Report 99-114

Train 225

derailment

near Levin

22 June 1999

Abstract

On Tuesday 22 June 1999, at about 0245 hours, the high leg rail at 93.707 km North Island Main Trunk broke under the passage of Train 225, a southbound express freight. The break caused the tenth wagon of the train to derail one axle which re-railed itself at the Roslyn Road level crossing 530 m further to the south and the locomotive engineer continued on unaware of what had happened.

A safety issue identified was the lack of an effective system for detecting and actioning rail defects located between rail ends.

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.

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List of Abbreviations

km/h	kilometres per hour
lb	pound
LE	Locomotive Engineer
m	metre
mm	millimetre
NDT	non destructive testing
NIMT	North Island Main Trunk
t	tonne
Tranz Rail	Tranz Rail Limited

Railway Incident Report 99-114

Data Summary

Train type and number:	express freight 225
Date and time:	22 June 1999, 0245 hours
Location:	93.707 km North Island Main Trunk (NIMT) near Levin
Type of occurrence:	derailment
Persons on board:	crew: 1
Injuries:	nil
Damage:	50 broken sleepers
Operator:	Tranz Rail Limited (Tranz Rail)
Investigator-in-Charge:	R E Howe

1. Factual information

1.1 Narrative

1.1.1 On Tuesday 22 June 1999, at about 0245 hours, Train 225, a scheduled southbound express freight, derailed in a right-hand (in direction of travel) 1400 m radius curve at 93.707 km NIMT (3.3 km north of Levin). The train consisted of a DX and a DC locomotive and 36 bogie wagons, with a total weight of 1394 t and length 547 m.

1.1.2 Subsequent inspection of the track indicated that the wagon had derailed to the left-hand (high leg) side of the curve and after running 530 m in a derailed condition rerailed itself at the Roslyn Road level crossing. The locomotive engineer (LE) had continued on unaware of the derailment.

1.1.3 Following the passage of Train 225 the signalling system for that section of track (Koputaroa to Levin) went to red. To enable the following Train 521 to enter the section, Train Control issued the LE of Train 521 with a Mis 59 authorisation[1]. Train 521 was an express freight consisting of 2 DC locomotives and 17 bogie wagons, with a total weight of 523 t and total length of 285 m.

1.1.4 The LE of Train 521 stated that when he was issued with the Mis 59 at 0336 hours the cause of the signal failure was not known and he assumed that it could be as a result of a broken signal bond wire. Train Control had indicated to him that it might be caused by a rail pull-apart initiated by the very cold weather being experienced at the time. There was a heavy frost in the area on the morning of 22 June.

1.1.5 The LE stated that he started off from Koputaroa at about 25 to 30 km/h and at the top of the 1:100 down grade into Levin had applied the engine brakes to hold the speed. He was negotiating the 1400 m radius right-hand curve when he suddenly noticed a gap in the left rail some 50 m ahead. The gap was noticeable as a dark patch in contrast to the moonlight reflecting off the moisture on the rail head either side.

1.1.6 The LE stated that he had not experienced or expected such a gap in the track and was concerned about braking the train in such a way that might result in "bouncing and shuddering" of wagons and cause a derailment. Rather than apply emergency braking he elected to gently apply the brakes and in so doing managed to bring the train to a stop in approximately 200 m with the trailing bogie of the ninth wagon straddling the rail gap. The train did not derail.

1.1.7 The LE advised Train Control of the situation and the local ganger was called out at 0350 hours to attend to the track. The ganger stated that on examining Train 521 he noted a broken section of rail lying on the access way adjacent to the rail gap. The broken piece of rail was 900 mm long and the concrete sleepers that had been supporting it had been shattered. He temporarily fixed the broken piece of rail into the rail gap and between 0515 hours and 0705 hours piloted Train 521 over the break plus 3 other southbound trains that had been delayed as a result of the incident. He stated that his main concern at that stage was to effect repairs to enable the passage of the following southbound express freight train and 2 passenger trains without undue delay.

1.1.8 Following the passage of these trains the heavy maintenance gang effected a permanent repair by thermit welding in a section of rail.

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[1] A Mis 59 was an authorisation issued by Train Control as the result of a signal failure and allowed a train to pass a signal at red to enter a section. The authorisation gave details of the time of issue, the train concerned, the signal at red to be passed, the section to be entered and the last train through the section. The Mis 59 also carried the following note:

> Level crossings in the section equipped with automatic alarms must be approached with caution as the alarms may not operate correctly. The train must travel cautiously, the locomotive engineer being prepared to find the section obstructed or displaced rail or points wrongly set.

1.1.9 When the length ganger arrived on site and had time to examine the approaches he observed that there was sleeper damage south of the position that Train 521 had stopped, extending to the Roslyn Road level crossing. This prompted an inspection of Train 225 following its arrival at Wellington, which revealed that the tenth wagon in the train consist (UK16626) had derailed the trailing axle of the leading bogie.

1.2 Track details

1.2.1 The track in the area of the broken rail consisted of 91-lb rail fixed by Pandrol fastenings onto concrete sleepers bedded onto clean crushed ballast. The track was on a 1 in 100 downgrade (in direction of travel of Train 225)

The rail was marked :- 91 - NZR - WORKINGTON 1970 and was laid in 1972.
The sleepers were stamped :- READY B68-87.

1.2.2 The track was continuously welded and was last destressed in November 1994. The track showed good alignment and level either side of the break. There was no evidence of any wheel burn marks on the head of the rail in the immediate area. The last EM80 track recording run was on 6 June 1999 (20 days prior to the incident).

1.2.3 As a result of damage to the sleepers and formation in the area of the break, and the subsequent resleepering, it was impossible to establish whether there had been any vertical movement of the sleepers under load prior to the derailment. The EM80 trace did not show any noticeable top deviation indicative of such movement. However, on the underside of the foot of the broken-out rail adjacent to the initial rail break there were transverse abrasion marks indicative of rail/sleeper movement.

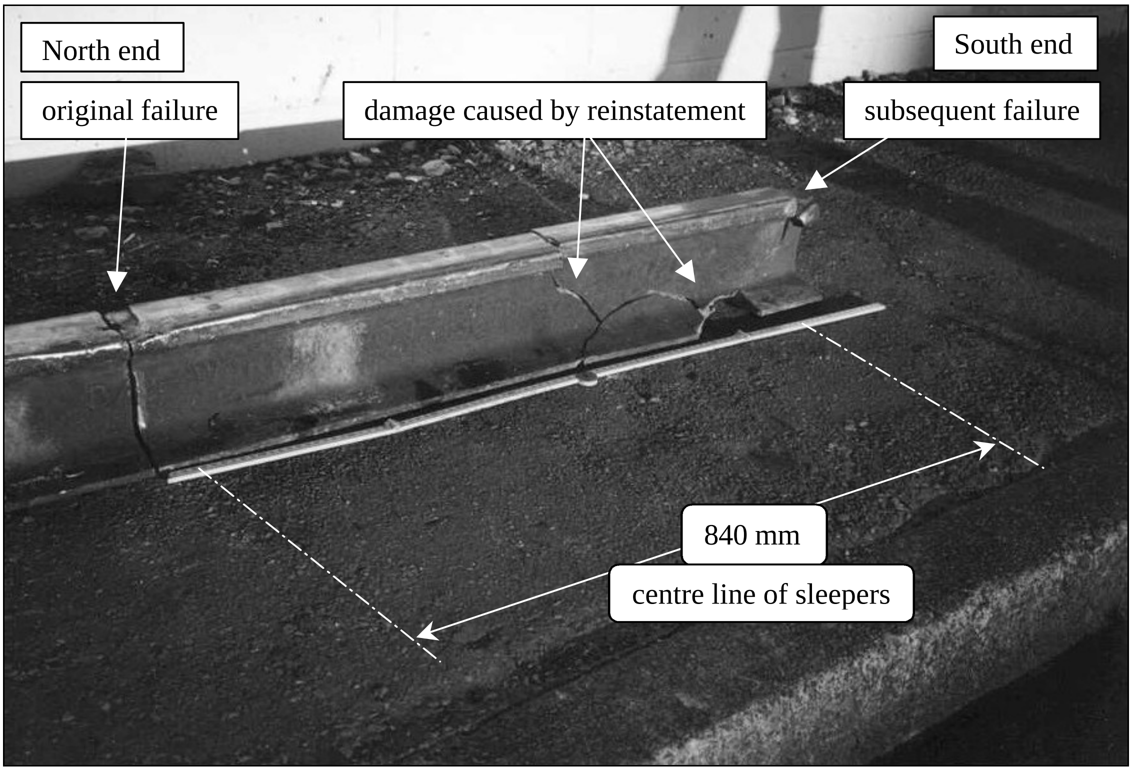

Figure 1
The length of broken-out rail section

1.3 Track failure details

1.3.1 Figure 1 shows the general appearance of the broken rail reconstructed as found. The head of the rail at the original failure showed evidence of having been fractured for some time while the break in the web and foot of the rail was fresh. The fracture in the rail evident between the 2 failures occurred while trains were being piloted over the break after the ganger had reinserted the broken section of rail.

1.3.2 Figure 2 shows an end view of the rail section at the original failure. A-7 mm deep segment of the rail head had broken out adjacent to the fault on the south side revealing a horizontal layered surface. There was a 10 mm loss in depth in the rail head resulting in lateral metal flow either side of the rail giving a 7 mm lip on the outside of the rail and 3 mm on the gauge side. The latter metal flow was limited to 3 mm by wear from rail traffic.

Figure 2
End view of the original failure face (north side of break)

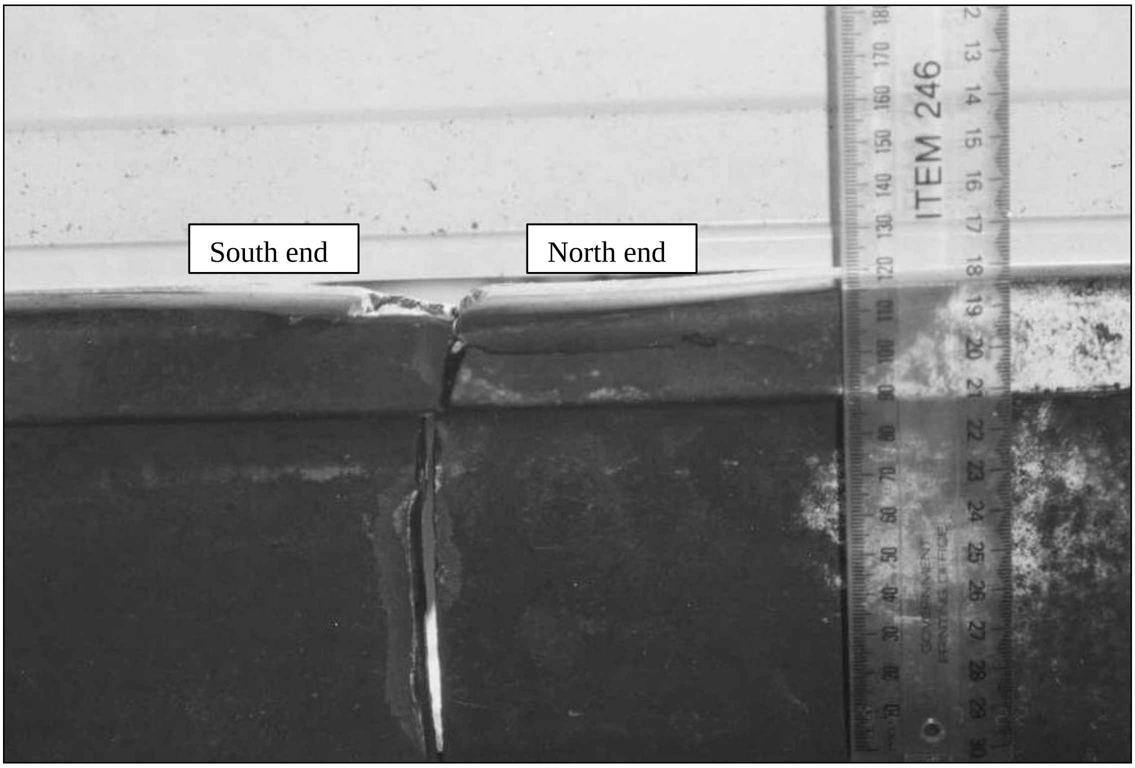

Figure 3
The extent of rail head flow

1.3.3 Figure 3 shows the extent of the loss of depth, the metal flow at the initial failure point, and the metal break-out at the south end.

1.3.4 The subsequent failure at the south end (see Figure 1) showed no obvious steel defects. The heavily end-battered head section on the south side of the rail failure was typical of damage caused by the wheels of loaded wagons jumping the gap and impacting on the exposed rail end during the passage of trains after the failure.

1.3.5 Two concrete sleepers were supporting the broken section of rail, one immediately to the south of the original failure and the other under the subsequent failure. Figure 1 shows the positions of the sleepers in relation to the rail breaks. The standard spacing for concrete sleepers for curved track down to 400 m radius was 700 mm. The actual spacing was approximately 840 mm.

1.4 Examination of the fractured rail

1.4.1 An examination of the fractured rail revealed a long-standing piping or porosity defect in the head section extending between 2 to 3 mm deep by up to 100 mm long.

1.4.2 The effect of rail traffic had depressed and rolled the top rail surface above the porosity defect in the head causing the rail head to become spread and dipped. The rail head was dipped up to 10 mm over a length of 150 mm.

1.5 Ultrasonic rail testing

1.5.1 The rail in the track had been ultrasonically tested on 13 October 1997, some 20 months prior to the incident, by a contracted Australian ultrasonic testing car. On the flaw detection report for that date a fault was recorded at 93.700 km NIMT on the left, outer rail and listed as a "Transverse Defect at Engine Burn"[2] (see Appendix 1). The run was made with kilometrage. The fault was not sized or given a priority ranking and was not therefore referred to track staff for action. White paint marks either side of the fault were applied to the web of the rail at the time which coincided with the position of the original failure. Figure 1 shows these white paint marks either side of the original failure.

1.5.2 The ultrasonic testing car detected rail faults while in transit. When a fault was found the car was stopped and the contracted operators, after marking either side of the rail fault with paint, examined the fault in detail using hand held probes and documented its features. The majority of faults related to rail ends and were prioritised by the Tranz Rail non destructive testing (NDT) operator, who travelled on the car, for corrective action in accordance with Code P.86. For mid-rail faults, where no procedures had been established, the NDT operator used his own discretion and experience, combined with that of the contracted staff, to allocate a priority.

1.5.3 The priority faults that were listed were given rankings 1 to 3 on a scale of 5, 1 being highest priority, and all had to be cut out and replaced within 3 months. Tranz Rail policy was that unclassified faults did not require any further action.

1.5.4 Tranz Rail had decided to ultrasonically test all A and B class lines commencing in 1997, recognising that the last test was carried out in the late 1970s, that 70 lb rail was still being used, and that 18 t axles had since been introduced to the system. Manual ultrasonic testing by Tranz Rail was restricted to rail ends and thermit welds.

1.5.5 No specific guidelines on how to action defects found between rail ends had been developed, and there were no instructions regarding prioritising of defects at the time of the incident.

1.6 Reporting and actioning of defective rails

1.6.1 Tranz Rail's "Operations Group Code" dated January 1996 covered reporting for defective rails in Code P.85:

> **P.85 DEFECTIVE OR BROKEN RAILS OR WELDS** must be reported as follows:
>
> a) When found by staff other than NDT Operators:
>
> by Gangers on Form M.58A.
>
> b) When found by NDT Operators:
>
> on Form NDTR-Rails (defects at bolted joints) or Form NDTR-RAIL WELDS (defects in thermit welds).
>
> Instructions for dealing with the above reports are contained in Code Supplement CSP/53.

NDT operator reports were only submitted on rail end defects and thermit welds. Tranz Rail Code Supplement CSP53 was similarly restricted in its instructions for dealing with reports.

[2] "Engine Burn" (more commonly termed "wheel burn" in New Zealand) refers to the slipping of driven axles which can cause cracking and shelling of the rail head.

1.6.2 Code P86 and P87 dealt with the actioning of reported defects.

P.86 DEFECTIVE RAILS WHEN REPORTED are to be dealt with as summarised below:

PRIORITY	DESCRIPTION	ACTION TO BE TAKEN
1	Major defects: track unsafe for traffic. Includes: Complete breaks, head broken out, major cracks close to complete failure.	Arrange track protection or impose 10 km/h speed restriction until defect can be repaired. Inform T & S M as soon as possible.
2	Serious defects which may deteriorate rapidly to Priority 1 condition. Includes: Cracks from holes, gas cut holes, vertical or horizontal split heads and webs or fillet cracks over 75 mm long, crushed web/depressed heads, and cracked welds.	Impose 25 km/h speed restriction and repair within seven days. Inform T & S M as soon as possible.
3	Significant defects needing early repair. Includes: Vertical and horizontal split heads, split webs or fillet cracks under 75 mm long, cracks intersecting each other or end of rail.	Keep under regular observation and repair within three months.
4	Minor defects requiring repair. Includes: extra bolt holes (uncraked), gas cut rail other or end of rail.	Inspect weekly and repair within six months unless condition worsens.
5	Minor defects reported by NDT Operators for information only.	No action required unless advised otherwise.

Other defects not listed above should be reported to the T & S M on the LGR.1 report. These may include:

a) Heavy corrosion: the limits for corrosion are in Code Supplement CSP/61. Where corrosion exists in a number of closely spaced shorter lengths, the rail must be programmed for replacement.

b) Excessive wear: limits for headwear are given in CSP/32.

c) Wheelburns and other running surface defects.

P.87 DEFECTIVE RAILS: ACTION BY TRACK AND STRUCTURES MANAGERS

T & S M must ensure that when reports on defective rails are received from Gangers, the correct action has been taken.

When M58A NDTR-RAILS or NDTR – RAIL WELDS reports are marked Priority 1 or 2, T & S M should examine the defects.

When defects appear to be unusual or to have been caused by heavy wear, corrosion, abrasion or similar damage, T & S M must carefully examine other rails or welds in the vicinity and take appropriate action if they appear unsafe. Discovery of a number of similar defects in one location should be reported promptly to the MTM.

These Code requirements did not define the priority and actioning of mid-rail faults found by ultrasonic inspection.

1.7 Train event recorders

1.7.1 The Kaitiaki event recorder on locomotive DX5097 (the leading locomotive on Train 225) showed that the speed of the train was 68 km/h and slowing at the time of the initial derailment. The maximum permitted speed was 80 km/h.

1.7.2 The event recorder log from DC 4185, the leading locomotive on Train 521 showed that it was travelling at 33 km/h prior to the LE braking when he observed a discontinuity in the rail head. Procedures for controlling speed under Mis 59 conditions are detailed in paragraph 1.1.3.

1.8 Personnel

1.8.1 The LE of Train 521 gained his B grade driver's ticket in 1989 and his A grade in December 1991 and had been based in Palmerston North since 1989. He held a current operating certificate for the duties concerned.

1.8.2 The length ganger had 16 years railway experience. He had been a length ganger for 7 years and transferred to Levin as the length ganger in November 1998. He was not aware of the ultrasonic testing fault that had been recorded at 93.700 km NIMT on his length on 13 October 1997. His length went from Paraparaumu (48.5 km NIMT) to Shannon (100 km NIMT) which he was required to inspect by sections on a 6-weekly cycle. The last detailed inspection of the site was carried out on 17 May 1999, and no running surface defect was reported in accordance with Code P.86.

1.8.3 The patrolling ganger had 24 years railway experience being appointed a grade 2 ganger in 1978 and a grade one ganger in 1987. He shifted to Levin as the length ganger in January 1993 and transferred to the patrolling ganger position with the arrival of new length ganger in November 1998. His twice-weekly patrol cycle included portions of track north of Wellington plus the Wairarapa Branch and totalled 320 km. He had patrolled the area concerned by hi-rail vehicle on the afternoon prior to the derailment and had not felt or seen anything out of the ordinary. He was also unaware of the fault at 93.700 km recorded by the ultrasonic car.

1.8.4 The NDT operator had 20 years railway experience, starting in a track maintenance gang. After 5 years he transferred to NDT operations following a 6-week in-house training course in NDT techniques as applied to rail. The position required further annual one-week recertification courses to ensure that testing standards were uniform. However, with the retirement of Tranz Rail's NDT Supervisor 4 years prior to the incident this recertification had been discontinued. The NDT operator was the senior operator of four Tranz Rail operators working through the whole rail system for rail end testing. His role during the contract testing was to assess the importance of the test data in terms of immediacy of action.

2. Analysis

2.1 The rail failure

2.1.1 Train 225 was signalled into the area of the rail failure indicating that the track circuit between Koputaroa and Levin (which included 93.707 km NIMT) was continuous prior to the train's arrival. The initial rail failure probably occurred during the passage of Train 225, due to brittle failure of the base of the rail propagating from the transverse defect which had developed in the head, and slowly extended into the web. The brittle failure was triggered by a combination of low rail temperatures and the passage of the train.

2.1.2 The original rail failure showed a piping/porosity defect in the head of the rail which would have been present since casting. A thin cross-section cut from the rail immediately adjacent to the initial failure revealed porosity in the head of the rail. Repeated wheel loadings over a long period of time had rolled the rail head steel and depressed the head. The resultant stress within the porus head area had initiated transverse fatigue cracks which had slowly propagated into the top of the web of the rail.

2.1.3 The original porosity defect is likely to have masked the size of the transverse defect beneath it which highlights the risk associated with leaving ultrasonically detected rail faults in the track unactioned, particularly on passenger-carrying lines such as the NIMT.

2.1.4 The 10 mm dip at the point of the initial rail failure had developed progressively over a considerable period as evidenced by the rolled lips on the rail head sides (see Figure 2). The dip had created a "hammering" effect on the track structure with the passage of rail traffic. There was evidence on the underside of the rail adjacent to the initial failure that there had been relative vertical movement between the rail and the sleeper at this point. It is likely that the plastic gauge plates between the Pandrol fastening and the foot of the rail were dislodged, exacerbating this movement. A combination of the rail dip and the loose fastenings would have created vertical movement of the sleeper under load without necessarily showing as an exceedance on the EM80 trace. The condition of the 2 sleepers at the break and the lack of evidence to support derailment damage at this point indicated the concrete sleepers may have failed prior to the rail failure.

2.2 The derailment

2.2.1 The initial rail failure under Train 225 left the high leg rail immediately to the north of the break unrestrained and free to move outwards as rail stress was released and lateral forces were applied by the train. This allowed the wheel of wagon UK16626 to strike the south end rail face, ride up and derail to the outside of the curve.

2.2.2 Without rail continuity and effective sleeper support immediately adjacent to the initial failure the rail was subjected to severe bending stress as the remainder of the 26 loaded bogie wagons on Train 225 ran over the unsupported rail, resulting in a further rail fracture 900 mm south of the initial failure. The reduced ductility of the steel at the lower temperatures experienced on the night made it more susceptible to failure under impact loadings.

2.2.3 The mechanics of the derailment were typical of those associated with mid-rail fractures on curved track and illustrate the high risk associated with such failures.

2.3 Inspections

2.3.1 Despite his previous knowledge as the local length ganger, the patrolling ganger, with an average of 128 km to inspect on a daily basis, could not be expected to monitor an incipient rail failure unless it was listed as an essential inspection item. The fact that he did not note and report on the dipped rail and surface failure evident at the site was probably due to the similarity with the commonly found wheel burn.

2.3.2 The length ganger was not aware of the rail fault, nor the presence and significance of the white marks on the rail, nor the fact that an ultrasonic car had been through the area. The significance of the 2 white marks painted on the rail by the ultrasonic testing team could have alerted him to some degree of caution if he had been aware of them, but without specific guidelines this would have been unlikely to result in any effective action. His detailed inspection should have noticed the dipped rail and heavy lipping and closer examination should have shown that wheel burn was an unlikely cause. However, this did not happen and no surface irregularity was reported.

2.3.3 The track defect as detected by the ultrasonic testing car was recorded as being at 93.700 km and on the outer left rail (in direction of kilometrage). The actual break was at 93.707 km on the outer right rail (in direction of kilometrage) but the presence of the marker paint on the right rail confirms that the defect was correctly located but wrongly reported.

2.3.4 The ultrasonic defect was recorded as being a "Transverse Defect At Engine Burn" in the 1997 inspection. However the rail in the area of the break, and particularly the opposite rail at the break, did not show any other evidence of wheel burns and as they do not generally occur in isolation (all axles are one piece) it is surprising that the specialist contract NDT staff classified the fault in this manner.

2.3.5 Despite the first mid-rail ultrasonic inspection for about 20 years finding a serious defect, no action was taken during the ensuing 20 months before the failure. A number of factors contributed to this:

- the lack of standards for inspection and reporting when using the contracted ultrasonic car
- the lack of suitable guidelines for Tranz Rail staff with the responsibility to prioritise defects for action
- the lack of training and experience of the Tranz Rail NDT operator in prioritising mid-rail defects
- the failure of field staff to recognise the size and significance of a surface defect which could not be readily attributed to a wheel burn.

2.3.6 Tranz Rail's decision to return to full rail testing in 1997 was a proactive response to a change in operating parameters. Many of the shortcomings of the initial run highlighted in this report have been addressed by the safety actions in Section 4.

2.4 Speed of Train 521

2.4.1 Even with full emergency brake application it was not possible for Train 521 to be stopped from 33 km/h within the 40 m sight distance that the LE had of the rail head discontinuity. The LE's action in electing to brake gently was a judgement call based on a perceived understanding of how the train would react. It was fortuitous that no wagons were derailed as they negotiated the 900 mm gap. A lower speed would have been prudent under Mis. 59 conditions.

3. Findings

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

3.1 The rail failure was initiated by a fatigue crack which started at the internal faces of a manufacturing defect which had been under stress following crushing and spreading of the rail head over a long period of time.

3.2 The fault was detected ultrasonically during the ultrasonic testing car run in October 1997 but was incorrectly classified as " . . . at Engine Burn".

3.3 The fault was not sized during the ultrasonic car run, and the significance of this defect was not realised and addressed prior to the failure.

3.4 There were no guidelines for actioning mid-rail defects found during ultrasonic testing.

3.5 Length track staff were unaware of the fault and were therefore not able to link this information with the visual indication of a rail head problem.

3.6 Detailed track inspection by the length ganger did not detect the dipped and rolled railhead and the fact that the distortion was not attributable to a wheel burn.

3.7 There were no standards set for the recertification of NDT operators. All other staff were appropriately certified.

4. Safety Actions

4.1 At the time of the incident Tranz Rail had arranged a contract for the ultrasonic testing of all class A and B lines starting in January 2000. The testing program provided for contracting an ultrasonic testing car for an average of 50 days per year over the next 3 years. This regular testing will result in all defects being sized and will include a wider number of defect classifications.

4.2 Following the incident, Tranz Rail completed a new NDT defect removal policy as detailed in the Significant Information Notice SIN T008 attached as Appendix 2. Preparation of SIN T008 had commenced prior to this incident, and it was issued late 1999 to form the action basis for all defects, including mid-rail defects, arising from the ultrasonic testing car inspection.

4.3 Tranz Rail have adopted size parameters as the criteria for specific action and do not now require additional skills from the NDT operators to prioritise mid-rail defects.

4.4 The imposition of a speed restriction, with a policy to remove the fault within 60 days of detection (which forms the basis of SIN T008), has addressed the lack of knowledge of track staff of the presence of rail defects. Sizing and tighter classification will help track staff appreciate the significance of any defects they have in the track and assist in determining the significance of visible signs of rail distress.

4.5 In view of the actions taken by Tranz Rail, no safety recommendations have been made regarding this incident.

Approved for publication 16 February 2000

W. P Jeffries
Chief Commissioner

Appendix 1

Speno Rail Maintenance Australia Pty Ltd.

Ultrasonic Rail Flaw Detection Defect Report.

Client: Tranz Rail New Zealand.
Track: Single Up North Island Main Trunk.
Date: 13th October 1997.

Operators: C.Mclean/M.Rose.
Ultrasonic Car: S.R.M.A. FL7 ST4A Mk1.

Defect Legend:

TD: Transverse Defect.
HSH: Horizontal Split Head.
VSH: Vertical Split Head.
HW: Head/Web Separation.
BH: Bolt Hole Crack.
GCRE: Gas Cut Rail Ends/Bolt Holes etc.
TDS EBF: Transverse Defect at Engine Burn.
HSW: Horizontal Split Web.
VSW: Vertical Split Web.
SCR: Shatter Cracked Rail.
C/O: Cracked Out.
DW: Defective Weld.
BR: Broken Rail.
MD: Mill Defect.
PR: Piped Rail.
TDX: Mutiple TD's In Same Rail Length.
PM: Previously Marked.

Test Date.	Defect Number	Defect Type	Defect Size.	Defect Location	Track Identification	Rail	Rail Weight	Weld Type	Defect Position	Rail Identification	Probes Used General Comments.
13.10.97	896	DW		49.880	Single N.I.M.T.	Left	50Kg	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	897	TD	Medium	50.160	Single N.I.M.T.	Left	50Kg		Head	Tangent	60 & 70 Degree
13.10.97	898	TD2	Small	50.880	Single N.I.M.T.	Left	50Kg		Head	Tangent	60 & 70 Degree
13.10.97	899	DW		50.995	Single N.I.M.T.	Right	50Kg	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	900	DW		52.860	Single N.I.M.T.	Right	50Kg	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	901	BH	Large	54.880	Single N.I.M.T.	Right	50Kg	Thermit	Web	Outer	35 & 45 & 0 Degree
13.10.97	902	DW		55.190	Single N.I.M.T.	Right	50Kg	Thermit	Head	Inner	60 & 70 Degree
13.10.97	903	DW		55.190	Single N.I.M.T.	Left	50Kg	Thermit	Head	Outer	60 & 70 Degree
13.10.97	904	DW		55.840	Single N.I.M.T.	Left	50Kg	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	905	DW		55.840	Single N.I.M.T.	Right	50Kg	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	906	DW		59.280	Single N.I.M.T.	Right	50Kg	Thermit	Head	Inner	60 & 70 Degree
13.10.97	907	HSH	Small	59.290	Single N.I.M.T.	Right	50Kg		Head	Inner	0 Degree
13.10.97	908	DW		61.670	Single N.I.M.T.	Right	50Kg	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	909	DW		66.950	Single N.I.M.T.	Left	50Kg	Thermit	Head	Tangent	60 & 70 Degree-C/O
13.10.97	910	DW		70.190	Single N.I.M.T.	Left	50Kg	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	911	HSW	Medium	76.390	Single N.I.M.T.	Left	50Kg	Thermit	Web	Outer	35 & 45 & 0 Degree
13.10.97	912	BR	Large	77.790	Single N.I.M.T.	Right	50Kg		Head/Web	Inner	35 & 45 & 0 & 60 & 70 Deg
13.10.97	913	DW		79.170	Single N.I.M.T.	Left	50Kg	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	914	BH	Medium	79.180	Single N.I.M.T.	Right	50Kg		Web	Tangent	35 & 45 & 0 Degree.H/Blk
13.10.97	915	DW		80.140	Single N.I.M.T.	Left	50Kg	Thermit	Web	Tangent	35 & 45 & 0 Degree
13.10.97	916	TD EBF		84.240	Single N.I.M.T.	Right	50Kg		Head	Inner	60 & 70 Degree
13.10.97	917	TD EBF		84.235	Single N.I.M.T.	Right	50Kg		Head	Inner	60 & 70 Degree
13.10.97	918	TD EBF		84.230	Single N.I.M.T.	Right	50Kg		Head	Inner	60 & 70 Degree
13.10.97	919	DW		84.980	Single N.I.M.T.	Right	50Kg	Thermit	Head	Tangent	60 & 70 Degree-C/O
13.10.97	920	DW		86.640	Single N.I.M.T.	Left	91lb	Thermit	Head	Inner	60 & 70 Degree-C/O
13.10.97	921	DW		89.780	Single N.I.M.T.	Left	91lb	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	922	DW		92.480	Single N.I.M.T.	Left	91lb	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	923	DW		92.480	Single N.I.M.T.	Right	91lb	Thermit	Head	Tangent	60 & 70 Degree
13.10.97	924	HSH	Medium	93.115	Single N.I.M.T.	Left	91lb		Head	Tangent	0 Degree
13.10.97	925	TD EBF		93.700	Single N.I.M.T.	Left	91lb		Head	Outer	60 & 70 Degree-C/O
13.10.97	926	DW	Large	93.950	Single N.I.M.T.	Left	91lb	Thermit	Head	Outer	60 & 70 Degree-C/O
13.10.97	927	DW	Large	94.270	Single N.I.M.T.	Left	91lb	Flashbutt	Head	Outer	60 & 70 Degree

Defect at 93.700 km →

Appendix 2

Tranz Rail
Infrastructure

SIGNIFICANT INFORMATION NOTICE
INFRASTRUCTURE

Expires 18 August 2000 SIN **T 008**

NDT Defect Removal Policies

Distribution: All holders of Operations Group Code Section 4.03.

INTRODUCTION

This SIN contains changes to the Infrastructure policy on the removal of NDT defects from track.

ACTION

Clause P86 is modified as below.

Defective rails when reported are to be dealt with as summarised below:

When rail is found to have any of the defects tested below, operation over the defect is not permitted until:-

1. The rail is replaced, or
2. The remedial action prescribed in the table is initiated.

It is the policy of Tranz Rail to remove all defective rail within 60 days from date of detection.

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10/08/99

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Defect	Size - Percent of Rail Head Cross-Sectional Area Weakened By Defect		If Rail Not Replaced Before Next Train Take This Action
	Less Than	But Not Less Than	
Transverse Fissure or) Compressed Fissure)	70 100	5 (small) 70 (medium) 100 (large) & BORH	40 km/h speed restriction 10 km/h speed restriction Supervise moves at 10 km/h speed restriction
Detail Fracture, Engine) Burn Fracture, Defective) Welds)	25 80 <100	5 (small) 25 (medium) 80 (large) 100	40 km/h speed restriction, fish plate within 20 days 40 km/h speed restriction & fishplate within 10 days 10 km/h & change out within 24 hours 10 km/h & supervise moves.

Defect	Length of Defect mm		If Rail Not Replaced Before Next Train Take This Action
	More Than	But Not More Than	
Horizontal split head) Vertical split head) Split web) Piped rail)	25 50 75 BORH*	50 75	60 km/h speed restriction 40 km/h speed restriction 10 km/h speed restriction Supervise moves at 10km/h
Head & Web Separating Bolt Hole Crack	0 20 45 BORH*	20 45 Over	60 km/h speed restriction 10 km/h speed restriction 10 km/h supervised
Broken Base	25 150	150	10 km/h speed restriction 10 km/h speed restriction & supervise
Ordinary Break Damaged Rail	-	-	10 km/h speed restriction & supervise 10 km/h speed restriction

* Broken Out Rail Head

Other rail defects which are not NDT related are to be reported to the Track & Structures Manager and recorded on the appropriate forms.

These defects would include heavy corrosion, (CSP/61); excessive wear, (CSP/32); wheelburns, shelling and other surface defects.

IMPLEMENTATION

This instruction will apply until Section 4.03 of the Railnet Code is reissued or until the expiry date above.

A P Walsh
MANAGER, TRACK & STRUCTURES ENGINEERING

NOTE: All T series Significant Information Notices, (SIN), are to be placed in the front of the Code or Code Supplement books as appropriate. They shall be stored in number order and removed when superceded or expired.