



**Report 00-107**

**freight train 688 and rail-mounted excavator**

**collision**

**between Waipunga and Waikoau**

**9 May 2000**

**Abstract**

On Tuesday, 9 May 2000, at about 1430, a collision occurred between a rail-mounted excavator, operating as a hi-rail vehicle, and Train 688 at 216.5 km between Waipunga and Waikoau on the Palmerston North - Gisborne Line. The excavator was operating outside its authorised work area and beyond the agreed “check call” time with the train controller when the collision occurred.

There were no injuries.

Safety issues identified included the accepted use of check calls between train controllers and track users instead of the required off track and clear times when authorising time on track, and the appropriateness of the training and experience of contract staff operating hi-rail vehicles.

Two safety recommendations were made to the operator.

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

These reports may be reprinted in whole or in part without charge, providing acknowledgement is made to the Transport Accident Investigation Commission.

# Contents

- [List of Abbreviations](#) ..... ii
- [Data Summary](#) ..... iii
- [1. Factual Information](#) ..... 1
  - [1.1 Narrative](#) ..... 1
  - [1.2 Personnel](#) ..... 2
  - [1.3 Train control procedures for handling track user enquiries](#) ..... 3
  - [1.4 Training and certification for HRV operations](#) ..... 6
  - [1.5 HRV rules](#) ..... 7
- [2. Analysis](#) ..... 7
- [3. Findings](#) ..... 9
- [4. Safety Actions](#) ..... 10
- [5. Safety Recommendations](#) ..... 10

## List of Abbreviations

HRV	hi-rail vehicle
km	kilometre(s)
km/h	kilometres per hour
LE	locomotive engineer
m	metre(s)
PNGL	Palmerston North - Gisborne Line
TC	train controller

## Data Summary

<b>Train type and number:</b>	freight train 688
<b>Other vehicle:</b>	rail-mounted excavator
<b>Date and time:</b>	9 May 2000, at about 1430
<b>Location:</b>	between Waipunga and Waikoau at 216.5 km Palmerston North - Gisborne Line (PNGL)
<b>Type of occurrence:</b>	collision
<b>Persons on board:</b>	train crew: 2 excavator: 1
<b>Injuries:</b>	nil
<b>Damage:</b>	minor
<b>Operator:</b>	Tranz Rail Limited (Tranz Rail)
<b>Investigator-in-charge:</b>	D L Bevin



# 1. Factual Information

## 1.1 Narrative

- 1.1.1 At about 1430 on Tuesday 9 May 2000, Train 688, a Napier to Gisborne freight service operated by Tranz Rail, collided with a rail-mounted excavator working at the 216.5 km mark between Waipunga and Waikoau on the PNGL. Train 688 was crewed by a locomotive engineer (LE) assisted by a second LE. Trains running in either direction between Napier and Gisborne operated with two-person crews for safety reasons because of the poor quality of radio reception over much of the route.
- 1.1.2 The operator of the excavator was working alone at the time of the collision. He had called the train controller (TC) by radio at 0730 from near the 217 km mark between Waipunga and Waikoau and requested time on track to work between 217 km and 218 km. The TC drew the plot line for the planned work together with the metreages requested on to the train control diagram, terminating the line at 1200. There were no trains expected in the area before 1430 so the TC authorised the excavator operator to work on track within the specified work area with a check call at 1200 for an update on expected train movements. He endorsed the check call as “c/c” on the train control diagram. The excavator operator confirmed these details and terminated the conversation.
- 1.1.3 The excavator operator had not been able to establish contact with train control from alongside the track for the original call because of poor radio reception and had driven the excavator about 1600 m away from alongside the track before communication could be established. This information was not given to the TC at the time of the call.
- 1.1.4 At 1145 the excavator operator called the TC, this time from 218 km and requested more time on track. The operator said, “218 between Waipunga and Waikoau”. The TC was aware the operator was seeking more time on track so he extended the original plot line on the train control diagram from 1200 to 1330 and endorsed “218” above the line. As there were no trains expected in the area during the requested extension of time, the TC authorised the time on track and responded to the excavator operator, “218 between Waipunga and Waikoau. Check call again 1330; we’ll see how 688 is getting on then”. Train 688 was the next expected train in the area and was scheduled to depart from Napier at 1400. The TC again endorsed “c/c” at the end of the plot line to remind him of the 1330 check call requirement. The excavator operator responded, “Roger, check call 1330 for 688” and terminated the conversation, believing that the TC’s authority to extend the time on track applied to his original work area, which was between 217 km and 218 km.
- 1.1.5 During the 1145 check call the TC had advised the excavator operator that Train 688 would be his next train movement but that there was some uncertainty about what time it would depart from Napier. Train 688 usually connected at Napier with Train 624 from Palmerston North for tonnage for north of Napier but on this day Train 624 was running about 2 hours late. A decision as to whether or not Train 688 would be held for the connection had not been conveyed to the TC at the time of the 1145 check call, so he had included the requirement for the 1330 check call from the excavator operator in anticipation that he would have more up-to-date information regarding Train 688 at that time.
- 1.1.6 The excavator operator later stated that he had misunderstood the check call time and thought it was for 1530. It was not until detail from the train control voice recorder was made available to him that he realised his error. This was the first day that he had worked by himself in that locality. Previously he had been working with the track gang and they had taken responsibility for making the check calls to TC and for providing protection. However, on this day the gang had been called away to another location to undertake emergency track maintenance work, otherwise they would have been working with the excavator operator as normal.

- 1.1.7 At 1345 the TC was advised that Train 688 would not wait for the connection with Train 624 so he authorised it to depart from Napier. He had not received a check call from the excavator operator at 1330 as agreed so he assumed the operator had completed his work and was off track and clear.
- 1.1.8 The LE of Train 688 was required to make a mandatory radio call to train control as his train passed through Eskdale and when he made this call the TC advised him that an excavator had been working at 218 km but the operator had not made a required check call at 1330. The LE was instructed to keep a lookout as he approached that locality in case the excavator operator had encountered any problems. This instruction was acknowledged by the LE.
- 1.1.9 As Train 688 rounded a curve at 216.5 km the LE saw the excavator sitting in the middle of the track in front of him and only had time to apply the emergency brake before he and the assisting LE took evasive action by diving to the cab floor and bracing themselves for the impact. The LE estimated his speed was about 45 km/h at the time the emergency brake was applied and that the force of the impact moved the excavator “at least 3 to 4 wagon lengths up the track”. When the locomotive crew first sighted the excavator it was operating side-on to the train as it was clearing out a drain alongside the track.
- 1.1.10 After the collision the locomotive crew checked on the condition of the operator of the excavator and found him to be shaken but unhurt. The LE then advised the TC of the collision.
- 1.1.11 The excavator operator had not seen the train until immediately before the impact and did not have time to take any action to protect himself.
- 1.1.12 No injuries were sustained although the locomotive of Train 688 suffered damage and was returned to Napier for a replacement. The excavator suffered external damage but was mobile and was driven away under its own power.
- 1.1.13 The collision occurred about 60 minutes after the agreed check call time and 1.5 km south of 218 km where the TC had last heard from the excavator operator and 500 m outside the originally agreed work area. The excavator operator later stated that he had been working on the opposite side of the track to the kilometreage marker pegs and had missed the 217 km peg.

## **1.2 Personnel**

### **The TC**

- 1.2.1 The TC was certified for the duties being undertaken on 5 February 1999. Since that time he had undergone a desk assessment in that position in March 2000 and voice tape playback audits in May 1999 and March 2000.
- 1.2.2 The time between the voice tape playback audits of 10 months did not at the time meet Tranz Rail’s compliance requirement of 6-monthly audits.

### **The excavator operator**

- 1.2.3 The excavator operator held a Level C certification which entitled him to work on track with a HRV without supervision by Tranz Rail staff. He had originally attained Level C certification while working as a sub-contractor in Wellington in 1996 and had been re-certified in 1998.



1.2.4 The operator later moved to Napier and undertook a one-day re-certification course on 13 April 2000, which involved a refresher course on relevant rules and procedures. Practical tests including on tracking and off tracking the HRV, and radio communication procedures with train control were undertaken with the track and structures manager to complete the re-certification.

1.2.5 Although the excavator operator was certified to operate without supervision, while he had been in the Wellington area he had always worked with Tranz Rail staff, who were responsible for on track authority and protection. He had never worked on his own during his 4 years there. Since his arrival and re-certification in Napier he had never been required to work on his own until the day of the collision.

### **1.3 Train control procedures for handling track user enquiries**

1.3.1 Tranz Rail's Operating Code Section 6 Instruction 14 Inquiries from Maintenance Workers, Hi-Rail Vehicles and Trolley Users stated in part:

#### **14.1.2 Summary of Procedures - Track Occupancy, Rules 175 and 198**

**The sequence of events for authorising and managing track occupancy is:-**

**Establish positively the exact purpose for which the occupation is required, in doing so the six critical elements are:**

- Callers Identity.
- On tracking location, (metreages to have stations, sidings, intermediate boards, signals between used to identify the EXACT locations).
- Off tracking location, (metreages to have stations, sidings, intermediate boards, signals between used to identify the EXACT locations).
- Nature of the work.
- Protection required.
- Time required for the work.

**Once the detail has been established the authorisation process is:-**

- Plot the movement on the train control graph.
- Execute required protection and safety buffer. (See 14.1.4)
- Give the correct time using the phrase "The time is".
- Repeat back, advise and authorise –
  - the on and off tracking locations and stations between etc
  - the last known location of the next train conflicting with the occupation
  - other track occupations which may conflict
  - the nominated time to be clear.
- Obtain an acknowledgement the track user has understood this information.

1.3.2 Tranz Rail's Engineering Rule 198(b) stated in part:

For every movement authorised, then the completion time agreed to for track occupancy will become the nominated time for the movement to be clear of the line.

1.3.3 Tranz Rail's Operating Code Section 6 Instruction 14.1.4 Nominated Time - Safety Buffer stated in part:

For occupations the nominated time MUST include a minimum safety buffer of fifteen minutes before the anticipated arrival of the next train ...

1.3.4 Tranz Rail's Engineering Rule 198(d), which covered the safeguarding of positions when circumstances altered, stated that:

If, after authorising an on track movement circumstances alter which would allow a train to conflict with the agreed on track time, train control must arrange to hold back that train, until the employee in charge has advised he is clear of the line or the nominated time has elapsed.

1.3.5 Tranz Rail advised that its procedures did not allow for the use of check calls between TCs and track users except in situations where the TC had agreed to hold all movements until the track user gave clearance. Tranz Rail's Operating Code Section 6 Instruction 14.1.5 Plotting Conventions stated in part:

Where Train Control agrees to hold all movements until the Track User gives clearance the designator "H" drawn at the right extremity of the plot line is to be used to indicate the line is obstructed until the Track User has called and given clearance...

Where a check call is planned it is to be shown as "cc" on or above the plot line or plot box at the check time agreed with the caller.

1.3.6 Tranz Rail also advised that the established method for dealing with enquiries from track maintenance workers was very specific and required actual track time to be agreed and authorised. This was to ensure both parties fully understood the extent of the authorised on track occupation. There was no provision for work to be authorised with a later check call to determine off tracking time.

1.3.7 Tranz Rail's Engineering Rule 198(b) stated in part:

Train movements are not to be forecast for unreasonably long periods. Where a proposed movement of a trolley or hi-rail vehicle is to be of considerable duration, Train Control and the employee in charge should agree when the next inquiry is to be made.

1.3.8 In a survey of 6 TCs, 3 stated that they saw the use of check calls in place of an off track and clear time as acceptable while 2 considered that the use of check calls in situations where an off track and clear time had been nominated was acceptable. The remaining TC did not use check calls under any circumstances and expected track users to be off track and clear at the nominated time unless he received a prior request for an extension of time on track.

1.3.9 A random survey of recent train control diagrams was carried out during the investigation and showed that the use of check calls between TCs and track users was common practice in those areas reviewed.

- 1.3.10 Tranz Rail had several processes in place to audit and assess the performance of TCs. These included regular voice tape playback audits, desk assessments and random auditing of completed train control diagrams.

## **1.4 Training and certification for HRV operations**

- 1.4.1 Tranz Rail's Operating Code Section 1 Instruction 5.1.4 Training Profile stated in part:

### **On the Job Training**

It will be the employing managers/supervisors responsibility to ensure that the employee identified is exposed to a sufficient range of practical experiences, field exercises through supervised on the job training. The employing manager/supervisor will provide a "Certificate of competency" to the Area Training M/STOP who will in turn issue a full and final certification (further STF 23) and operating certificate.

### **Level D - General Knowledge Engineering (one day course)**

Employees with this level must work under the supervision of another employee certified in Level C, B or A.

This level includes:-

- General Rules.
- Signal Rules.
- Protection for accidental obstruction and other Engineering rules which deal with emergencies.
- Basic radio/Train Control communications.

### **Level C - General Knowledge Engineering (five day course)**

Employees with this level may work without supervision within the nature and scope of this certification.

This level includes:-

- Previous Level D certification.
- General Rules.
- Signal Rules.
- All forms of protection and Engineering rules.
- Safe operation of Trolley/Hi-Rail Vehicle Rules.
- Radio communication and Code Supplement instructions.

- 1.4.2 The track and structures manager considered that as the excavator operator had a Level C certification, and had worked in the particular work area long enough under supervision to have gained local knowledge, he was competent to be left alone to work while the gang was moved to another work site. There was no formal test of the operator's local knowledge.

## 1.5 HRV rules

### 1.5.1 Tranz Rail's Engineering Rule 194(b) defined a HRV as:

A hi-rail vehicle in the following rules is a road vehicle, used for maintenance or inspection duties, weighing up to an unladen weight of 10 tonne, fitted with rail trolleys such that it can be driven along the track and can also be driven on or off track at level crossings or other suitable places.

### 1.5.2 Tranz Rail's Engineering Rule 194(c) defined the employee in charge as:

The employee who is responsible for the safe movement of a trolley or hi-rail vehicle or a group of such vehicles.

### 1.5.3 Tranz Rail's Engineering Rule 199(b) stated:

**Driver without local knowledge** - Where for some reason the driver is not an employee with adequate local knowledge, he must be accompanied by a second employee who holds the appropriate current operating certificate.

## 2. Analysis

2.1 The TC did not nominate an off track and clear time when the original call was made at about 0730, nor did he when the excavator operator check called again at 1145. In both cases the operator was given time on track up to the next check call time.

2.2 The TC and the operator had differing expectations from the 1145 check call regarding the authorised work area. The TC assumed the excavator to be working at 218 km only and had endorsed the train control diagram accordingly. In so doing he made no allowance for the excavator to move from the 218 km to off track or for any other reason. The excavator operator understood he was authorised to continue working within the previously authorised work area, which was between 217 km and 218 km. The excavator operator's understanding was reasonable given that the check call was made for an update on train information; not to request a change of work area. The TC incorrectly assumed the work area had been changed to at 218 km only, just because that was where the excavator operator reported calling from.

2.3 When the 1330 check call had not been received by 1345 the TC initially assumed that the operator had completed his work and that the excavator was off track and clear. When he authorised Train 688 to depart from Napier he knew that the LE had to make a mandatory radio call from Eskdale and if circumstances had altered before then he would have been able to inform the LE of the situation regarding the excavator at that time.

2.4 The TC was unaware that the original call from near the 217 km had not been made from trackside because of radio reception difficulties. Had he known this it may well have influenced both his response when the expected 1330 check call was not received and his decision to allow Train 688 to advance into the work area.

2.5 Although the radio reception had no direct influence on this incident the quality of coverage raised the issue of its ability to be relied on in the case of an emergency. This concern was reinforced by the policy of double crewing trains running through the area. It was conceivable that the excavator operator could have been trying to make the 1330 check call or trying to contact train control in an emergency but without success.

- 2.6 Because the TC had not nominated an off track and clear time as part of the track occupancy authorisation, there was no 15-minute buffer in effect before Train 688 could enter the work area. The TC obviously had some concerns about the whereabouts of the excavator and the failure of the operator to make the 1330 check call, so he should have arranged for Train 688 to stop at Eskdale until the whereabouts of the excavator had been established. The TC could have attempted to contact the excavator operator by radio before allowing Train 688 to depart from Eskdale, or arranged for the LE of Train 688 to call on channel 1 as he approached the work area.
- 2.7 The action taken by the LE of Train 688 when advised of the situation was appropriate; however, the misunderstanding over the last known location of the excavator by the TC meant that the LE's planned action to slow the train down at the 217 km was too late to avert the collision.
- 2.8 The excavator operator had forgotten the check call time but, although he was still on track 60 minutes after he should have made the check call, the collision may have been avoided had he still been within the original authorised work area. The LE of Train 688 had been warned by the TC to keep a lookout for the excavator at the 218 km and had planned to slow his train down at the 217 km in preparation for any action he may have needed to take around the 218 km peg. The collision occurred at 216.5 km.
- 2.9 The LE was unable to confirm the distance from where he first sighted the excavator but it seems reasonable to assume from the actions taken by the LE immediately prior to impact, together with the initial train speed of 45 km/h, that the original sighting distance was about 40 m, or about 3 seconds.
- 2.10 The excavator was working at right angles to the track and the operator was unaware of the presence of the train until immediately before impact so there was insufficient time for him to have taken any action before the impact.
- 2.11 The excavator operator was not a Tranz Rail employee. He was employed as a sub-contractor and it was reasonable to expect that his knowledge of the location of trackside metreage pegs and other identifying features was not as extensive as that of an experienced Tranz Rail track employee with local knowledge of the area. Although he had originally obtained his Level C certification in Wellington in 1996 he had been working under the supervision of suitably certified Tranz Rail staff since that time, both in Wellington and in Napier. The day of the collision was the first day since his original certification in Wellington, approximately 4 years earlier, that he had operated without the presence and support of track gang employees. It is of concern that the first time a certified sub-contractor worked unsupervised he became confused with the time and his location, the 2 key elements which provided for his safety. This raises doubts as to the suitability of the training and certification of such workers and to the levels of their local knowledge.
- 2.12 The use of check calls between TCs and track users was not an uncommon practice. The TC was aware that there were no train movements around for a significant time and, in the interests of giving the excavator operator as much time on track as possible, attempted to minimise the need for the excavator to off track during the work period. The TC should have set a nominated off track and clear time with the excavator operator with a requirement that the operator contact him before that time if an extension of time on track was required. However, as the excavator operator mistook the time for the 1330 check call it was possible he could also have misunderstood an off track and clear time of 1330.

- 2.13 Tranz Rail procedures only allowed for the use of check calls in situations where train control had arranged to hold all movements until the track user gave clearance, but there was a requirement within the Engineering Rules that the TC and the track user were to agree on when the next enquiry was to be made in circumstances where the proposed movement of an HRV was to cover a considerable period of time. In these situations such an enquiry could only be made through a check call initiated by the track user and conflicts with other procedures detailing acceptable check call situations.
- 2.14 The survey highlighted variable understanding among TCs regarding the correct use of check calls. Six of the 7 TCs (including the TC involved in the incident) considered the use of check calls in any situation dealing with enquiries from track users was permissible, while the remaining TC did not use check calls at all. These variances probably arose as a result of the conflicting messages contained within Tranz Rail's documentation.
- 2.15 The use of check calls in place of nominated off track and clear times, and where nominated off track and clear times were in effect, was not identified for action by any of the train control audit or assessment processes. The TC concerned had undergone a desk assessment and 2 voice tape playback audits, the latter not meeting Tranz Rail's stated requirements, since being certified in the position and his use of check calls had not been corrected. The completed train control diagrams surveyed confirmed that the use of check calls was widespread amongst TCs and must have been apparent to staff responsible for audit. The lack of any action indicated a widespread acceptance of this unauthorised method of operation.

### **3. Findings**

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

- 3.1 The TC was certified but had not undergone the required audits and assessments as required by Tranz Rail's procedures.
- 3.2 The excavator operator was certified but had not had any previous experience operating on track alone and did not have enough local knowledge to operate on track alone in this instance.
- 3.3 The factors contributing to this collision were:
- the failure of the TC to nominate an off track and clear time
  - the use of check calls by the TC in place of nominated off track and clear times
  - the failure of the excavator operator to make the 1330 check call to the TC
  - the presence of the excavator outside the authorised work area due to the operator's lack of knowledge and experience of track position markings.
- 3.4 The actions planned by the locomotive crew were appropriate and may have averted the collision had the excavator still been within the original work area.
- 3.5 The frequent use of check calls between track users and TCs was apparently widely known and accepted and Tranz Rail's audit and assessment procedures had not resulted in any follow-up action to correct this unauthorised procedure.
- 3.6 Notwithstanding check calls not being allowed to replace nominated off track and clear times, the TC's use in an area known to have unreliable radio coverage was not appropriate.

## 4. Safety Actions

- 4.1 Following the collision Tranz Rail advised that the excavator operator had been stopped from working within the Tranz Rail corridor without supervision by Tranz Rail track staff. This instruction was to continue until the manager, regional manager and stops examiner were satisfied of his competency.
- 4.2 In response to Report 00-101 Tranz Rail advised that it had reviewed the procedures regarding the frequency of voice tape audits and desk assessments and had implemented changes in the process effective from 31 August 2000. In view of this no further recommendation was made with regard to that issue.

## 5. Safety Recommendations

- 5.1 On 5 February 2001 the Commission recommended to the managing director of Tranz Rail that he:
- 5.1.1 decide what role check calls have during controlled on track time for HRVs, track maintenance gangs and other track users and issue clear instructions covering any permitted use (108/00)
  - 5.1.2 introduce procedures for certified staff operating HRVs to also be certified as to their local knowledge of the work area involved before they are permitted to work unaccompanied. (124/00)
- 5.2 5.2.1 On 30 January 2001 the managing director of Tranz Rail replied:
- 108/00: As noted in our correspondence of 14 November 2000, Tranz Rail accept this recommendation.
  - 124/00 Tranz Rail does not accept this recommendation.
- This already appears as Rule 194(b) of the rules and regulations. The operator in question had, on a number of occasions, been accompanied through the area – this is how route knowledge is gained.

Approved for publication 24 January 2001

Hon. W P Jeffries  
**Chief Commissioner**