



Report 97-111

Train C25

log fall from wagon

Tokoroa

14 October 1997

Abstract

On Tuesday 14 October 1997, at about 0815 hours a 3.7 m log fell from a wagon forming part of Train C25, a Kinleith to Mount Maunganui log train, as it passed through Tokoroa. The log cartwheeled for 38 m, cleared a 1.8 m high fence and came to rest on a trampoline in a residential property.

The fall occurred because the combination of load height and spacing of wagon cradles was insufficient to restrain the 3.7 m log. Safety issues identified were the adequacy of the Tranz Rail Freight Handling Code covering loading of 3.7 m logs, the interpretation of the code, the suitability of current Tranz Rail Limited rolling stock to transport 3.7 m logs and compliance monitoring of log loadings.

Transport Accident Investigation Commission

Rail Incident Report 97-111

Train type and number:	Express freight C25
Date and time:	14 October 1997, 0815 hours
Location:	Near Tokoroa at 58.22 km Kinleith Branch
Type of occurrence:	Log fall from wagon
Persons on board:	Crew: 1
Injuries:	Nil
Damage:	Minimal
Investigator-in-Charge:	R E Howe

1. Factual information

1.1 Narrative

- 1.1.1 On Tuesday, 14 October 1997, Train C25 was a rostered Tranz Rail Limited (Tranz Rail) log train operating between Kinleith and Mount Maunganui. It was crewed by a Locomotive Engineer (LE) and departed Kinleith at 0803 hours.
- 1.1.2 The train consist was two locomotives, DC4565 and DC4409, together with 36 loaded bogie wagons; a mixture of 8 USLs, 18 ULAs, 1 ULB and 9 ULEs.
- 1.1.3 All wagons were loaded with 3.7 m pinus radiata logs of varying diameters in two bundles per wagon, each bundle being contained by a pair of wagon cradles.
- 1.1.4 At approximately 0815 hours a log fell from one of the wagons as the train passed through Tokoroa. After hitting the ground it travelled a further 38 m, then cleared a 1.8 m high back boundary paling fence and ended up on a trampoline in a private residential section, 5.5 m from the fence. The house occupant was hanging out washing 5 m away from the trampoline when the log landed.
- 1.1.5 When Tranz Rail became aware of the log fall Train C25 was stopped at Waharoa for checking. The LE of Train C25 examined the load and stated that nothing stood out as being unusual. He stated that he had felt nothing out of the ordinary in the riding of the train up to that point.
- 1.1.6 The Mount Maunganui team leader, train examination maintenance, also inspected the train at Waharoa and took photographs of the rear wagons. He was satisfied with the safety of the train and authorised it to complete its journey to Mount Maunganui without restriction. All wagons were subsequently photographed at Mount Maunganui before unloading. Figures 1 and 2 show one of these wagons.

1.2 Site details

- 1.2.1 An examination of the track in the area of the log fall indicated that the log had impacted onto the ground four times before ending up on the trampoline.
- 1.2.2 The track alignment was straight and on a 1 in 6600 downgrade in the area where the log fell. The track structure consisted of heavyweight welded rail fixed by screwed fastenings onto treated softwood sleepers. All fastenings were tight giving a satisfactory line and level to the track. Some 15 m prior to the first impact mark of the fallen log a soft spot in the track showed evidence of approximately 15 mm vertical movement under load. Visual observation and cab riding showed this had no appreciable effect on rolling stock movement.
- 1.2.3 The log which fell from the train was 3.7 m long, tapered in diameter from 350 mm to 240 mm and stencilled "KCL". The log loading manifest showed logs stencilled in this way were loaded on the last nine wagons on the train. It was not possible to ascertain from which of these wagons the log fell.
- 1.2.4 The maximum authorised speed on this section of track was 70 km/h. The locomotive event recorder log was extracted following the incident. The time of extraction meant that the only available output relating to the incident was the Long log which gave day, time and speed every ten seconds for seven days prior to the completion of the recording.

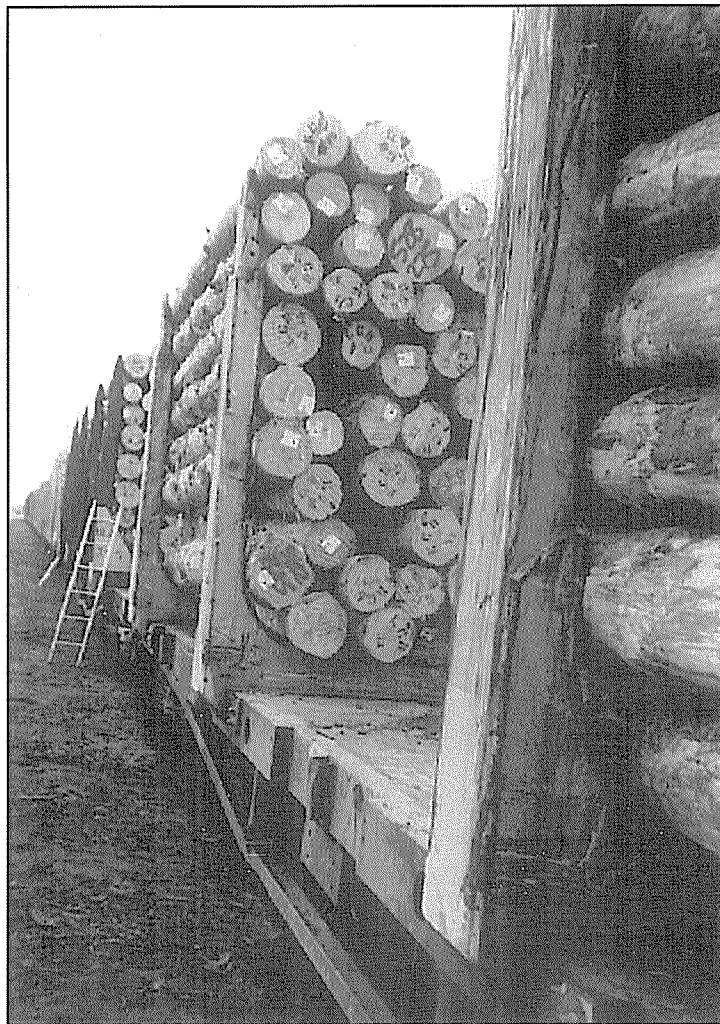


Figure 1
End view of Wagon ULE 213 at Mount Maunganui prior to unloading



Figure 2
Side view of wagon ULE 213 at Mount Maunganui prior to unloading

1.3 Control of log loading

- 1.3.1 The processing and cartage of 3.7 m logs by rail is a relatively recent development to suit the Korean markets. Many of the logs are small in diameter, and until the market developed would have been considered only as off-cuts. These logs currently account for approximately 20% of the New Zealand market and 30% of the logs railed out of Kinleith.
- 1.3.2 When short export logs were first introduced, the logs produced were a Japanese “A” grade, 4.1 m long with an average weight of 470 kg. The small Korean sawlogs (KCL 3.7 m) are now averaging 160 kg and the Korean pulpwood (KXB 3.7 m) are averaging 149 kg.
- 1.3.3 The rail cartage of smaller diameter, shorter logs has been accommodated by the use of conventional log wagons which were built for the longer, larger diameter logs.
- 1.3.4 The wagons were loaded at the rail sidings at the Carter Holt Harvey Ltd (Carter Holt Harvey) mill site by a private contractor working for Carter Holt Harvey. The operation was under the control of a Log Yard Co-ordinator employed by Carter Holt Harvey.
- 1.3.5 Tranz Rail Freight Handling Code (the code), Section 16 -'LOGS' (Appendix 1) set out the loading parameters for logs on wagons. Both Carter Holt Harvey and their loading contractors were familiar with the code.
- 1.3.6 The code included the maximum height to which logs could be loaded with respect to the top level of the wagon cradles and the minimum allowable longitudinal projection of the logs beyond the cradles. Diagram 16.1 of the code allowed up to one third of the diameter of the log (but never more than 200 mm) to protrude above the top of the cradle. The logs were required to project beyond each cradle by at least 150 mm.
- 1.3.7 The 3.7 m logs came within the description “Uniform Length: Matched Logs” as used in the Tranz Rail Freight Handling Code.
- 1.3.8 The code permitted such logs, loaded to code requirements, to be transported without strops or chains. The code did not make it clear whether “Uniform length: Matched logs” with projection between 75 mm to 150 mm required strops or chains. Strops or chains were not used on Train C25 on the day.
- 1.3.9 The contractors used “loaders” (Caterpillar 966 wheel loaders) to load the wagons. The loaders were also used to adjust logs to the correct level and to achieve the correct projection of the logs beyond the cradles. This work was carried out at the loading site.
- 1.3.10 Carter Holt Harvey stated that although the code provision allowed loading one third of a log diameter (to a maximum of 200 mm) above the top level of the cradles, they instructed their loading contractors to treat the top of the cradle as the desirable limit. For logs above this height the Yard Co-ordinator used his judgement as to whether the logs were sufficiently wedged in to be stable. In this regard it was noted that, because of the taper on the logs, there could be significant differences in height from one end of a log bundle to the other.
- 1.3.11 Once loaded, the wagons were conveyed by Tranz Rail shunting service from the mill site to the Kinleith marshalling yard.
- 1.3.12 If, on arrival at the Kinleith yard, logs were seen by Tranz Rail staff to need attention on the wagons, a loader could be brought up from Carter Holt Harvey’s yard to make the necessary adjustments. This, however was not the preferred action as it was operationally inefficient and wherever practicable adjustments were carried out at the loading siding. No adjustment was requested for the load on C25 on 14 October 1997.

- 1.3.13 Loaded log wagons were shunted, 12 at a time, from the loading siding to the Kinleith yard by Tranz Rail. This operation was under the control of a shunter. The shunter who made up Train C25 stated he walked and checked both sides of the shunt before the wagons were picked up. He stated this included checking the load for height and projection beyond the cradles.
- 1.3.14 When checking the load on the make-up of Train C25, the shunter stated that he considered that the loading configuration was satisfactory. However he did comment that it was often very difficult to judge the height of a log at the top and middle of a wagon, or to ascertain from ground level how far it was above the top of the cradles.
- 1.3.15 An Operations Supervisor, acting as the Train Examiner Operations (TXO), was responsible for the final check of load security before the departure of Train C25. The Operations Supervisor had booked on at Kinleith at 0430 hours on the day of the incident.
- 1.3.16 His duties as TXO included a terminal brake test, and a check of wagon couplings and load security. These duties required him to walk the full length of both sides of the train, checking load security as he went, before giving the all clear.
- 1.3.17 While carrying out this work the Operations Supervisor stated that he noticed one wagon about half way down the train on which a log appeared too high. He got on top of the wagon to find it was "... wedged in pretty tight". Satisfied that it was not going to move he let it pass. He did, however, arrange to have a message relayed through to the Carter Holt Harvey log yard that the loaders were "... loading a bit too high".
- 1.3.18 The Operations Supervisor stated that in recent months it had been necessary to remove loose, overheight logs from wagons by manhandling them over the side but in his opinion there were no logs on Train C25 that were in this category.
- 1.3.19 Two days after the incident the Investigator-in-Charge made a random check of Train C25 just prior to its departure from Kinleith. It was noted that the required minimum log projection beyond the cradles was commonly less than the stipulated 150 mm at each end. A check on the outside dimensions of the cradles on a number of the log wagons showed measurements of up to 3.5 m and none at 3.4 m or less (3.4 m is the maximum dimension allowing 150 mm projection either side on a 3.7 m log).
- 1.3.20 The check also revealed the log height of a number of wagons exceeded the maximum permitted by the code which was in effect on the day of the incident (the subsequent code amendment to reduce height to cradle level was not in effect at the time of the check).
- 1.3.21 Tranz Rail carried out random audit checks on log loads in transit. These were carried out by the Service Manager (Forestry) and Site Service Co-ordinators.

1.4 Personnel

- 1.4.1 The LE of Train C25 held a current Operating Certificate (expiring March 1999). He was a top grade LE allowing him to operate passenger trains. He had booked on at Mount Maunganui at 0430 hours and travelled by road to Kinleith.
- 1.4.2 The shunter making up Train C25 had 17 years railway experience and had been a shunter at Kinleith since 1989. He carried a current certification for the duties concerned.
- 1.4.3 The Operations Supervisor who carried out the Train Examiner duties had 16 years railway experience. In 1994, after being at Kinleith for approximately five years, he was promoted to Train Examiner Operations and for the last 12 months had been an Operations Supervisor. He carried current certificates for shunter and TXO duties.

2. Analysis

2.1 General

- 2.1.1 With rail transport of 3.7 m logs the rail corridor tends to isolate any spills that do occur but the potential consequences are just as serious as in other modes of transport.
- 2.1.2 It was fortuitous that this log spill had no serious consequences. The close proximity of the house created a serious potential for death or injury.
- 2.1.3 Despite Tranz Rail's prompt action in reducing load heights following the Tokoroa incident, (see section 4.1), a later incident was reported which involved a 3.7 m log falling from a rail wagon near a level crossing at Paengaroa.
- 2.1.4 The weight of the small and short Korean logs is significant. The low weight of these logs increased the tendency to move around on top of the wagons.

2.2 3.7 m logs by rail

- 2.2.1 The use of standard wagons to transport 3.7 m logs contained by only two cradles per bundle placed more emphasis on log stability, especially near the top of the cradle.
- 2.2.2 The Tranz Rail loading code required the use of strops or chains on "Random size & length: Pulp logs" where longitudinal projection beyond the cradle was between 75 mm and 150 mm. The code for "Uniform length: Matched logs" had no such provision. However diagram 16.1 of the code required strops or chains for all loads with a minimum projection between 75 mm and 150 mm. This ambiguity requires clarification.
- 2.2.3 Investigation of this incident has revealed a common tendency amongst Tranz Rail operational staff concerned with Kinleith log traffic to rely on individual judgement to decide what height and projection exceedances were acceptable. Effective safety codes require practical limits and full compliance to ensure a controlled safety regime.

2.3 Train C25

- 2.3.1 The photographs taken of the loaded wagons on Train C25 at Waharoa and Mount Maunganui showed that in a number of cases the logs were loaded higher than allowed by the code. From the photographs it was determined that at least eight of the wagons were loaded more than 200 mm above the top of the cradles. Seven of the wagons showed logs which had significant non-compliance with code requirements for longitudinal projection beyond the outside of the cradle. Figures 1 and 2 show typical height and projection non-conformity.
- 2.3.2 It could not be determined whether the log in question rolled over the top of the cradle or whether one end of a top outside log became free from a cradle allowing it to tip down and clear the wagon. From the ground indentations made by the log after it left the wagon, the latter scenario is more likely.
- 2.3.3 The checking of loaded log wagons on Train C25 was carried out at three different levels:
 - By the contract log loaders themselves. They had a vested interest to ensure that the wagons were loaded in a way which minimised any subsequent adjustment by them. Carter Holt Harvey's Log Yard Co-ordinator's responsibility was to ensure that Tranz Rail's code requirements with regard to loading parameters were met by the log loaders, which required him to check their performance on a random basis.

- By the Tranz Rail shunter who took the rakes of loaded wagons from Carter Holt Harvey's loading yard to the Kinleith yard for marshalling into Train C25. In addition to his primary duty of the shunting of wagons, he was required to check the correct and safe loading of the wagons before they were moved.
- By the Operations Supervisor who had the final responsibility to ensure that the log train, when marshalled, was safe to run. This responsibility included the checking of the load on the wagons.

Despite this multiple checking process, on the day of the incident Train C25 left with approximately 20% of the wagons loaded overheight. It was apparent that the Tranz Rail Code, although known and understood, was subject to individual interpretation.

- 2.3.4 The action arising from the inspection at Waharoa following the incident confirmed such individual interpretation. The train was considered safe to run and was authorised to continue to Mount Maunganui with no wagons reduced, no load adjustment and no speed restriction. In the event the trip was completed without further incident despite the code non-compliance.
- 2.3.5 Analysis of the Long log output based on the assumed departure point from Kinleith indicated a likely speed of approximately 72 km/h at the location where the log fell.

3. Findings

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

- 3.1 It is probable that the log fell from the log wagon as a result of being loaded outside the Tranz Rail Freight Handling Code requirements.
- 3.2 It is likely that eight of the 36 wagons on Train C25 were not loaded to code requirements in relation to height and all 36 had variable levels of non-compliance with requirements for minimum projection beyond the cradles.
- 3.3 The Tranz Rail code for minimum requirements for log projection beyond the cradles could not be complied with for 3.7 m logs.
- 3.4 The light weight of the KCL 3.7 m logs made them particularly susceptible to dynamic train motion during transit.
- 3.5 The Tranz Rail code was ambiguous in relation to the use of strops or chains on "Uniform length: Matched logs" which had a projection of between 75 mm to 150 mm.
- 3.6 There did not appear to be a common interpretation of the Tranz Rail code requirements within and across the levels of inspection.
- 3.7 Random audit checks were not resulting in sufficient corrective action to control loading to code requirements.
- 3.8 The track condition was not a factor in the log fall.
- 3.9 The speed of Train C25 was not a factor in the log fall.

4. Safety Actions

4.1 Load height

4.1.1 Immediately following the advice of the fallen log, Tranz Rail issued the following instruction:

Due to an incident where a 3.7 m log has fallen off a wagon and rolled onto private property, Section 16 of the Freight Handling Code is to be amended until the results of the investigation into this incident are known.

Section 16.3e is to be altered to read: 'Logs must not protrude above the cradles'.

4.2 Longitudinal projection of logs beyond cradles

4.2.1 Prior to the incident, Tranz Rail had already been carrying out trials with the aim of redefining projection requirements. Further tests are planned to enable a new code to be defined at an early date. The new code will overcome the current unsatisfactory situation that virtually all 3.7 m logs fail to meet current code longitudinal projection requirements. Although it is likely that the practical figure which can be achieved on accurately placed 3.7 m logs on standard cradle centres will be acceptable the current non-compliant practice weakens the status of the code and requires regularising. As part of the review Tranz Rail will be checking cradle centres to ensure that any new code requirements for 3.7 m logs allows for variable cradle spacing tolerance, and will be arranging adjustment to cradle locations where they are not within tolerance.

4.3 Use of chains or strops

4.3.1 The current code is being revised and will be redrafted to clarify when and where to use chains and strops, particularly with regard to 3.7 m logs.

4.4 Code interpretation

4.4.1 Tranz Rail propose specific training sessions at key centres such as Kinleith and Murupara to ensure that all staff associated with log handling interpret code requirements correctly and consistently.

4.5 Auditing

4.5.1 Arrangements are in hand to formalise the role of Accounts Managers in the audit process to support current random audits carried out by the Tranz Link Service Manager (Forestry), and Site Service Co-ordinators.

4.6 General training

4.6.1 Tranz Rail are organising one day refresher courses for TXOs. While general in nature, and not specifically related to log handling or the incident, opportunity will be taken to reinforce this aspect of train examination duties.

5. Safety Recommendations

5.1 In view of the actions taken by Tranz Rail the Commission has made no safety recommendations regarding this incident.

Appendix 1

SECTION 16 LOGS

- 16.1 Transportation
- 16.2 Rail Loading Information
- 16.3 Loading Restraints

For equivalent guidelines for Road Transportation, see section 3 of this manual.

16.1 TRANSPORTATION

For conveyance purposes, logs can be subdivided into two groups:

- **SHORT LOGS** Length from 2.4 m to 7.9 m
- **STANDARD LOGS** Length from 8.0 m to 14.0 m

16.2 RAIL LOADING INFORMATION

The following table defines the number of cradles for each wagon type, and describes the minimum/maximum log lengths and maximum load capacity.

WAGON TYPE	NO OF CRADLES	LOG LENGTHS		MAX LOADING CAPACITY
		MIN	MAX	
		metres	metres	Tonnes
ULA	4	3.6	13.1	43
ULB	2	10.0	13.1	38
ULC	2	10.0	13.1	38
ULD	6	2.3	13.1	30.5
ULE	4	3.6	13.1	38
URL	4	2.3	13.1	30.5
USL	4	3.6	13.1	38
FB	2	9.7	14.0	48
FC	4	4.5	8.0	53

16.3 LOADING RESTRAINTS

The following rules are illustrated in figure 16.1

UNIFORM LENGTH : MATCHED LOGS

- a: Logs must **PROJECT BEYOND** each cradle by at least 150mm
- b: Logs must be at least 150mm **CLEAR OF ALL HANDGRIPS**
- c: Logs must **NOT OVERHANG WAGON ENDS**
- d: Logs must **NOT PROTRUDE OUTSIDE** the cradle edges
- e: Logs may **PROTRUDE ABOVE** the cradle by a **MAXIMUM** of **ONETHIRD** log thickness but **NEVER MORE THAN 200mm**

RANDOM SIZE & LENGTH : PULP LOGS

When short or odd shaped logs are included in the load, then

- f: Any logs shorter than cradle length...
 - must be **NESTLED** into the centre of the load.
 - must **NOT PROTRUDE** through the outer log screen
 - must **COMPLY** with conditions **b, c, & e** above.
- g: Where there are logs against the cradle that **CANNOT** comply with condition **(a)** above, then the minimum projection beyond the cradle can be reduced to 75mm if:
 - **TWO BELLY STROPS** per bundle must be applied.
 - Minimum **breaking strength** of each strop must be at least **half the weight** of the load
 - The Belly Stropps are **inside the cradles** and must **contain all logs**
- h: All logs touching the cradle (outer logs) must **COMPLY** with conditions **b, c, d & e** above



LOG LOADING RULES

RAIL LOADING DATA				
WAGON TYPE	NO OF CRADLES	LOG LENGTHS		MAXIMUM LOADING CAPACITY
		MIN	MAX	
ULA	4	3.6	13.1	43
ULB	2	10.0	13.1	38
ULC	2	10.0	13.1	38
ULD	6	2.3	13.1	30.5
ULE	4	3.6	13.1	38.0
URL	4	2.3	13.1	30.5
USL	4	3.6	13.1	38
FB	2	9.7	14.0	48
FC	4	4.5	8.0	53

LOG LENGTHS	Metres
SHORT LOGS	2.4 to 7.9
STANDARD LOGS	8.0 to 14.0

For Road Conveyances, refer to "TRUCK LOADING CODE" Chapter 10 Pages 53 - 61

DIAGRAM 16.1

LOG LOADING RULES

