set forward approximately 45 m to the coaling point and the footplate crew were preparing to take coal when they felt the impact as the carriages collided with the engine at approximately 4.244 km GVR.
- 1.1.13 One of the assistant guards had been at the leading end of the second carriage when the train arrived at Pukeoware. He dismounted and placed the steps for passengers to disembark. Some 2 - 3 minutes after arrival he was standing by the train when he noticed movement behind him and turned to see the four carriages moving slowly down the grade towards the detached engine.
- 1.1.14 He immediately boarded the moving train at the leading end of the second carriage and ran through the first carriage to the handbrake wheel in the leading right corner. He was able to apply the wheel two full turns but stated this had little effect on the speed of the carriages which collided with the engine at a speed he estimated as “power walking pace” (approximately 6 km/h).
- 1.1.15 There were approximately 12 passengers on board the train who had elected not to view the depot facilities. The only injury occurred in the last carriage where a female passenger collided with a stanchion causing a minor cut and bruising to one ear.
- 1.1.16 Damage to the train was limited to two broken windows in the third carriage.

1.2 Operating requirements

- 1.2.1 The requirements for securing a train before the engine was detached were laid down in the GVR Rules and Regulations Manual, General Operating Rules, Rule 384 which stated:

Securing Train Before Engine Detached

As air brakes are liable to release owing to leakage, they must not be relied upon to secure a train or any portion of a train when the train engine is detached. The following procedure must be carried out before the train engine is detached:-

- (a) After the train has been brought to a stop, the air brakes on the train must be left applied or if they have been released, they must be reapplied by reducing the brake pipe pressure by at least 10lb per square inch (70 kpa) before the coupling cocks between engine and train are closed and the brake pipe hoses are parted.
- (b) Sufficient hand brakes including the hand brake on the leading vehicle must be fully applied to hold the train or rear portion of the train stationary in the event of the air brakes releasing due to leakage, before any attempt is made to uncouple the engine from the train.
- (c) Where the engine is required to be detached from and recoupled to the train enroute, the Enginedriver must ensure that all hand brakes that have been applied are fully released before the Guard signals the train to proceed.

and Automatic Air Brake Rules, Rule 613 and Rule 615 which stated:

613. Staff members must NOT use the air brakes to secure vehicles detached from the engine. Before detaching any vehicles from the engine, sufficient hand brakes must be applied to secure those vehicles.

615. Securing Train Before Engine Detached

As air brakes are liable to release owing to leakage of air, they must not be relied upon to secure a train or any portion of a train when the train engine is detached. The following procedure must be carried out before the train engine is detached.

(a) After the train has been brought to a stop, the air brakes on the train must be left applied or if they have been released, they must be reapplied by reducing the brake pipe air pressure by at least 10lb per square inch (70 kpa) before the coupling cocks between engine and train are closed and the brake pipe hoses are parted.

(b) Sufficient hand brakes including the hand brake on the leading vehicle must be fully applied to hold the train or rear portion of the train stationary in the event of the air brakes releasing due to leakage of air before any attempt is made to uncouple the engine from the train.

Where the engine is required to be detached from the train enroute, the Enginedriver must give prior advice to the Guard so as to enable him to apply the hand brake on the rearmost vehicle of the train immediately on arrival at locations where the engine or front portion of the train is to be detached.

(c) After the engine has been recoupled to the train, the train crew must ensure that all hand brakes that have been applied are fully released before the Guard signals the train to proceed.

1.2.2 Procedures for guards and assistant guards were outlined in the GVR document “Duties of guards and assistant guards”. Although this covered duties during booking on, and at various stages on the route, no mention was made of the duties associated with detaching the engine at an intermediate station such at Pukeoware.

1.2.3 Similar procedures for enginedrivers and firemen were outlined in GVR procedures “Duties of locomotive drivers” and “Duties of fireman on trains” respectively. As for guards no mention was made in either of these documents of the duties associated with detaching the engine at an intermediate station.

1.2.4 GVR advised the use of a fireman to drive a passenger train under supervision was covered by GVR General Operating Rule 363 which stated:

363. Fireman’s Duties

(a) An Enginedriver is responsible for seeing that the duties of his Fireman are properly performed. The Fireman must act under the direction of the Enginedriver of the train and promptly obey his instructions.

(b) Locomotives To Be Moved Only By Authorised Staff

A Fireman may move a steam engine only when instructed by and in the presence of an Enginedriver. Locomotives may be moved only by members authorised to drive locomotives, and in depots, only by members certified as competent to move these types of motive power.

1.3 Staffing arrangements

1.3.1 The GVR staff rostered for 17 May included a train crew of enginedriver, fireman, guard and two assistant guards. A cleaner¹ was sometimes rostered if available but was not an essential staffing requirement. Train 31 did not have a rostered cleaner on the day, although a youth who was too young to be under training² but described as “an enthusiastic volunteer” was part of the cab crew and appropriately dressed as a cleaner.

1.3.2 The rostered guard had a pre-arranged commitment to sign an agreement in Waiuku and left the train at 1240 hours. A qualified assistant guard took over the guard’s duties until the rostered guard’s return to the train at Pukeoware at 1440 hours.

1.4 Coaling arrangements

1.4.1 Until 8 February 1998 coaling on a normal Sunday timetable had been “as required” and was carried out on whichever scheduled service the footplate crew felt appropriate. All train staff were notified on the day as to which service would apply.

1.4.2 On 12 February 1998 an instruction was issued to all footplate crews to trim and coal the bunkers on the 1500 hour service on a normal Sunday timetable i.e. during the 10 minute stop at Pukeoware between 1525 hours and 1535 hours.

1.4.3 On 17 May 1998 the assistant guard and the enginedriver confirmed the coaling arrangements at 1430 hours and the assistant guard briefed the rostered guard on his return. The rostered guard confirmed he was aware of the coaling stop at Pukeoware on the 1520 hour Fernleigh service.

1.4.4 Although the fireman estimated he had been at the controls for “15 or 20 rides” he had not been driving during a coaling stop at Pukeoware until the day of the incident. His normal pattern since February had been to drive the 1200 hours and 1400 hours return trips which did not involve coaling. On 17 May a special charter ran one hour before the first timetabled service resulting in the fireman driving the 1100 hour, 1300 hour and 1500 hour services.

1.5 Personnel

1.5.1 The enginedriver was a foundation member of GVR and had been a certified steam driver since 1980. His latest certificate was dated 1 April 1997. He had not attended the last annual GVR staff training day held on 12 October 1997.

1.5.2 The enginedriver stated that he did not notice that the train brakes were released and Train 31 was stopped on the engine brakes at Pukeoware on 17 May. He did not check what brakes were applied before he alighted from the cab to uncouple, assuming that having stopped on the grade the train brakes would be on.

¹ Cleaners were firemen under training and carried out tasks as directed by certified staff.

² Certified firemen had to be a minimum of 17 years of age and the youth was some years away from this qualification.

- 1.5.3 The fireman at the controls was in his second season with GVR. He held current certification as a fireman and had attended the last training day.
- 1.5.4 The fireman stated that he understood that it was the fireman's job to apply the train brakes³ before detaching the engine, and that he had always done this when carrying out firemen's duties in the past.
- 1.5.5 The guard had been with GVR for five years and had been certified for guard duties for 15 months. He had also attended the last training day.
- 1.5.6 He stated that he had been aware that the 1520 hour Fernleigh service had been designated as the coaling stop although 17 May was the first time he had been rostered on guard duties since this requirement had been introduced.
- 1.5.7 When asked why he did not apply the handbrake on the rear carriage he stated he did not know but "I've always known that the handbrake is an additional one, because normally the air brake is perfectly satisfactory to hold the train and the front brake is always put on by the driver and the rear brake is a sort of an added bit that you put on as a safe guard".
- 1.5.8 The assistant guard who boarded the moving carriages and attempted to fully apply the handbrake was a senior member certified for guard duties. He stated he was aware of the emergency brake on the leading carriage and its purpose and method of operation but in the heat of the moment attempted to apply the handbrake because this was the method of braking he was familiar with in his normal duties.
- 1.5.9 All staff were volunteers working in their own time for personal satisfaction. There was no indication that fatigue or stress played a part in the incident.

1.6 Site details

- 1.6.1 The main line through Pukeoware is on a 1 in 100 downgrade towards Glenbrook following a steep 1 in 42.75 downgrade from Fernleigh to Pukeoware.

1.7 Braking and train handling details

- 1.7.1 The GVR carriages were equipped with Westinghouse air braking. Each of the carriages was equipped with an emergency brake tap which could be used by staff or passengers to apply the train brakes in an emergency.
- 1.7.2 For the leading carriage on Train 31 this emergency brake tap was located inside the open carriage on the left leading side and opposite the externally fitted handbrake wheel on the right leading side.
- 1.7.3 The operation of the emergency brake was covered by Rule 616 which stated:

616. Stopping Trains in Emergency

If, in an emergency, a Guard should have cause to stop a train, he must open the brake cock in either the Guard's compartment or carriage and leave it open until the train has stopped.

An emergency application of the air brake must not be made except in an actual emergency.

³ Before uncoupling the fireman could reduce air pressure and apply the train brakes using the air tap at the coupling point of the leading carriage.

An Enginedriver becoming aware that the air brakes have been applied from the Guard's compartment or carriage or automatically must at once assist in stopping the train.

Enginedrivers and Guards must report to the Train Controller all instances of the emergency brake being applied from the Guard's compartment or carriage.

Guards must not allow any article to be hung on the handle of a brake cock in a Guard's compartment or carriage.

Appropriate operating instructions were mounted adjacent to the lever for the information of passengers, although in the case of the leading open carriage sunlight had caused fading.

- 1.7.4 The engine control included two separate brake handles, the automatic brake handle which controlled the brakes on the engine and carriages (train brakes) and the engine brake handle which controlled the brakes on the engine only.
- 1.7.5 The GVR Operations Manager stated the accepted method of stopping a train such as Train 31 was optional, and left to the enginedriver depending on locality and circumstances. A normal stop would be made using the train brakes. However it was not unusual to release the train brakes just prior to the train coming to a stand to achieve a smoother stop, and then immediately apply the engine brakes once the train had stopped. For a passenger stop without engine detachment it was also common practice to release the train brakes after stopping to avoid the delay associated with building up air pressure to release the brakes when ready to depart.
- 1.7.6 The handbrake at the front of the leading carriage was tested following the collision. Approximately 18 full turns were required to reach the applied position. The brake blocks were worn, although within accepted limits, but the brake gear needed adjustment. When correctly adjusted the desirable maximum number of turns to apply such a handbrake is approximately 11.

1.8 Safety system

- 1.8.1 The GVR held a rail service licence granted under the Transport Services Licensing Act 1989 in March 1997. The GVR approved safety system required annual audit and the last audit prior to the incident was carried out in August 1997. This audit proposed no amendments to the safety system, found no specific issues that required addressing, and commented favourably on the safety record of the GVR since its inception in 1977.
- 1.8.2 The GVR safety system included a structured training and certification system which covered initial certification and the requirement to attend periodic refresher courses within a period not exceeding 18 months.

2. Analysis

2.1 The chain of events leading to the collision was:

- the train brakes were not applied before detachment of the engine (Rule 384 (a))
- the handbrake on the rear carriage was not applied (Rule 615 (b))
- the handbrake on the front carriage was not effective
- the enginedriver authorised the engine to pull away without ensuring the train brakes had been applied and that the rear handbrake had been applied (Rule 615 (a) and (b))
- the assistant guard did not apply the emergency brakes once it was realised the carriages were moving.

2.2 The fireman at the controls was not aware that he had to apply the train brakes before the engine was detached and the enginedriver did not ensure this was done before uncoupling.

2.3 It is accepted that on the job training is a necessary prerequisite for firemen to progress to enginedrivers. However, such training should be in controlled conditions which ensure qualified enginedrivers supervise staff who may not be aware of all safety requirements. On the day in question the presence of the youth in the cab carrying out some duties of the fireman under supervision may have distracted the enginedriver from his prime responsibility of supervising the fireman at the controls.

2.4 With regard to the rear handbrake application there appeared to be an understanding by at least one staff member that this was an additional requirement rather than an essential requirement, and this may have influenced the oversight in this instance.

2.5 The handbrake on the leading carriage was out of adjustment and it is likely that this carriage was ineffectively braked when the runaway occurred. Routine brake tests should have pointed to a potential problem with the handbrake adjustment through the air brake piston maximum travel indicator. It was likely that this handbrake had been out of adjustment for some time. Had the handbrake been applied by the enginedriver his experience would have most likely told him by the feel of the extra resistance that the train brakes were not applied. The number of turns required should have alerted him to a potential problem. The youth who applied the brakes did not have the benefit of such experience.

2.6 GVR Rules 384 and 615 both referred to “Securing Train Before Engine Detached”. Although substantially the same they differed in important aspects relating to detachment of the engine from the train. The introduction to each clause and subclause (a) were similar (see 1.2.1). Subclause (b) of Rule 384 was similar to paragraph 1 of Subclause (b) of Rule 615 and required sufficient handbrakes to be fully applied before any attempt was made to uncouple the engine from the train. GVR does not have any radio communication between the guard and enginedriver and on the day of the incident the enginedriver only knew that the handbrake of the leading carriage had been applied (although unknown to him not effectively). One handbrake was not “sufficient” to hold the train on a 1 in 100 downgrade. It was apparent that reliance on compliance with subclause (d) of Rule 384 was based on a trust in the guard applying the handbrake on the rear vehicle for planned detachments. This is confirmed by the second paragraph of Subclause (b) of Rule 615.

2.7 A possible confusion exists between Rules 613 and 615. The common key point is that air brakes must not be relied on (Rule 615) and not that they must not be used (Rule 613).

- 2.8 Although all staff concerned were aware of the coaling stop at Pukeoware on the 1520 hours Fernleigh service the rear handbrake was not applied. The guard could not explain his failure to carry out this requirement and there was no check system to ensure this was done. With no communication between the guard and cab crew there was no defence to pick up this lapse.
- 2.9 By comparison Rule 610 relating to brake tests required that if a guard was to carry out an intermediate brake test the following procedure must first be adopted:

. . . Immediately after the train engine has been coupled to the train, the Guard himself must personally release the hand brake from the leading vehicle of the train and then proceed to the rear of the train and there he himself must personally release the hand brake on the rearmost vehicle, and then, and only then can the Intermediate Brake Test be carried out . . .

This strict procedure was necessary to allow the requirements of an intermediate brake test to be met on the rear vehicle. It is considered similarly effective procedures are required to ensure brakes are applied when detaching an engine as those in place to ensure brakes are released when reattaching an engine, particularly when detaching the engine on the grade at Pukeoware.

- 2.10 The last defence which may have avoided the collision was the opportunity presented to the assistant guard to apply the emergency brake. His training and experience was such that he was not sufficiently at ease with the emergency brake system to instinctively use it when required.

3. Findings

Findings and safety recommendations are listed in order of development and not in order of priority.

- 3.1 All staff were appropriately certified for their rostered duties.
- 3.2 The fireman was not adequately supervised when driving the train.
- 3.3 The presence of a third person in the cab also requiring some supervision may have distracted the enginedriver from his prime responsibility.
- 3.4 There were no defences to ensure the rear handbrake was applied before the engine was uncoupled.
- 3.5 The delegation of the important duty of applying the leading handbrake to an inexperienced youth minimised the chance to detect that the train brakes were not applied and that the handbrake was out of adjustment.
- 3.6 GVR Rules 384 and 615 require reconciliation and clarification with regard to the confirmed information necessary before cab crew can attempt to uncouple the engine from the train.
- 3.7 The assistant guard's actions showed a lack of familiarisation with the use of the emergency brake system under foreseeable conditions.

4. Safety Actions

- 4.1 Following the incident GVR carried out an internal inquiry.
- 4.2 GVR has amended the duties of enginedrivers, and the duties of guards and assistant guards, to cover detaching an engine at an intermediate station such as Pukeoware.
- 4.3 GVR also used the incident as a case study for all operating staff during the annual staff training day in October 1998. Events prior to the collision were recreated in the field as staff were taken through the following key issues:
- Distraction during on the job training. Third persons are not now permitted in the cab during such training.
 - The correct method of securing a train on a grade before detaching the engine.
 - Control of the delegation of critical tasks such as the application of the handbrake.
 - Indications of the need for handbrake adjustment, particularly during brake tests and during brake application.
 - An understanding of the air brake system with particular respect to the emergency brake application taps installed in all carriages.
- 4.4 GVR advised that Rule 613 will be amended to reflect the intent expressed in Rule 615 that air brakes must not be relied on.

5. Safety Recommendations

- 5.1 The prompt and effective action taken by GVR following the incident covered most deficiencies and issues arising from the incident. The Commission found it necessary to make only one recommendation.
- 5.2 On 8 January 1999 it was recommended to the General Manager of GVR that he:
- 5.2.1 Introduce procedures to ensure that when the application of the rear handbrake is required by the Rules, the application is confirmed to the enginedriver before an attempt is made to uncouple the engine from the train (104/98).
- 5.3 On 18 December 1999 the General Manager, GVR had responded, as follows, to the preliminary safety recommendation of the same wording as the above final safety recommendation:
- 5.3.1 The GVR will endeavour to formulate and implement a practical and effective procedure to ensure that the handbrake on the rearmost vehicle of a train is fully applied, and the application confirmed to the engine driver before the engine is uncoupled from the train.

