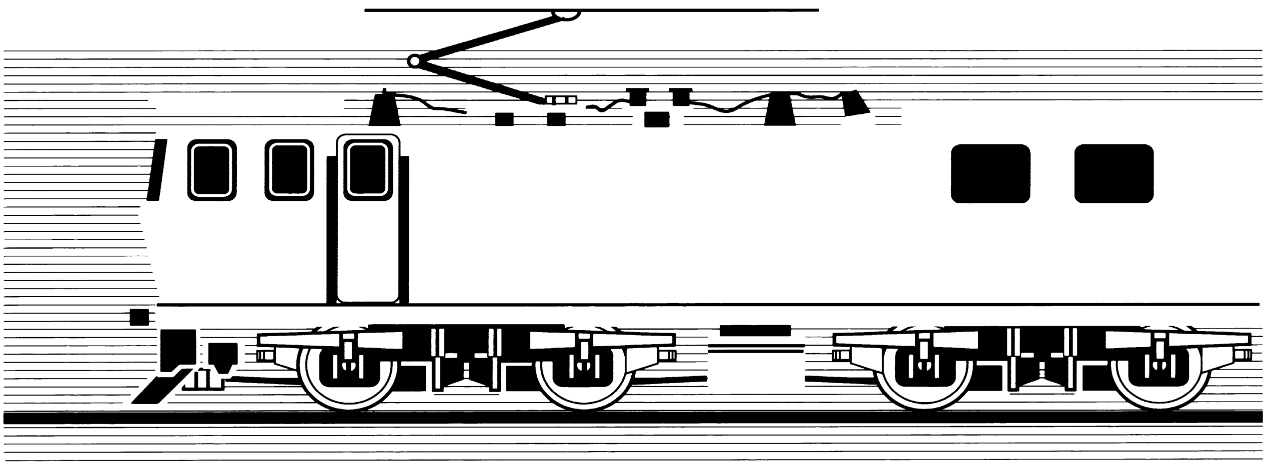
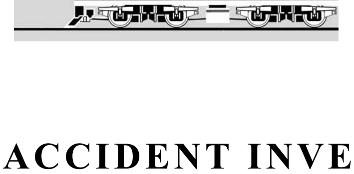


RAILWAY OCCURRENCE REPORT

04-110 Wagon runaway, Owens siding, Onehunga industrial line 5 April 2004


TRANSPORT ACCIDENT INVESTIGATION COMMISSION NEW ZEALAND

Report 04-110

wagon runaway

Owens siding; Onehunga industrial line

5 April 2004

Abstract

On Monday, 5 April 2004, at about 0630, wagon ZH 358, which had been detached from a locomotive and left isolated on the loop at Owens Siding, ran away down the loop and on to the Onehunga industrial line. The wagon travelled across 3 level crossings before it stopped about 2 kilometres from the siding.

The safety issues identified included the lack of an adequate defence to prevent runaway wagons entering the Onehunga industrial line from Owens siding.

Safety recommendations were made to the Chief Executives of Toll NZ Consolidated Limited and New Zealand Railways Corporation.

Contents

Figures

Abbreviations

Alstom	Alstom New Zealand Transport Services
km	kilometre(s)
km/h	kilometres per hour
m	metre(s)
Toll Rail[1]	Toll NZ Consolidated Limited
Tranz Rail	Tranz Rail Limited
UTC	coordinated universal time

[1] New owner of Tranz Rail from 5 May 2004.

Data Summary

Train type and number:	L9 shunt
Wagon:	ZH358
Date and time:	5 April 2004, at about 0630[2]
Location:	Owens siding, Onehunga industrial line
Persons on board:	locomotive: 2
	wagon: nil
Injuries:	nil
Damage:	nil
Operator:	Tranz Rail Limited (Tranz Rail)
Investigator-in-charge:	D L Bevin

[2] Times in this report are New Zealand Standard Time (UTC + 12) and are expressed in 24-hour mode

1 Factual Information

1.1 Narrative

1.1.1 On Monday, 5 April 2004, Train L9 was an Auckland shunting service and consisted of a DH locomotive and wagon ZH358. Train L9 was crewed by a locomotive engineer and a rail operator.

1.1.2 At about 0625 Train L9, which had travelled from Westfield and shunted Penrose enroute, arrived at Owens siding on the Onehunga industrial line to place ZH358 to a customer's siding for discharge. An empty wagon in the siding was required to be moved to another load out facility, so the locomotive, with ZH358 attached, entered the siding under the direction of the rail operator and caught on to the empty wagon (see Figure 1, shunt movement 1).

1.1.3 The locomotive, now with a wagon attached at each end, reversed out of the siding (see Figure 1, shunt movement 2) and on to the loop where the consist stopped clear of the facing points (see Figure 1, shunt movement 3).

1.1.4 The rail operator then set the facing points to normal and directed the consist forward until the locomotive and the empty wagon were clear of the facing points where he stopped the movement and detached ZH358 (see Figure 1, shunt movement 4). The locomotive, with the empty wagon attached to the front, then moved down the loop, leaving ZH358 where it had been detached clear of the facing points (see Figure 1, shunt movement 5).

1.1.5 At the bottom end of the loop, the locomotive travelled through the points and on to the main line, where it stopped while the rail operator set the points for the main line. After this was done he directed the movement back up the main line with the empty wagon now trailing behind the locomotive (see Figure 1, shunt movement 6).

1.1.6 As the locomotive travelled up the main line the rail operator saw ZH358 rolling down the loop towards them. He called to the locomotive engineer to stop the locomotive, then ran to the moving wagon and attempted to apply the brakes but was unsuccessful.

1.1.7 The wagon travelled from the loop to the main line through the bottom points and continued down the Onehunga Industrial Line for about 2 km, crossing 4 level crossings as it did so, before it stopped.

1.1.8 The rail operator chased the wagon on foot and caught up with it only after it had stopped. He secured the wagon and returned to Owens siding to pilot the locomotive to recover the wagon and return it to the siding.

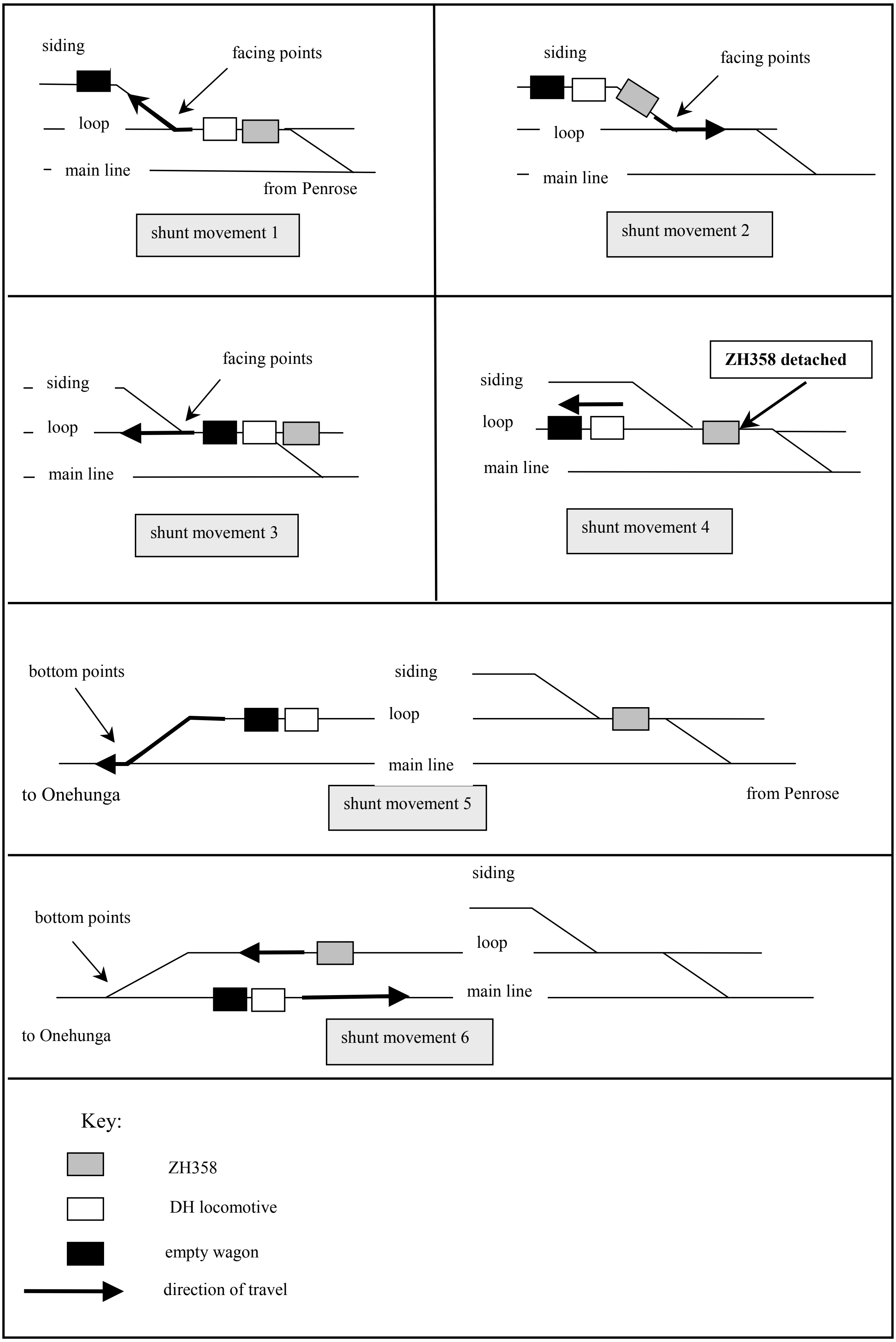


Figure 1
Shunt movements

1.2 Site information

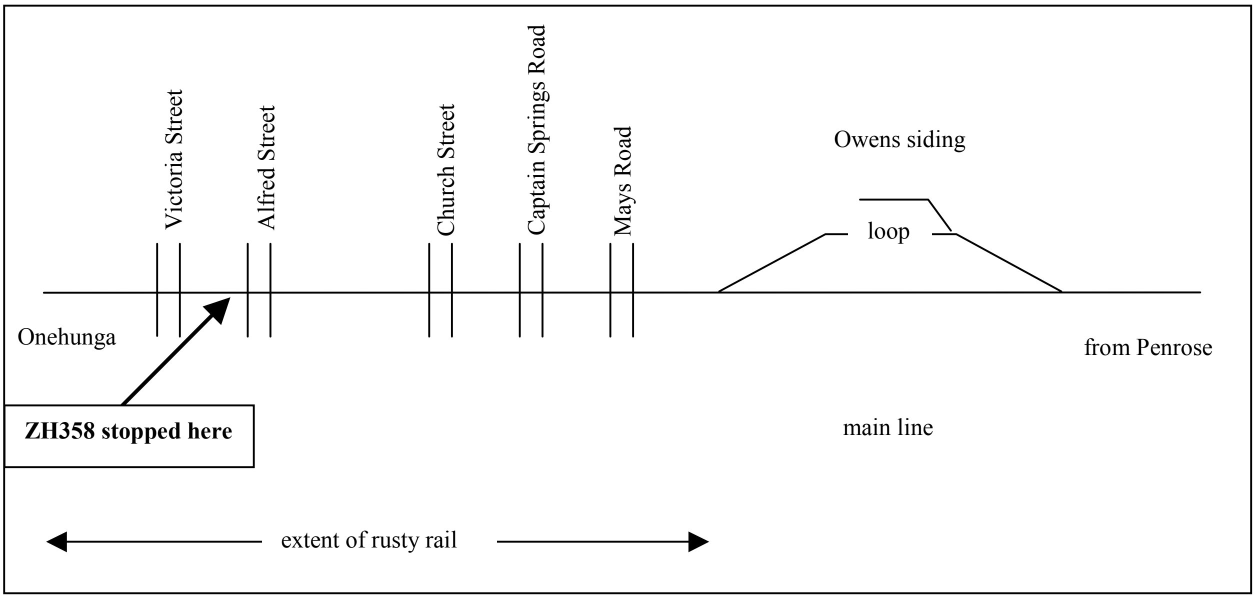


Figure 2
Site diagram of Onehunga industrial line showing location of Owens siding (not to scale)

1.2.1 The 4.5 km long Onehunga industrial line branched off the North Auckland Line at Penrose. Owens siding, a single-ended siding located 1.57 km from Penrose, was the only rail facility in regular use on the line. It was usually serviced twice a day by Train L9 shunting service.

1.2.2 The maximum line speed on the main line, loop and sidings on the Onehunga industrial line was 10 km/h.

1.2.3 The loop and adjacent main line at Owens siding was 220 m long on a descending 1 in 280 gradient from Penrose. Tranz Rail's code required tracks where shunting, storage or loading and unloading of wagons were to occur to be level wherever possible. The maximum gradient allowed was 1 in 200.

1.2.4 There was no derailing block on the loop to prevent runaway wagons from entering the main line and running down towards Onehunga.

1.2.5 There were no scheduled train services operating beyond Owens siding on the Onehunga industrial line and there had been none for a number of years. The absence of trains caused a build-up of rust on the unused rails beyond Owens siding. The layer of rust had the potential to insulate the wheels of any rail vehicles from the track circuits, resulting in unreliable operation of level crossing alarms from and including Mays Road to the end of the line (see Figure 2).

1.2.6 Tranz Rail's operating procedures required the warning devices for each of the level crossings to be operated manually when it was necessary for rail vehicles to use the line beyond Owens siding. Owens siding connected to the loop and had standing room for 5 wagons. There was a shelter near the start of the siding with standing room for one wagon (see Figure 3).

1.2.7 All points at Owens siding were hand operated.

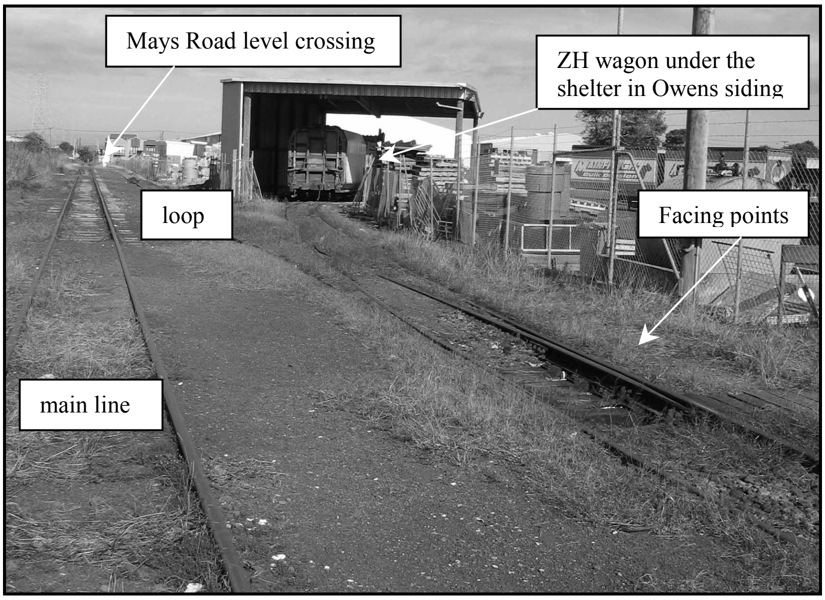


Figure 3
Owens siding looking towards Mays Road level crossing and Onehunga

1.2.8 At the Onehunga end of the siding, the loop rejoined the main line through the bottom points (see Figure 4).

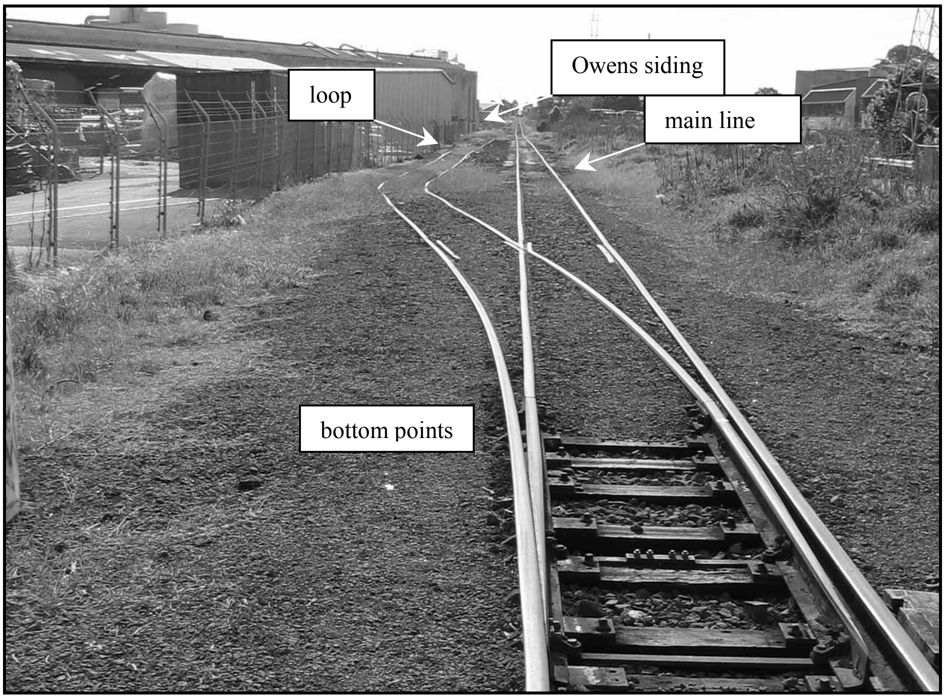


Figure 4
View from the bottom end points towards Penrose

1.2.9 The main line had an even gradient, but the track on the loop had an undulating top with low rail joints. About half-way towards the bottom points, the loop was about one metre lower than the height of the main line. The undulating top on the loop can be seen in Figure 4.

1.2.10 The bottom points were situated about 107 m before Mays Road level crossing. There was an "alarms start here" board erected 80 m from the level crossing. This provided standing room for a locomotive and one wagon clear of the bottom points without starting the warning alarms at the level crossing (see Figure 5).

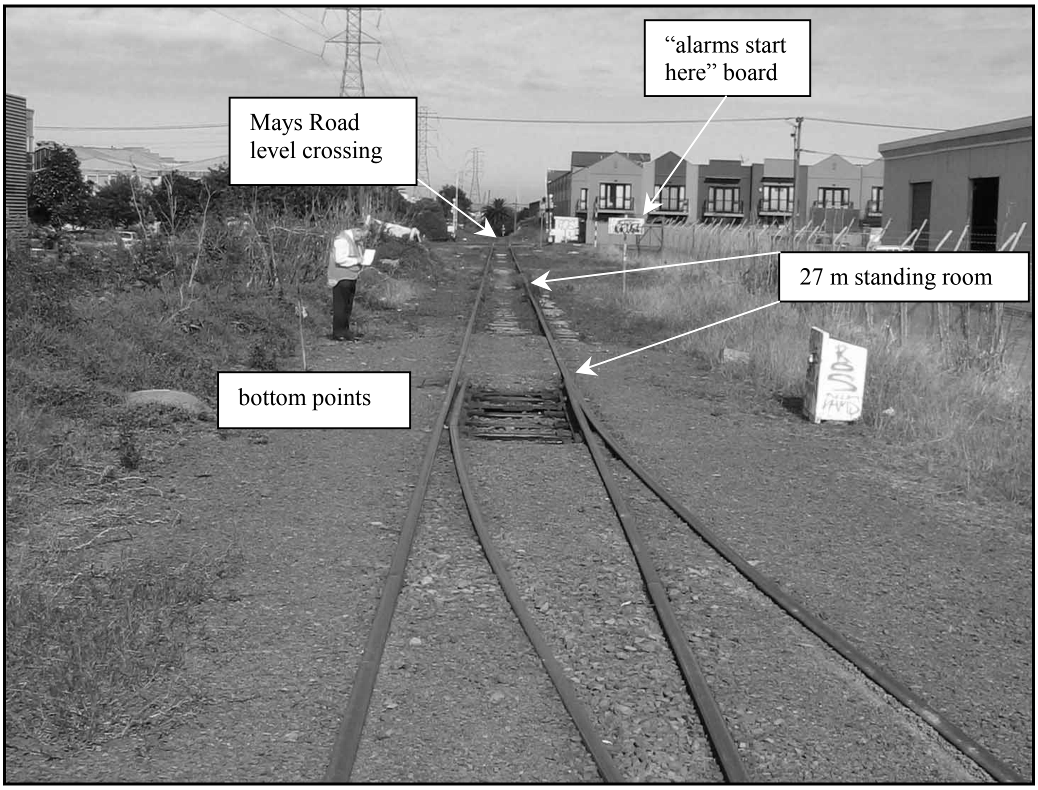


Figure 5
Bottom points and Mays Road level crossing

1.2.11 Immediately after crossing Mays Road the main line descended in a steeper gradient of about 1 in 48 towards Onehunga.

1.2.12 The Onehunga industrial line had previously been classified as a branch line and as such the points would have had locks and some form of protection against wagons encroaching on the main line at both ends of the loop. The most likely form of that protection would have been interlocked trap switches or non-interlocked stop blocks.

1.2.13 When the branch line was reclassified as an industrial line, and part of the Penrose yard, points locks and protection against wagons encroaching on the running line were no longer required and the equipment had been removed at some later time.

1.2.14 Trains approaching a level crossing are detected by "track circuits". These are insulated joints in the rail at appropriate distances before and after a protected level crossing. A small voltage is applied across the rails, and while that voltage is maintained electrical relay switches are held open and the alarms do not operate. If the rails become electrically connected by sufficiently low resistances, such as through the wheels and axles of a vehicle, the voltage differences reduce, the relay switches close and the alarms begin to operate.

1.2.15 When rail heads are heavily rusted or the numbers of axles on trains are small, the risk of intermittent operation, or non-operation, of the alarms is high. Railways have standing instructions about piloting trains over level crossings when track circuit operation of the alarms cannot be relied on.

1.3 Personnel

The locomotive engineer

1.3.1 The locomotive engineer had 10 years experience, with the last 3 years based in Westfield. He was familiar with the operation of the Onehunga industrial line. He said that after completing the shunt at Penrose, they had caught on to ZH358 and did an air brake test before departing from Penrose.

1.3.2 He said that he proceeded into Owens siding under the direction of the rail operator and caught on to the empty wagon. He then reversed out of the siding, clear of the facing points and stopped. After the rail operator had set the facing points for the loop he moved forward a short distance on to the loop and stopped clear of the facing points.

1.3.3 The locomotive engineer said he had applied the air brake to commence slowing the train and applied the independent[3] brake as the train came to a stop. He used this braking technique when shunting on the loop as a safety measure because the track was often slippery from grass growing over it, and from the rusty rail, but also because the loop ran downhill to the Mays Road level crossing. He said he made a reasonable application that reduced the air pressure in the system from 550 kPa to about 400 kPa, more than the minimum application of 50 kPa, and he would have expected that to hold the wagon once it was uncoupled.

1.3.4 He said that applying the independent brake as the locomotive stopped took up any slack between the buffers, and assisted the rail operator to uncouple the wagon. Also the air brake application enabled the rail operator to get better purchase when he applied the hand brake. The movement had stopped before the rail operator went between the locomotive and ZH358 and uncoupled the brake hoses. The locomotive engineer later said that he had watched the rail operator apply the hand brake on the wagon before he uncoupled it from the locomotive.

1.3.5 The locomotive engineer said that after ZH358 had been uncoupled, they propelled[4] the empty wagon down the loop and through the bottom points on to the main line. He said that at the time the locomotive pulled away ZH358 was stationary and did not follow them down the loop. Once through the bottom points, the locomotive stopped and the rail operator reset the points for the main line.

1.3.6 The locomotive engineer said that as they moved back along the main line he was sitting on the side of the locomotive next to the loop, and the rail operator was standing on the same side of the shunter's refuge at the front of the locomotive. He thought they had travelled about 50 m when the rail operator called to him that the wagon was moving, and he saw it slowly creeping down the loop towards them.

1.3.7 It was still dark at the time but the locomotive engineer said he saw the rail operator run to the front of the approaching wagon and he thought the rail operator had tried to pull the air tap to apply the brakes but the wagon kept going and went out of view once it had passed his locomotive. He also thought the rail operator may have moved to the opposite end of the wagon and stood on the hand brake to apply more pressure in an attempt to stop the wagon.

1.3.8 The locomotive engineer opened his cab window and looked back as ZH358 moved away from him. His visibility was restricted by the empty wagon coupled to the rear of the locomotive but he saw that the warning devices at Mays Road level crossing were operating intermittently as ZH358 approached and moved over the crossing.

1.3.9 He made 3 attempts to contact the rail operator by radio before he secured the locomotive and started to walk down the track towards Mays Road. He had walked about 400 m when he found the rail operator's radio on the ground and after walking a further 100 m he saw the rail operator walking towards him. The rail operator told him that the wagon had stopped and that he had secured it so they returned to the locomotive.

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[3] Use of the independent brake results in a brake application in the locomotive only

[4] The wagon was attached to the front of the locomotive in the direction of travel.

1.3.10 The locomotive engineer obtained the necessary authority from the train controller before he moved the locomotive down the main line to where ZH358 had stopped. He said the warning devices at Mays Road, Captain Springs Road and Church Street level crossings were working intermittently as the train approached and crossed them.

1.3.11 When they reached ZH358 they attached it to the empty wagon on the front of the locomotive. The locomotive engineer said he did an air brake test before moving because he wanted to satisfy himself that the brakes on ZH358 were working. He also kicked the brake blocks to make sure they were hard against the wheels and not just lying against them. As he did so he noticed that there was a lot of mud on the brake blocks but he did not know where it had come from.

1.3.12 Once he was satisfied that the brakes were working correctly, he moved the train back to Owens siding and, under the direction of the rail operator, placed ZH358 in the siding.

1.3.13 The locomotive engineer's understanding was that both the air brake and the handbrake were applied before the wagon ran away. He felt that if there had been no brakes applied the wagon would have run even further than it did. He said he was aware of the ripple effect (see 1.10) but was unsure if it could occur to a single wagon

1.3.14 He said he felt that there would not have been much air left in the wagon braking system to release when the rail operator tried to stop the wagon because the air had been released when the air brake had been applied after exiting Owens siding.

The rail operator

1.3.15 The rail operator had 6 years experience in that role but had a total of 28 years experience in various operating roles in the Auckland area. He was familiar with the operation of the Onehunga industrial line.

1.3.16 The rail operator said that prior to Train L9 departing Westfield he did an air brake test on the train. He recalled that the piston rod on the brake cylinder of ZH358, the last wagon in the rake, was working and this confirmed for him that the air brake system was working throughout the train.

1.3.17 On arrival at Penrose ZH358 had been placed into another siding out of the way because of the shunting work to be done. The rail operator said that after ZH358 had been placed to that siding he had pulled the air brake tap to allow some of the air to release, thereby applying the air brake but he did not apply the handbrake. After completing the shunt at Penrose he attached ZH358 to the locomotive and said he did an air brake test before departing for Owens siding.

1.3.18 When they arrived at Owens siding, the facing points were already set for the siding so the rail operator said he guided the locomotive, with ZH358 trailing, onto the empty wagon standing in the shelter. He then attached the empty wagon and instructed the locomotive engineer to reverse out of the siding.

1.3.19 After clearing the facing points, he reset them for the loop then directed the locomotive engineer forward a short distance beyond the points where he stopped the movement and detached ZH358 from the locomotive. He said he lifted the air tap on the locomotive first, before lifting the air tap on the wagon and uncoupling the air hoses.

1.3.20 The rail operator later said he could not remember if he had released more air by pulling the tap back down slightly to further apply the air brake. He also initially thought that he had applied the handbrake but later recalled that he had not.

1.3.21 He then piloted the movement, with the empty wagon attached to the front of the locomotive, along the loop and through the bottom points to stop on the main line. He reset the bottom points and guided the shunt back up the main line.

1.3.22 The rail operator was riding in the shunter's refuge on the front of the locomotive when he noticed ZH358 was travelling towards him on the adjacent loop line. He called to the locomotive engineer to stop and said he then ran to the front of the moving wagon and pulled the air brake tap down to apply the air brake but there was no air in the system and the wagon continued moving. The handbrake was not down (applied) so he said he pumped the handbrake lever up and down in an attempt to apply the brake but was unsuccessful.

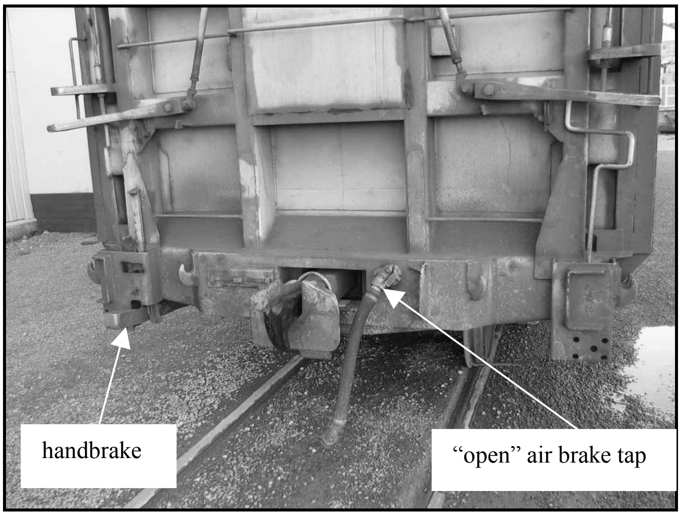

Figure 7
Handbrake end of a ZH class wagon

1.3.23 Although the air brake is accessible from both ends of the wagon, the handbrake is only located at one end (see Figure 7), in this case the trailing end in the direction of travel of the wagon.

1.3.24 The rail operator said the wagon continued to gather speed so about 2 wagon lengths from Mays Road level crossing he jumped off. He chased after the moving wagon on foot and when he located it he secured it and walked back towards Owens siding. About 500 m from the siding, he met the locomotive engineer walking towards him.

1.3.25 After discussing the situation they returned to the locomotive, obtained the necessary authority, and moved down to recover the wagon.

1.4 Wagon ZH358

1.4.1 At the time of the incident, ZH358 had a declared gross weight of 45 tonnes. Tranz Rail's Fleet and Equipment Information Catalogue stated that ZH class wagons had a maximum gross tonnage of 57 tonnes.

1.4.2 There were no mechanical defects or outstanding mechanical checks recorded against ZH358 in the wagon maintenance systems of either Tranz Rail's or Alstom New Zealand Transport Services (Alstom)[5].

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[5] In April 2002, Tranz Rail contracted out the inspection and maintenance of locomotives and rolling stock to Alstom to standards set by Tranz Rail.

1.5 Shunting procedures

1.5.1 Up until the last few years it had been standard railway practice to convey small numbers of wagons around shunting yards without the air brake in operation, relying solely on the locomotive or independent brake.

1.5.2 Changes to shunting procedures and the desire to improve safety within shunting yards led to Tranz Rail's shunting procedures requiring that brake hoses between wagons were coupled and the air brake operating during travel and shunting.

1.6 Westinghouse air brakes

1.6.1 The air brake is the standard, fail-safe train brake used by railways all over the world. It is based on the simple physical properties of compressed air.

1.6.2 A moving train contains energy, known as kinetic energy, which needs to be removed from the train in order to cause it to stop. The simplest way of doing this is to covert the energy into heat by applying a contact material to the rotating wheels. The material creates friction and converts the kinetic energy into heat. The wheels slow down and the train eventually stops. The material used for braking is normally in the form of a block.

1.6.3 The braking system uses compressed air as the force to push the blocks on to the wheels. The compressed air is transmitted along the train through a brake pipe. Changing the level of air pressure in the pipe causes a change in the state of the brake on each vehicle. It can apply the brake, release it or hold it on after a partial application (see Figure 6).

1.6.4 At the ends of each vehicle, angle cocks or taps are provided to allow the ends of the brake pipe hoses to be sealed when the vehicle is uncoupled. The cocks prevent the air being lost from the brake pipe when vehicles were uncoupled from the train.

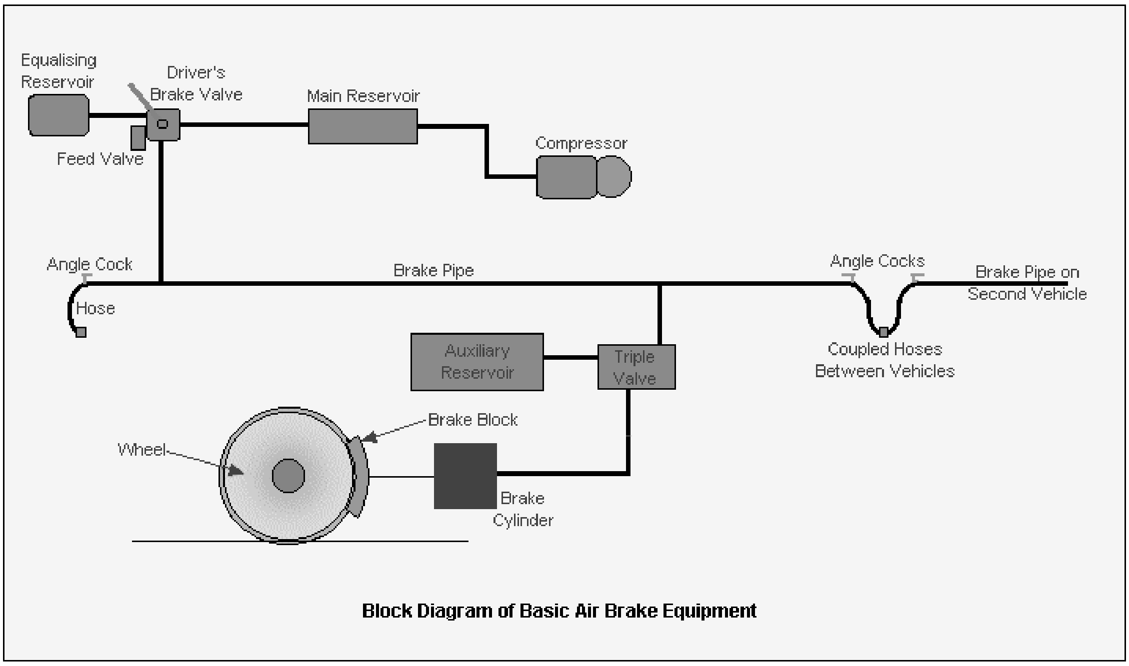

Figure 6
Diagram of basic air brake equipment
(source Railway Technical Web Pages 1998 –2004)

1.6.5 When a locomotive engineer applies the brake, air pressure in the brake pipe escapes. The loss of pressure is detected in the triple valve of each vehicle. When the pressure on the brake pipe side of the triple valve falls, the auxiliary reservoir pressure on the other side pushes a slide valve over, opening a connection between the auxiliary reservoir and the brake cylinder. Auxiliary reservoir air now feeds through into the brake cylinder, forcing the piston to move against the spring pressure and causing the brake blocks to be applied to the wheels. Air will continue to pass from the auxiliary reservoir to the brake cylinder until the pressure in both is equal.

1.6.6 Over a period of time, the air pressure from the auxiliary reservoir will bleed off and the brake will release. Therefore, it was important that the handbrake was also applied if the vehicle was to be isolated for any length of time.

1.6.7 The brake pipe is connected between vehicles by flexible hoses, which can be uncoupled to allow vehicles to be separated. Loss of air in the brake pipe anywhere in the train will cause the brake to apply. Brake pipe pressure loss can be through a number of causes such as:

- a controlled release by the locomotive engineer
- a rapid reduction by the locomotive engineer through an emergency brake application
- a rapid reduction through a burst pipe or hose
- a rapid reduction when the hoses part as a result of the train becoming parted or derailed.

1.6.8 When a locomotive engineer releases the brake, air pressure in the brake pipe is replenished from the main reservoir. The change in pressure is detected by the triple valve and the reverse process applied, thus releasing the brakes from the wheels.

1.6.9 A full service brake application resulted in a drop in air pipe pressure from 550 kPa to 400 kPa. The majority of the braking effect came during a full service brake application. However, an increased brake application could be achieved by further reducing the air pressure, either from the locomotive controls or from the wagon tap if the wagon was uncoupled.

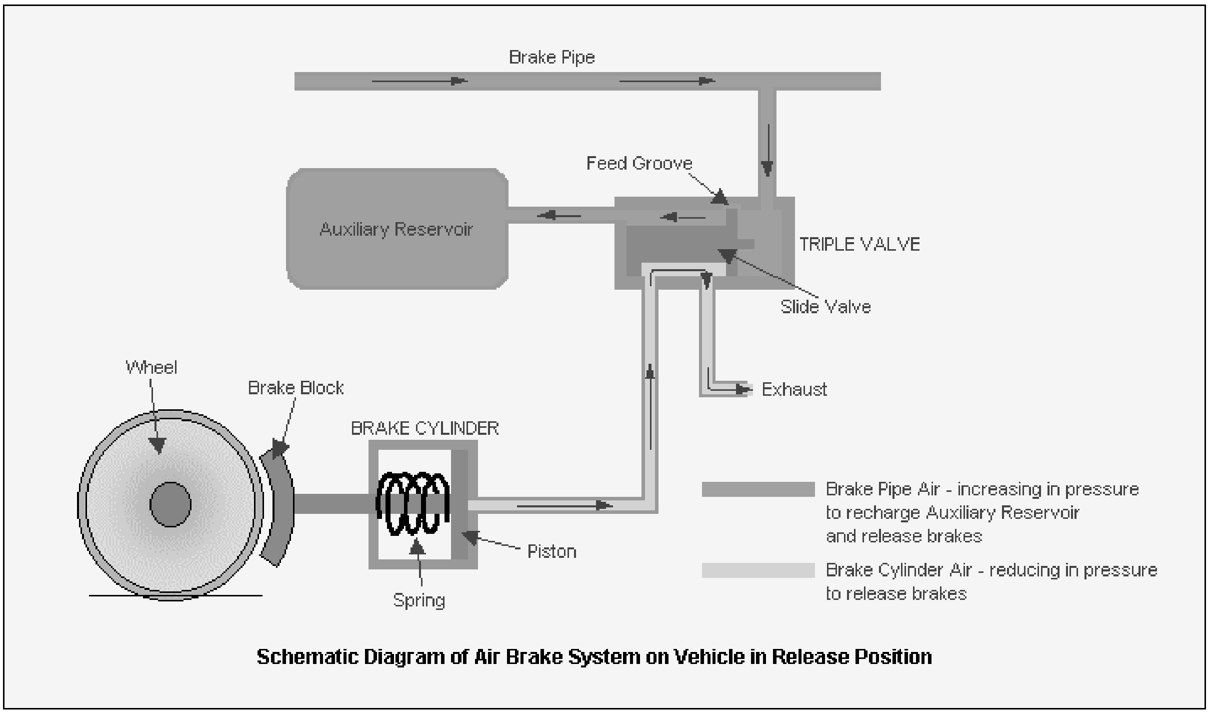

Figure 7
Schematic diagram of air brake system in release position
(source Railway Technical Web Pages 1998 –2004)

1.7 Post-incident inspections of wagon ZH358

1.7.1 About 5 hours after the incident the train examiner maintenance examined the air brake on ZH358. He said that when he arrived at Owens siding he noticed the brake cylinder piston rod was extended, which indicated to him that the air brake system still retained some air pressure.

1.7.2 The train examiner then connected a portable compressor to the air brake system and charged the air brakes before simulating a brake application by opening the brake tap in the same manner as the rail operator said he had done earlier. The operation of the brake tap was repeated at the opposite end of the wagon, and both tests confirmed the air brake system was working correctly. He also confirmed that there had been no detectable air leakage when he isolated the wagon with full air pressure and with both brake taps closed.

1.7.3 He also tested the handbrake system and confirmed that the brakes became engaged at notch 4 on the ratchet, which was within Tranz Rail's code requirement.

1.7.4 The day after the incident a full Westinghouse brake test was completed on ZH358 in Wellington depot. The air brake stayed applied for about 3 hours before the wagon was pulled from the depot to continue its journey. The wagon successfully passed all the requirements of the test.

1.7.5 The hand brake was found to be in good working order and held the wagon when the hand brake lever was locked in place.

1.8 Incident simulation

1.8.1 On Friday, 5 November 2004, the incident was re-enacted in a simulation exercise in an attempt to replicate the conditions under which a loaded ZH class wagon could run away after being placed on the loop at Owens siding.

1.8.2 Toll Rail supplied a loaded ZH class wagon and DH class locomotive, both similar to those involved in the original incident. However, because of operational requirements it was not possible to utilise the original crew for the simulation.

1.8.3 The ZH wagon was placed in the position ZH358 had been placed with the following results:

- with a similar air brake application as that reported to have been made by the locomotive engineer during the original incident the wagon did not move
- with the handbrake only applied, the wagon did not move
- with no brakes applied the wagon commenced to roll almost as soon as it was detached from the locomotive but stopped after running about 10 m.
- within that 10 m it cleared the facing points and entered the loop before stopping.

1.9 Human factors

1.9.1 The activities of an individual can be divided into 3 types:

- knowledge-based actions
- rules-based actions and
- skill-based behaviour.

1.9.2 Unlike knowledge-based or rules-based actions, skill-based behaviour is unconscious, rapid, seemingly effortless and, most importantly, it is automatic. For example, car drivers change gear, steer, work the accelerator and travel regular routes almost without thinking because the actions have become automatic.

1.9.3 Such behaviour frees an operator to think of other things, but the cost is that the actions are not monitored well. Even skilled operators can be unaware of the automatic procedures they follow and may even be unable to explain how the actions are performed. When asked to recall specific details of a particular day, an operator is likely to recall what is normally done, and not recall any deviation from the normal.

1.10 Other information

1.10.1 Toll Rail advised that some operating personnel had reported instances of a phenomenon known as ripple or surge effect, which may cause unintentional release of the air brake.

1.10.2 The phenomenon is neither common nor fully understood but apparently can occur when exhausting air is stopped by lifting the tap, causing a back-surge of air to the triple valve. If the surge is sufficiently strong, the triple valve detects it as air replenishment and releases the brake.

1.10.3 Toll Rail's mechanical engineers and other experienced rail engineers were of the opinion that if the phenomenon was to occur it would be more likely to do so in a long consist with a continuous coupled air pipe rather than in a short consist or single-wagon situation.

1.10.4 Toll Rail advised it had recommended to their technical committee that trials be undertaken on various classes of wagons and rakes to try to understand how the phenomenon occurred, as part of a wider study into wagon braking issues.

2 Analysis

2.1 If the actions of the locomotive engineer and the rail operator were as they recalled ZH358 would have had the air brake applied when it was detached and the runaway would not have occurred.

2.2 In order for ZH358 to run away it had to have been left without braking. The rail operator recalled that he had not applied the handbrake at the time the wagon was detached so for some reason the air brake must also have not been applied.

2.3 The tasks carried out in this incident, as in any other shunting movement, were repetitive for shunting crews and the locomotive engineer and rail operator may well have recalled what they would normally do rather than what actually happened on the day. The constant coupling, uncoupling and recharging of the air brake reservoirs required under present-day shunting procedures was time-consuming and probably irritating to shunt train crews who perhaps may not be convinced that such work was necessary.

2.4 The shunt crew may have thought that they could leave the wagon standing for a few minutes without the hand brake applied and perhaps a minimum residual air pressure in the reservoir and were unaware that the gradient where they left the wagon was steeper than in most railway marshalling yards in the country and could start a free running wagon rolling. They probably would not have forseen the risk of a runaway if a wagon did begin to roll, especially since there was no visible defence against such a thing to remind them.

2.5 Because the loop dropped at least one metre below the main line the gradient where the wagon was detached would have been steeper than the 1 in 280 gradient of the main line.

2.6 Possible scenarios that could have led to there being no air in the air pipe system of ZH358 and therefore no air brake in effect included:

- the wagon was attached to the locomotive at Penrose and an air brake test was not done prior to departure
- the movement was stopped by use of the independent brake after exiting Owens siding
- a ripple or surge effect.

2.7 After ZH358 was reattached to the locomotive at Penrose, the air remaining in the system, which was keeping the brake on during the time it had been isolated in Penrose, was possibly dumped, thereby releasing the brake. Had the air pipe system been pumped up for an air brake test this air would have been replaced.

2.8 When the shunt arrived at Owens siding the locomotive engineer may have used the locomotive independent brake to stop the movement. This did not require the air system of ZH358 to be charged.

2.9 The possibility of the ripple effect was unlikely as there was only one wagon involved and the relatively small volume of air would probably have been exhausted before the rail operator could have taken any action that may have initiated the phenomenon.

2.10 Post incident tests showed that the air brake system was working correctly and was able to maintain adequate pressure. Had the brake hoses been coupled up and the taps opened prior to departure from Penrose, the air pipe system would have been fully charged and would have maintained pressure during the short journey to Owens siding. There would probably have also been enough air for the air brake to respond to the rail operator's application when he attempted to stop the runaway wagon. The fact that the wagon ran away and there was no air available to the rail operator to apply further braking supports the scenario that it was isolated with no air in its system.

2.11 The incident re-enactment confirmed that:

- if the air pipe pressure had been retained at 400 kPa it was most unlikely that the wagon could have moved from its position
- although the handbrake had not been applied, had it been it would have prevented the wagon from moving, even if the air brake had not been applied
- given the right conditions it was likely that a loaded and unrestrained ZH wagon could roll away from where ZH358 had been detached and gather speed as it travelled along the loop towards the bottom end points.

2.12 Tranz Rail was aware that the warning devices at the level crossings beyond Owens siding could not be relied upon to operate for the passage of rail vehicles because of the rusty rail conditions and had issued instructions to manage the possibility. However, these instructions were directed at controlled or accompanied movements, which could be stopped at level crossings while the warning devices were manually operated. There was no such opportunity to manually activate the warning devices in this instance. The fact that they operated intermittently for the passage of the runaway wagon was fortuitous and a safety recommendation was made to the Chief Executives of Toll NZ Consolidated Limited and New Zealand Railways Corporation regarding runaway wagons entering the Onehunga industrial line.

3 Findings

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

3.1 The locomotive engineer and the rail operator were appropriately certified for the duties they were undertaking.

3.2 The rail operator thought that he had applied the air brake when he detached ZH358 from the locomotive.

3.3 The handbrake had not been applied to ZH358 when it was detached near the facing points at Owens siding.

3.4 ZH358 was probably left unrestrained after it had been detached from the locomotive at Owens siding.

3.5 The handbrake and air brake system on ZH358 were tested following the incident and found to operate within Tranz Rail's code specifications.

3.6 There was no defence in place to prevent wagons running away from Owens siding from entering on to the Onehunga Industrial Line.

3.7 The warning devices at the level crossings beyond Owens siding could not be relied upon to operate automatically for rail vehicles.

4 Safety Recommendations

4.1 On 1 July 2004, the Commission recommended to the Chief Executive of Toll NZ Consolidated Ltd that he:

> install a protection device on the loop at Owens siding to prevent an uncontrolled wagon movement travelling in a westerly direction beyond that point. (031/04)

4.2 On 16 August 2004, the Chief Executive of Toll NZ Consolidated replied in part:

> We wish to confirm that a derailing block has been installed on the loop at Owens siding in Onehunga.

4.3 On 25 August 2004, the Commission replied to the Chief Executive of Toll NZ Consolidated that:

> The Commission is satisfied that the recommendation has been acted upon and the status of the safety recommendation is "closed-acceptable".

4.4 On 27 September 2004, the Commission made the following Preliminary Safety recommendation to the Chief Executive of New Zealand Railways Corporation that he:

> install a protection device on the Onehunga industrial line near Owens siding to prevent uncontrolled wagon movements in a westerly direction beyond that point (075/04).

4.5 On 1 November 2004, the Chief Executive of New Zealand Railways Corporation responded to the Preliminary Safety recommendation in part:

> At present the Industrial Line is regarded as a part of Penrose Station Limits, and therefore, shunting staff may have less inclination to treat it as a main line. It is proposed to clarify, and properly document, the status of the Industrial Line by the reissue of the S & I diagram to separate the Industrial Line out from Penrose Station Limits. The Industrial Line would be shown as part of the "Controlled Network", thus reinforcing its's status as a "Main Line".

The following would then apply:

- Permission to enter the Industrial Line would be required from the Train Control Officer (TCO)
- The Working Timetable (WTT) instructions would ban wagons being left unattended on the main line.
- An "All Trains Stop Board" would be erected just past Owens Siding, defining the limits for normal Industrial Line operations. Permission for trains to operate past this point will require the issue of a Special Bulletin.
- The derailing block currently installed on the west end of loop by Owens Siding, protecting the main line would be shown on the S & I diagram, with a special instruction specifying that it must be left locked in the derailing position at all times, and only opened when a train movement is entering or exiting the loop at the west end.

It is considered that the above steps will provide adequate operational and documented safeguards to minimize the risk of future runaways, without resorting to the non-standard solution of providing a derailing block on a main line. Note that installation of derailing blocks on the main line have historically caused operational problems.

If subsequent experience shows that these arrangements do not result in the require compliance to procedures, NZRC will then reconsider the need for a derailing block, or other protection mechanisms, to prevent runaway wagons form passing over Mays Road Level Crossing and continuing further down the Industrial Line.

4.6 On 14 April 2005 the Chief Executive of New Zealand Railways Corporation advised that the actions listed in his letter of 1 November 2004 were being progressed, and at this stage he anticipated they could be implemented in approximately 2 months.

4.7 On 19 April 2005 Preliminary Safety recommendation 075/04 was formalised as a Final Safety Recommendation to the Chief Executive of New Zealand Railways Corporation.

Approved for Publication 28 April 2005

Hon W P Jeffries

Chief Commissioner

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