



Report 99-127
siding shunt derailment
Fletcher Paper private siding
Mt Maunganui
17 December 1999

Abstract

At approximately 1630 hours on Friday 17 December 1999, a rake of wagons being propelled from Fletcher Paper private siding in Mt Maunganui derailed as a result of being pushed over a derailing block. The wagons slewed from the track and crossed a public road level crossing before colliding with a building and coming to rest on the opposite side of the road. The safety deficiencies identified included:

- the use of motorcycles by staff during shunting of sidings
- the lack of formalisation of local speed limits
- the positioning of staff during the propelling movement.

Two safety recommendations were made to address these issues.

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List of Abbreviations

km	kilometre(s)
km/h	kilometre(s) per hour
m	metre(s)
RCO	remote control operator
t	tonne(s)
Tranz Rail	Tranz Rail Limited

Data Summary

Train type and number:	late siding shunt
Date and time:	17 December 1999, at about 1630 hours
Location:	Fletcher Paper private siding, Mt Maunganui
Type of occurrence:	derailment
Persons on board:	crew: 2
Injuries:	nil
Damage:	rolling stock: minor building: extensive
Operator:	Tranz Rail Limited (Tranz Rail)
Investigator-in-Charge:	Dennis Bevin

1. Factual Information

1.1 Narrative

- 1.1.1 At about 1630 hours on Friday 17 December 1999, the late siding shunt locomotive DH2845 was propelling a rake of 8 wagons west along No. 1 road after completing shunting duties at Fletcher Paper private siding.
- 1.1.2 The shunt was about 170 t and 120 m long and under the control of a remote control operator (RCO), assisted by a shunter.
- 1.1.3 The RCO and shunter had commenced duty at 1400 hours and, after completing some work within the Mt Maunganui marshalling yard, had travelled via No 3 Industrial Line to service other private sidings, including Fletcher Paper private siding. The RCO had accompanied the light locomotive while the shunter had proceeded ahead by motorcycle.
- 1.1.4 The shunt proceeded to Fletcher Paper private siding where it entered the eastern end of the shelter and coupled on to a rake of 8 wagons.
- 1.1.5 After coupling on the rake the shunter climbed on to the motorcycle and left the shelter through the western entrance on his way to Totara Street level crossing. On his way he forgot to check the position of the derailing block¹ on the shed road, between the western entrance and the level crossing. The derailing block obstructed the road along which the shunt was going to travel.
- 1.1.6 The RCO had been on the ground until the rake had cleared the eastern end of the shelter where he stopped it and walked to the locomotive, checking that the air brake pipe was connected through the rake and that all the wagons were correctly coupled as he went. He also set the points for No. 1 road, along which he intended to propel the rake.
- 1.1.7 The RCO positioned himself in the seat on the right hand side of the locomotive in the direction of travel. He waited for the air pressure to build up and then advised the shunter by radio that he was ready to push.
- 1.1.8 The shunter was at the Totara Street level crossing and confirmed that the route was clear and safe for the shunt to proceed. As the shunt approached from No. 1 road the shunter started the crossing alarms at Totara Street level crossing then crossed to the other side of the road in preparation for going back to Mt Maunganui yard on the motorcycle.
- 1.1.9 From his position in the locomotive cab the RCO could see the shunter and could also see that the level crossing alarms were operating. He was satisfied that it was safe for the rake to proceed.
- 1.1.10 The RCO received a call from the shunter advising him that the leading wagon was 5 wagon lengths, about 75 m, away from the level crossing and that the alarms were operating and the traffic had stopped.

¹ A derailing block is installed across a line to prevent wagons running away or fouling other tracks. When locked in the closed position the derailing block diverts wagons away from the mainline, loop or siding being protected.

- 1.1.11 The driver of a motor vehicle stopped at the level crossing heard a bang and saw the leading wagon of the shunt rise in the air as it was pushed over the derailing block and come towards his car. He quickly drove his car over the level crossing, ahead of the approaching wagon. The RCO had not seen the car when it was stopped at the level crossing as it was on his off side, and his view was obstructed by the wagons being propelled, so it was not until the car arrived on his side of the rake that he became aware of it. He did not know why it had crossed against the level crossing alarms.
- 1.1.12 The shunter had also heard the bang and when he turned around he saw that the leading wagon of the rake had derailed and that the rake was still moving forward. He immediately called to the RCO by radio, "Stop Stop."
- 1.1.13 The RCO stated that when he received the call from the shunter, he was approaching the shed road along No. 1 road. He immediately applied the brakes by hitting the emergency stop button on the remote pack, which was strapped to his chest, but by this time the locomotive was passing over the points.
- 1.1.14 There was a pile of sand beside the points where No. 1 road joined the shed road, about 70 m from the derailing block. This had been deposited by the locomotive when the RCO applied emergency brakes. The locomotive stopped 4 wagon lengths, about 60 m, from the derailing block.
- 1.1.15 The RCO thought that his speed would not have exceeded 10-12 km/h, although this was an estimate only, as the speedometer in the locomotive cab was not working. Tests undertaken by Tranz Rail using the same consist of wagons showed the following stopping distances at different speeds:
- 10-12 km/h - stopping distance 12.3 m
 - 18-20 km/h - stopping distance 24.85 m
 - 25 km/h - stopping distance 47.1 m
 - 30 km/h - stopping distance 59.3 m
- 1.1.16 When the rake stopped, the leading wagon had gone over the derailing block, crossed the road and crashed into a building. The second and third wagons had followed the leading wagon over the derailing block and had come to rest at an acute angle across Totara Street. The fourth wagon, which had also derailed, had not reached the street. All wagons in the rake remained coupled although the brake pipe between the first and second wagons had fractured (refer Figure 1).



Photograph courtesy of Bay of Plenty Times

Figure 1
Aerial view of the derailed rake

- 1.1.17 The RCO did not see the derailing block from his position in the locomotive cab. He was watching the shunter as he approached Totara Street level crossing and assumed from his radio message saying that the route was set and safe for the passage of the rake that the shunter had removed the derailing block.
- 1.1.18 Tranz Rail mechanical staff inspected the rake immediately after the derailment and confirmed that the brakes on all wagons were “full on”.
- 1.1.19 A gas mains site and an electrical switchboard, both of which were located in the immediate vicinity, sustained damage, which required evacuation of the immediate area by emergency services.
- 1.1.20 Two occupants of the building at the time of impact narrowly escaped injury.

1.2 Site information

- 1.2.1 A connecting spur ran from Mt Maunganui yard to a set of points approximately 10 m west of Totara Street level crossing. From here the spur continued straight ahead, becoming the shed road providing access to the western end of the shelter, as well as to roads 1, 2 and 3. No. 3 Industrial Line veered away to provide access to other private sidings (refer Figure 2).

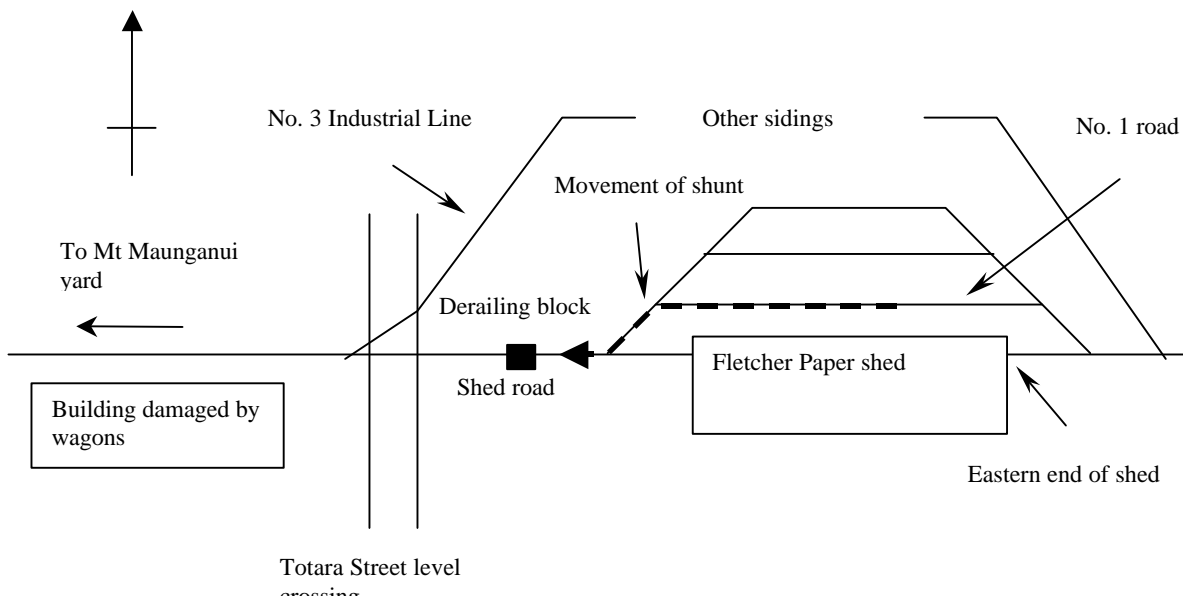


Figure 2
Site plan of the derailment area
(not to scale)

- 1.2.2 No. 1 road was one of 3 other roads accessed off the shed road. It was classed as a siding and was not used for discharging/loading of wagons.
- 1.2.3 No 1 road rejoined the shed road through a set of points approximately 70 m before the derailing block and between the western entrance to the shed and Totara Street level crossing. The derailing block was sited 27 m before the level crossing to prevent runaway wagons from the western end of the shed fouling Totara Street level crossing or No.3 Industrial Line and had been installed approximately 2 months earlier.
- 1.2.4 The derailing block was a New Zealand Railways 1946 design, the current standard, and complied with Railnet Code P54(f), which stated in part:

Derailing blocks:

must be mounted, when closed, so as to divert any wagon away from the main line, loop or siding being protected.

- 1.2.5 The distance from the derailing block to the building on the western side of Totara Street was 57 m.

1.3 Shunting of the siding

- 1.3.1 Tranz Rail Operating Code, section 5, Operating Instructions for Yard Shunting and Allied Staff, Remote Control Locomotives, Instruction 4.4 included:

Operators are required to work within the “range of vision”

Range of vision means being able to see down the track in the direction of travel while having the movement under control. The range of vision will be influenced by such conditions as the weather, buildings, grades, propelling, time of day etc.

The Operator is required to take up a position with adequate range of vision in the area being shunted at all times. Keeping the “range of vision” may require significant movement on the part of the Operator.

It is the responsibility of the Operator to ensure that operations are always protected and carried out safely. While travelling through yards, the operator or second person must ride on or precede the leading vehicle.

While shunting, the Operator’s position will be determined by the need to maintain adequate “range of vision”, especially shunting dead end roads, into and out of sidings, approaching level crossings and areas of common territory.

The range of vision requirement may be shared by the Operator’s second person (where provided) when instructed to assist during shunting operation

...

Operators must not exceed 6 km/h (walking speed) while shunting sidings.

- 1.3.2 A semi-permanent bulletin, amending Rail Operating Code section 5, Instruction 4.4, was in effect at the time. The bulletin replaced the underlined requirement with:

Operators must not exceed walking pace while shunting onto roads where discharging/loading of wagons is being carried out.

- 1.3.3 Rail Operating Code section 5, Operating Instructions for Yard Shunting and Allied Staff, Instruction 1.10, stated in part:

Maximum Speed of All Movements on All Lines other than Main Lines and Industrial Lines

The maximum speed of all movements on other than Main Lines and Industrial Lines must NOT exceed 25 km/h. The speed of the movement must be so regulated that it can be stopped in the clear distance seen ahead.

- 1.3.4 Rail Operating Code section 5, Operating Instructions for Yard Shunting and Allied Staff, Instruction 1.7, stated:

1.7 Propelling

When propelling rakes of vehicles, staff must signal the movement from a position at or near the head of the rake in the direction of travel from which a clear view of the intended route can be obtained.

- 1.3.5 The use of a motorcycle during shunting of Fletcher Paper private siding was approved by Tranz Rail and was included in Mt Maunganui Private Siding and Wharf Instructions No 9 (d) which stated in part:-

If on motorcycle, staff must report to Fletcher Challenge Paper Foreman to obtain permission to enter shed.

- 1.3.6 An informal agreement existed with Fletcher Paper that shunt movements would not exceed walking pace in their siding, and the RCO and shunter were aware of this. This was not documented in Mt Maunganui Private Siding and Wharf Instructions, section 9, Fletcher Challenge Paper Siding, which was in effect at the time.

1.4 Personnel

- 1.4.1 The RCO commenced employment with New Zealand Railways in 1981 and was certified for RCO duties in 1996. His certification was current for the duties being performed.
- 1.4.2 Tranz Rail advised that since the incident the RCO has terminated his employment with them.
- 1.4.3 The shunter commenced employment with New Zealand Railways in 1996 and was certified for shunting duties in 1999. His certification was also current for the duties being performed.

2. Analysis

2.1 Shunting activities

- 2.1.1 The factors contributing to the incident were:
- the shunter not ensuring that the derailing block was in the correct position
 - neither the shunter nor the RCO being in an appropriate position as defined in Rail Operating Code, section 5, Instruction 1.7, for the intended propelling movement
 - the speed of the shunt exceeding the RCO's "range of vision"
 - the acceptance by Tranz Rail for motorcycles to be used during shunting activities in the siding.
- 2.1.2 The shunter's failure to check the position of the derailment block after he left the shelter was influenced by the use of the motorcycle and the perception of "haste" as he proceeded to the level crossing in preparation for the passage of the shunt on its return to Mt Maunganui yard. If he had been riding at or near the head of the rake or walking ahead it is likely that he would have seen and removed the derailing block. Although Mt Maunganui Private Siding and Wharf Instructions provided for the use of motorcycles while shunting at Fletcher Paper private siding, this did not remove responsibility from the shunter to ensure that the intended route for the movement was clear when he authorised the RCO to proceed with the propelling movement.
- 2.1.3 The use of the motorcycle encouraged haste by allowing the shunter to move ahead to set the route, something that would normally be done at walking pace or by stopping the shunt to allow the shunter to jump off and do this. A safety recommendation addressing this issue has been included in section 5 of this report.
- 2.1.4 The RCO being in the locomotive cab would have been allowed by Tranz Rail's rules had the shunter been riding at or near the front of the rake or accompanying the rake on foot but because he was not, the RCO was not operating within his range of vision. The RCO could have controlled the movement from the leading end without the shunter's assistance but chose not to.
- 2.1.5 The distance the rake travelled after riding over the derailing block indicated that it was probably travelling between 20 and 25 km/h, which equated to about 7 m per second. At that speed it would have taken about 8 seconds for the leading wagon to have covered the distance from the derailing block to the building. By the time the shunter reacted and called the RCO to stop, and the RCO had responded, it was too late for an emergency stop application to prevent the wagons striking the building.
- 2.1.6 Braking tests carried out showed that the rake could have stopped within approximately 12-15 m had it been travelling at between 10 and 12 km/h, as stated by the RCO. These tests did not

factor in derailed wagon resistance, which was considered such that stopping distances under derailment conditions could be expected to be less than those resulting from the tests.

- 2.1.7 The brakes were found to be “full on” on all of the wagons in the rake after the derailment. It was most likely that this was the result of the train pipe between the first and second wagons breaking when the leading wagon hit the building. The loss of air would have immediately applied the brakes.
- 2.1.8 At the time the RCO applied emergency brakes from the locomotive the brakes were in the process of responding from the earlier air loss and, together with the resistance from the derailed wagons, would have accounted for the quick stop of the locomotive. Although the RCO did not notice, it was probable that the derailment resistance was in effect and slowing the rake before the wagons hit the building and before the RCO applied the emergency brakes.
- 2.1.9 Although the requirements of Rail Operating Code, section 5, Instructions 1.7 and 4.4 were widely known amongst shunting staff, it was common practice for the shunter to return to the level crossing from the western end of the shelter on the motorcycle once the work was completed while the RCO took the rake out of the eastern end of the shelter. Not all RCOs rode in the locomotive cab when propelling back to Mt Maunganui yard: some positioned themselves in the shunters’ refuge at the leading end of the locomotive; others positioned themselves at or near the front of the rake, depending on line of sight requirements.
- 2.1.10 The derauling block had been installed about 2 months before the incident, and both the RCO and the shunter were aware of its existence.

2.2 Speed of shunting movements

- 2.2.1 Tranz Rail’s documentation regarding speeds in sidings required that a 6 km/h (walking pace) restriction was in place when shunting sidings where discharging/loading of wagons was being carried out; otherwise, a speed restriction of 25 km/h applied.
- 2.2.2 As the road on which the shunt was operating was not being used for the loading and discharging of wagons the 6 km/h speed restriction did not apply so the shunt could proceed at a maximum speed of 25 km/h in accordance with Rail Operating Code, section 5, Instruction 1.10.
- 2.2.3 Although the RCO was aware of an informal “walking pace while shunting” agreement with Fletcher Paper private siding, he appeared to have disregarded it on this occasion. This agreement was not documented and a safety recommendation covering this issue has been included in section 5 of this report.
- 2.2.4 The speedometer in the remote controlled shunt locomotive was defective so speeds were dependent on the RCOs judgement. Defective speedometers were not uncommon in such locomotives and this was probably the reason why Tranz Rail documentation references to 6 km/h were replaced with “walking pace”.

3. Findings

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

- 3.1 The RCO and shunter were appropriately certified for the duties being carried out.
- 3.2 The shunter did not fully ensure that the intended route for the rake was safe before advising the RCO to proceed.
- 3.3 The position taken up by the RCO in the absence of the shunter did not allow him to maintain adequate line of vision during the propelling manoeuvre.
- 3.4 The current Tranz Rail operating procedures allowed a maximum shunting speed of 25 km/h, which was probably excessive for the movement being undertaken.
- 3.5 The speed of the shunting movement was about 25 km/h when the rake hit the derailing block.
- 3.6 The use of a motorcycle for shunters to travel ahead of a shunt had the potential to diminish shunter vigilance.
- 3.7 Speedometers in remote-controlled shunting locomotives often did not work.
- 3.8 The installation of the derailing block was consistent with the relevant Tranz Rail codes and standards, and both the RCO and the shunter were aware of its presence.

4. Safety Actions

- 4.1 As a result of previous investigations carried out by the Commission into 3 similar shunting incidents involving remote control operations in Railway Occurrence Report 99-107, Southdown, Railway Occurrence Report 99-108, Middleton and Railway Occurrence Report 99-111, Kinleith, 2 safety recommendations relating to some issues raised in this investigation have already been made to Tranz Rail. The first related to the training and compliance monitoring of RCOs, to which Tranz Rail responded that changes had been made in the Safety Observation Process to address the issues raised and the second recommended a review of existing code instructions relating to training procedures for RCOs, which Tranz Rail advised was currently being undertaken.
- 4.2 Based on the positive response of Tranz Rail to the safety recommendations previously made, and likely action arising from the review of the lessons learned in this incident, no additional safety recommendations regarding remote control operation have been made.

5. Safety Recommendations

5.1 On 9 August 2000 it was recommended to the managing director of Tranz Rail Limited that he:

5.1.1 determine maximum allowable speeds for all shunt movements when operating in sidings, regardless of whether or not discharging or loading of wagons is taking place, and include such information in the relevant yard and siding instructions and agreements. (047/00)

5.2 On 16 October 2000 the managing director of Tranz Rail Limited replied:

5.2.1 Final Safety recommendation 047/00

We will review the wording in our Code to remove the possibility [of] misinterpretation.

5.3 On 24 October 2000 it was recommended to the managing director of Tranz Rail Limited that he:

5.3.1 prohibit staff members from riding motor cycles for any time they are required to maintain safe line of sight for a propelling movement when shunting sidings. (046/00)

Approved for publication 27 September 2000

Hon. W P Jeffries
Chief Commissioner