Report 01-108

express freight Train 842

derailment

Otira Tunnel

7 July 2001

Abstract

On Saturday 7 July 2001, at about 1900, express freight Train 842 derailed in the Otira Tunnel. The leading locomotive derailed 2 axles at a failed rail joint which had been installed as a temporary repair for a fractured rail found on Thursday 5 July.

There were no injuries.

Safety issues identified included:

- the suitability of the standards for temporary track repairs
- the frequency of inspection of temporary track repairs
- the monitoring and control of rail top wear in the Otira Tunnel
- the damp contaminated ballast condition throughout the tunnel
- the high percentage of down trains exceeding temporary speed limits
- the track standard required to meet the commercial demand of coal train loadings and the necessary minimum speed required to ascend the 1 in 33 tunnel grade.

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List of Abbreviations

kg	kilogram
km	kilometre
km/h	kilometres per hour
LE	locomotive engineer
LTSA	Land Transport Safety Authority
m	metre(s)
mm	millimetre (s)
Tranz Rail	Tranz Rail Limited

Data Summary

Train type and number:	express freight Train 842
Date and time:	7 July 2001, at about 1900
Location:	Otira Tunnel 124.248 km Midland Line
Type of occurrence:	derailment
Persons on board:	crew: 2
Injuries:	none
Damage:	minor
Operator:	Tranz Rail Limited (Tranz Rail)
Investigator-in-charge:	R E Howe

1 Factual

1.1 Narrative

1.1.1 On Saturday, 7 July 2001, Train 842 was a scheduled express freight loaded coal train from Ngakawau to Lyttelton.

1.1.2 The train consist from Otira to Arthur's Pass was locomotives DFT 7008, DX 5270, DX 5189 and DX 5500, all coupled in multiple, hauling 19 coal wagons and 5 cement wagons. The train weight was 1384 t with a length of 405 m.

1.1.3 In accordance with normal operating practice for the Otira Tunnel, 2 of the 4 locomotives were additional (banker) locomotives attached to Train 842 at Otira to provide sufficient motive power to ascend the 1 in 33 grade from Otira to Arthur's Pass. The pattern was for bankers to detach at Arthur's Pass and return light to Otira for further banking duties.

1.1.4 The train was crewed by a locomotive engineer (LE), accompanied in the cab by an additional LE to return the banker locomotives from Arthur's Pass to Otira.

1.1.5 Train 842 departed from Otira at about 1853 and once clear of the yard the LE advanced the throttle to notch 8 (maximum throttle), the standard procedure for ascending the long grade to Arthur's Pass.

1.1.6 Just over one kilometre into the tunnel the LE felt a kick in the track. He had felt a momentary kick at the same location on Friday 6 July and on early trips on Saturday 7 July, but had not reported them because track irregularities in the tunnel which could be felt in the cab as a kick were normal.

1.1.7 However, on this occasion the kick continued, and increased in severity until the LE could see his locomotive was derailed to the right side. He immediately notched back and let his train come to a stop on the grade. He then applied the brakes and left the locomotives running to maintain air pressure and thus ensure continued braking on the grade.

1.1.8 The LE then left the cab and inspected his train. He found two axles of the leading locomotive were derailed, and advised Train Control of the circumstances. Incidents such as derailments in the tunnel came under the Otira Tunnel Emergency Procedures Plan and this plan was activated by Train Control.

1.2 Site information

1.2.1 Train 842 came to a stop at 1900 at about 124.034 km Midland line, with the two axles of the leading bogie of the leading locomotive derailed 500 mm to the right side of the track. The locomotive event recorder from the leading locomotive was extracted for analysis.

1.2.2 Wheel damage to the sleepers and wheel flange marks on the right rail established the point of derailment at 124.248 km. This was at a joint in the left rail forming one end of a 4.2 m temporary closure rail which had been installed on Thursday 5 July 2001 to repair a rail fracture.

1.2.3 Figure 1 shows the relationship of the closure rail to the point of derailment. Figure 2 shows the east joint of the closure rail as found following the derailment, with Train 842 still straddling the joint.

1.2.4 The closure rail east joint had failed. One of the two bolts originally holding the fishplates had fallen out. The other bolt was in position but loose, allowing the fishplates[1] to splay. The foot of the closure rail was resting on the splayed end of the right fishplate causing the closure rail to sit proud of the tunnel rail by about 100 mm at the joint (refer Figure 1).

[1] Steel plates fitted to either side of abutting rails and bolted through the rails to join the rails together.

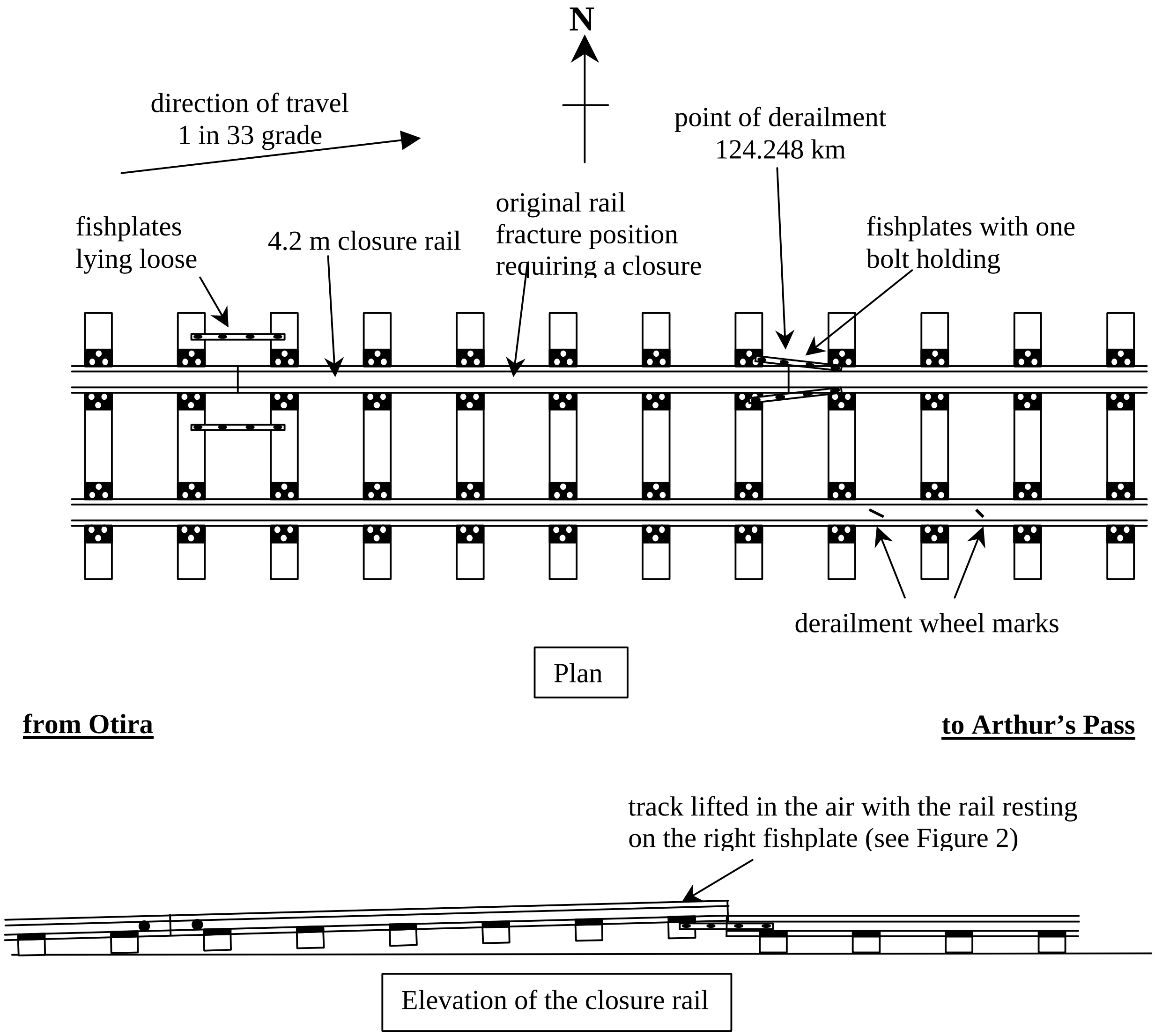

Figure 1
The temporary closure rail as found following the derailment

Figure 2
Two views of the closure rail east joint as found following the derailment
(Train 842 still in position)

1.2.5 The closure rail west joint had also failed. The fishplates and the 2 bolts were lying loose alongside the joint. Rail-to-sleeper fastenings still held the rail in vertical and horizontal alignment.

1.2.6 The point of derailment was at a wet spot in the tunnel, and overhead seepage had affected rail and fastening conditions. The wet ballast was contaminated by accumulated coal dust which had built up over the years. This contamination was present throughout the tunnel length.

1.3 Otira Tunnel information

1.3.1 The Otira Tunnel is 8.5 km long and on a uniform ascending grade of 1 in 33 from Otira at the west end, to Arthur's Pass at the east end. The track was replaced in the tunnel in 1981 with 50 kg/m rail on treated pinus radiata sleepers with pandrol bedplates. All joints were welded after relay, making rail throughout the tunnel continuous.

1.3.2 Up until 1997, all freight trains and the majority of passenger trains were hauled by 4 electric locomotives in multiple using a 1500v overhead direct current system. In 1997 electric operations ceased and full diesel operation commenced. Full diesel operation was introduced in conjunction with the installation of a door and fans at the western Otira portal.

1.3.3 The tunnel is fully lined with concrete and concrete blocks. Water leakage was extensive throughout the tunnel length. Although various schemes to prevent leakage onto the rails had been considered over the years, none had been actioned. A covered concrete box drain extended throughout the tunnel on the left side and carried a considerable volume of water. The floor of the tunnel was sloped towards this drain. The contamination of the ballast with coal dust inhibited the efficiency of the drain in some areas.

1.4 Temporary closure rail

1.4.1 A fractured rail was found at 0930 on Thursday, 5 July 2001, during a normal visual inspection of the tunnel by the track inspector. Such rail fractures in the tunnel were not uncommon. The track inspector recalled finding about 12 such fractures during the 16 months he had been involved in Otira Tunnel inspection, most of them at wet spots in the tunnel.

1.4.2 The track inspector noted that the worn pandrol bedplates between the rail and sleepers on each side of the fracture had been broken for some time, and that the track structure was loose and unsupported around the fracture.

1.4.3 He immediately applied clamped fishplates[2] to hold the rail together temporarily, contacted the ganger of the length, and briefed him on the poor condition at the fracture and on the need for urgent rail replacement. The tunnel already had a temporary speed restriction of 40 km/h in place for rail repair. 40 km/h was the appropriate speed for a temporary clamped rail fracture so the track inspector did not impose a further speed restriction.

1.4.4 The length ganger immediately arranged to replace rail at the fracture with a temporary closure rail. The rail he picked up was a second-hand length of 50 kg/m rail with one point of top wear. Loss of steel from a rail head was measured by a gauge which read points of top wear directly in mm. The top wear limit for 50 kg/m rail was 18 points. To avoid delay he picked the rail up before seeing the site and was therefore unaware of the top wear he was required to match up to in the tunnel.

[2]Clamped fishplates are temporary fishplates which are applied to the rails without bolts and held by screwed clamps which fix them to the rail.

1.4.5 The closure rail was installed on the afternoon of Thursday, 5 July. The ganger had to replace 5 broken bedplates in the immediate vicinity of the rail fracture. When installing the closure he found the tunnel rail head at the west closure joint was heavily worn (later measured as 17 points of top wear). The ganger had not had to deal with such a major vertical mismatch in a temporary closure rail before. His solution was to grind the closure rail head down progressively over a 400 mm length to match the tunnel rail as shown in Figure 3. The joint was fastened using 2 bolts per fishplate instead of the 4 required for a permanent joint. Two bolts was the code requirement for temporary closures to be welded at early date, in this case within one week. The bolts were tightened with a portable power tool to an unknown torque.

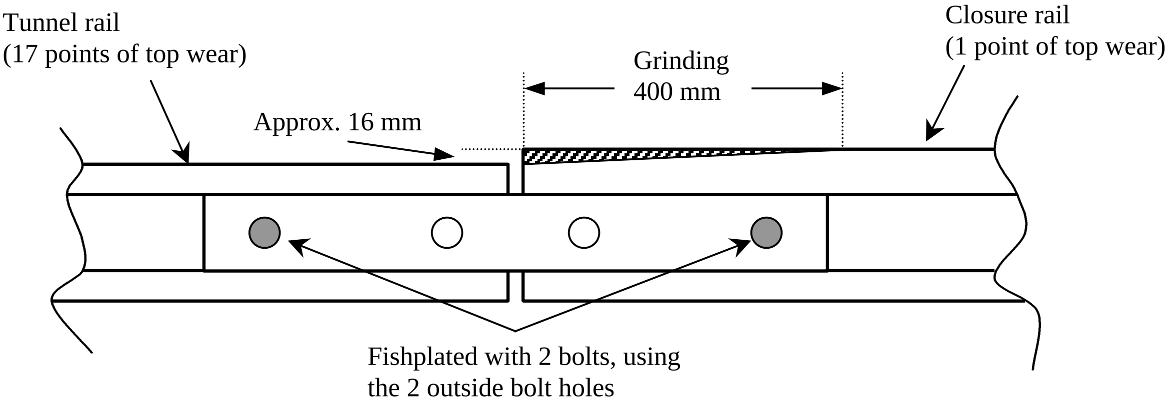

Figure 3
West closure joint detail

1.4.6 The ganger was aware of the 40 km/h speed restriction through the tunnel. As this was less than the defined 60 km/h for a rail less than 8 m in length, bolted at both ends and with 2 bolts per joint, the ganger did not need to impose any additional speed restriction to meet code requirements. There was no requirement for any additional inspection before the next track inspector inspection on Monday, 9 July. The closure was completed on 5 July.

1.4.7 During the repair work on 5 July the length ganger carrying out the repairs did not have a grinder and arranged for one to come from Greymouth. The Greymouth ganger who brought the grinder went into the tunnel and saw the installed closure before grinding started. He was concerned at the joint mismatch and the amount of grinding necessary. In his words "I wasn't too happy about it, the grinding was quite incredible, especially at the western end".

1.4.8 Although the Otira Tunnel was not apart of the Greymouth ganger's length, he was also chairman of the Greymouth branch of the Rail and Maritime Transport Union. In this capacity he spoke to both the track and structures manager Greymouth and the area manager Christchurch on Friday 6 July about his concerns and followed up with an email on the same day.

1.4.9 The Greymouth ganger's concerns, although prompted by what he had seen in the tunnel the previous day, related to the medium to long-term actions needed to deal with the tunnel track problem, and not to the short-term suitability of the particular temporary joints.

1.4.10 The code requirements covering the maintenance work to be carried out following the discovery of a fractured rail are included as Appendix 1 to this report.

1.5 Rail traffic over the temporary closure rail

1.5.1 The following traffic passed over the temporary joints between installation of the temporary closure on the afternoon of 5 July and the derailment at 1900 on 7 July:

- 9 up express freight coal trains[3]
- 4 up express freight general trains
- 3 up express passenger trains
- 4 down express freight trains
- 10 down empty coal trains
- 10 down banker movements
- 2 down express passenger trains.

DFT 7008, the leading locomotive on Train 842, had been used on freight and passenger trains as well as banker movements during this period.

1.6 Personnel information

1.6.1 The length ganger had 38 years track experience and had been Grade 1 ganger for the length including the Otira Tunnel for 12 years. He was appropriately certified for Grade 1 ganger duties.

1.7 Otira Tunnel rail condition review

1.7.1 Tranz Rail had become aware of a possible increase in the number of rail faults and failures in the tunnel and in October 2000 had commissioned an internal report to look at rail condition. This report covered all aspects of the track and tunnel structure affecting track safety, and included under the heading "Risk":

> While maintenance of rail continues on an ad hock basis as today, with little effective reporting and data capture systems there is an increased risk of failure which will significantly affect the operation of the route as well as the potential safety related issues. There are maintenance related issues identified in this tunnel and they require to be given some level of importance over the similar items in a more open, yielding and less isolated environment.

1.7.2 The Land Transport Safety Authority (LTSA) had received a copy of the report as part of its audit function and in February 2001 requested details of the proposed remedial strategy, its timetable, and its completion date.

1.7.3 Tranz Rail produced an action plan covering the remedial work and its timing. Work was currently in hand, with the LTSA monitoring progress on the plan through the audit process.

1.7.4 Rail faults and failures can be detected either visually or ultrasonically. With Tranz Rail visual inspection occurred mainly during the twice weekly inspections made by the track inspector. Tranz Rail supplied the following figures for cracked or broken rails found visually in the Otira Tunnel over the last 3 years:

1999	4
2000	2
2001 to July	8

1.7.5 Tranz Rail had intended ultrasonic rail inspection of the Otira Tunnel to be carried out every year. This had been achieved recently, except for 1999 when the ultrasonic inspection car was damaged in a collision. Tranz Rail supplied the following table giving inspection dates and the number of defects found per kilometre for the Otira Tunnel, the Midland line, and the New Zealand average:

[3] On the Midland Line up trains were those travelling from west to east, and therefore ascending the grade through the tunnel.

	October 1997	December 1998	1999	August 2000
Midland Line	0.68	0.26	not tested	not tested
Otira Tunnel	0.12	Nil found	not tested	2.5
National Average	0.89	0.26	0.42	0.47

Tranz Rail had no code requirement for frequency of ultrasonic inspection.

1.7.6 Broken rails can also be detected electrically in track-circuited areas. However, due to the contaminant build-up in long tunnels the rails are effectively coupled electrically over a relatively short distance creating practical difficulties for reliable track circuiting. For this reason the Otira Tunnel was not track-circuited and used axle counters to monitor train movements. The Kaimai Tunnel was converted to axle counters for the same reason. In neither case can broken rails be detected electrically. Tranz Rail was investigating the capability of the existing signalling communications system and the modifications required to give information on rail breaks (refer to section 4.2).

1.8 Otira Tunnel emergency procedures

1.8.1 Since 1997, the Tranz Rail Working Timetable had included a section covering operation of the Otira Tunnel, with particular emphasis on the ventilation system and emergency procedures. Tranz Rail have recently been reviewing all major tunnel procedures and producing integrated emergency procedures covering internal operations and external interfaces such as with Police and other emergency services. The procedures for the Otira Tunnel were completed and introduced on 1 June 2001. The finalisation and testing of these procedures is being monitored by the LTSA as part of its audit process.

1.8.2 Because this incident was the first since completion of the procedure, and possibly the first derailment to have occurred in the tunnel, the investigation included a review of the tunnel emergency procedures. The following key points were established:

- the incident was classed as a tunnel emergency by Tranz Rail
- the tunnel ventilation system was immediately activated to maintain air quality
- the train crew and the track staff member who brought them out of the tunnel some 60 minutes after the derailment were appropriately equipped with respirators, although these were not required
- the Police control was not requested to activate the "Otira Tunnel Emergency Procedure" as required by the procedures.

1.8.3 Tranz Rail initiated a debrief following the incident. The debrief showed that the nature and timing of the response had met expectations, although areas for improvement were identified and actioned.

2. Analysis

2.1 The derailment

2.1.1 The derailment was caused by the failure of the temporary bolted closure rail installed to replace a fractured rail. Analysis of the event recorder output showed Train 842 was travelling at 35 km/h when the derailment occurred. The previous up movement was express passenger Train 802 an hour earlier, which passed over the temporary bolted closure at about 46 km/h. The fact that a train derailed in a tunnel due to track condition on a line frequently travelled by passenger trains was a significant factor in the commission deciding to investigate this incident. Had the failure occurred one hour earlier during the passage of the passenger train the potential consequences for rail safety would have been greater.

2.2 Rail failure

2.2.1 The fractured rail which was found on 5 July was a track defect that could be expected to occur from time to time and had defined procedures to deal with it. Suitable procedures correctly applied would have avoided the derailment.

2.2.2 The significance of the recorded rail failures in the tunnel was their frequency, and the related risk exposure in a long tunnel carrying passenger traffic. Figures supplied, and anecdotal evidence, suggested both the number of defects per year and the number of rail breaks per year in the tunnel were rising. Work already carried out, or proposed, arising from the action plan developed from the recent review of track condition in the tunnel should address this issue.

2.3 The joint failure

2.3.1 The main reason for the failure of the west closure joint was dynamic loading from the particular tunnel rail traffic pattern, accentuated by the dip in the rail head profile caused by grinding to a depth of 16 mm maximum over a 400 mm length. The dynamic loading would have been exacerbated by the poor ballast support. Once the west joint had failed, the rail movement available caused the east joint failure, which then initiated the derailment. It is unlikely that the 100 mm vertical displacement of the rails at the east joint was present when the down bankers passed over the joint about 30 minutes before the derailment.

2.3.2 Although the precise mechanics of the derailment could not be established it is likely that the vertical rail displacement occurred when the east end of the closure rail lifted as the leading axle of Train 842 passed over the failed west joint. This could have let the fishplate enter under the rail foot at the east joint. The resulting twist transmitted to the locomotive as the leading axle then negotiated the high east joint would have induced a derailment to the right. However, the condition of the closure rail joints was such that a number of dynamic rail/wheel interactions could have a initiated a derailment.

2.3.3 The 40 km/h temporary speed restriction through the tunnel had been imposed for rail repairs in recognition of the conditions identified in the October 2000 report. An uphill speed restriction significantly less than 40 km/h could not be placed inside the western end of the tunnel without resulting in decreased train loading. A speed of about 30 km/h was the minimum required outside the western end of the tunnel to allow the current loaded coal train consist to negotiate the grade without stalling or experiencing excessive wheel slip. Rail defects and failures from wheel burns in the railhead as a result of wheel slip had been an ongoing problem since full diesel operation came into effect.

2.3.4 Comparison of the train control diagram and the event recorder output from DFT 7008 showed that DFT 7008 was part of the motive power for all 16 up movements and for 16 of the 26 down movements, including the 10 returning banker movements, that had passed over the closure rail before the derailment.

2.3.5 Analysis of the event recorder output from DFT 7008 showed the following pattern of speeds through the tunnel during this period:

Up movements

- all 9 loaded coal trains and 4 freight trains were within the speed restriction
- 2 of 3 passenger trains reached maximum speeds 25% above the speed restriction.

Down movements

- 6 of 10 banker movements were made at maximum speeds of 10% to 30% above the speed restriction
- 2 of 5 empty coal trains reached maximum speeds of 30% and 60% above the speed restriction.

2.3.6 The speed at the point of derailment was generally less than the average speed through the tunnel, as most down trains reduced speed approaching the west portal. The approximate average speed of the 10 trains exceeding the temporary speed restriction was 48 km/h throughout the tunnel but 45 km/h at the point of derailment.

2.3.7 This analysis covered a 51-hour period and showed a general level of non-compliance with temporary speed restrictions by down trains. As a result the temporary closure rail was not only subjected to the high dynamic loading from loaded up coal trains travelling at their maximum practical speed of about 35 km/h in this area, but also from down trains with 16.2 t locomotive axles, travelling at speeds up to 30% above the speed limit.

2.3.8 Additional impact loading was applied to the joint due to the dip in the rail top profile caused by the rail head grinding. This created a shock loading for the west closure joint as each axle passed over it, with vertical movement permitted by the general track condition adding to the effect of all loadings.

2.4 Speed restrictions

2.4.1 The 40 km/h temporary speed restriction in effect was lower than the defined 60 km/h temporary speed restriction for a 2 bolt per joint temporary closure rail (refer Appendix 1, clause 882). However, the track condition at the joint, and the amount of grinding carried out to match rail heads, meant this defined limit was not appropriate for circumstances on the day.

2.4.2 Local track staff were able to exercise judgement in specific situations and impose temporary speed restrictions in the standard range from 10 km/h up, and a common speed restriction for track condition was 25 km/h. However, although a temporary speed restriction of less than 40 km/h was theoretically possible, it could not be implemented practically at the site of the closure rail without a reduction in train loadings. Train loadings had been a factor considered by Tranz Rail when setting the temporary speed restriction of 40 km/h for rail repairs. Given such specific instructions it is understandable that local staff did not consider it necessary to impose a lower speed restriction for a temporary repair that had become common practice.

2.5 The closure rail

2.5.1 The installation of the closure rail was a standard maintenance practice and had been used in the tunnel frequently to replace broken or damaged rail. The unusual factor on this occasion was the difference in rail top wear due to the heavily worn tunnel rail. The ganger was not expecting such a difference and had not encountered such a mismatch previously. The problem was not appreciated until the closure rail was installed, and grinding then became the only option for reinstating traffic without major delay.

2.5.2 The Tranz Rail code requirements (refer Appendix 1) made 2 references to correcting differing top wear. Clause 440 referred to using "an approved method of rail end welding and grinding" and clause 513 to "vertical mismatch must be corrected by grinding or welding prior to the passage of a train". Grinding to eliminate top wear difference was therefore permitted, but no standards or limits were defined. In this case, the top wear difference caused excessive shock loading from traffic over the joint in spite of the ganger's attempts to grind it.

2.5.3 The general track condition in the Otira Tunnel, the heavy traffic, and the practical speed restriction which could be imposed without disrupting operations made temporary closure rails less tolerant to variations such as mismatched rail sections and time in the track before permanent repairs were carried out, and justified more frequent inspection than the normal 4-day interval. The Tranz Rail procedures did not recognise this, and the ganger believed that the 40 km/h temporary speed restriction gave sufficient protection to the joint until the next inspection. Tranz Rail have since amended procedures and temporary closures in the tunnel now require 4 bolts per joint and daily inspection.

2.5.4 The concerns expressed by the Greymouth ganger prior to the derailment did not prompt immediate action which may have avoided the derailment. Although initiated by concern at the extent of the grinding, the thrust of the representation was the medium to long-term strategy for dealing with the tunnel track condition. The fact that no immediate action was taken does not indicate a lack of appropriate action from the staff to whom these concerns were expressed.

2.6 Otira Tunnel track condition

2.6.1 The overall condition of track in the Otira Tunnel was the initiating factor which eventually led to the incident. However, the inspection system had found and responded to the defect, and it was the appropriateness of the temporary remedial work that was the prime cause of the derailment. Tranz Rail had already taken action to define the extent of the tunnel problem, and action has since been taken, or is proposed, which will address the overall track condition issue (refer section 4.2).

2.7 Otira Tunnel emergency procedures

2.7.1 This investigation, and the Tranz Rail internal debrief, prompted some minor amendments to the emergency procedures as detailed in section 4.1.4. Although the Police control section of the procedure was not activated, this was appropriate in the circumstances. The main change to the procedure now gives Tranz Rail the opportunity to evaluate known information and not activate external emergency services when the safety of the public or staff is not at risk.

3. Findings

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

3.1 Train 842 derailed when 2 temporary joints holding a closure rail failed under load.

3.2 The operation of the train did not contribute to the derailment or its severity.

3.3 The rail joint details were inappropriate for the speed and nature of the rail traffic that travelled over them over a 51-hour period.

3.4 The joint failures were caused by a combination of:

- impact loading due to localised rail head grinding to match rail height
- vertical movement permitted by the loose rail-to-sleeper fastenings and the wet contaminated ballast.

3.5 Failure of the temporary rail joints was brought forward by excessive dynamic loading due to a high level of non-compliance with temporary speed restrictions by down trains.

3.6 The procedures in place to control the standard of temporary repair work in the Otira Tunnel did not give due consideration to the practical speed restrictions possible to meet commercial operating demand, the general condition of the track in the tunnel, and the risk exposure associated with passenger traffic through the tunnel.

3.7 Improved procedures are required to enable defects and temporary repair work to be managed as part of the Tranz Rail safety management system until planned upgrading of the Otira Tunnel track reduces the risk exposure associated with track condition.

3.8 The Otira Tunnel Emergency Procedures plan adequately met the demands of this incident.

4. Safety Actions

4.1 On 8 October 2001, Tranz Rail advised that:

4.1.1 The following changes have been proposed for inclusion in T:200, Infrastructure Engineering Handbook:
Clause 516 "or as shown in Table 7" is added at the end of the clause.
Changes are proposed to clause 522 and Table 7 (Page 77) that relate to rail mis-match or joints out of line. These have not yet been finalised.
Table 7 (Page 77) title now: SPEED RESTRICTIONS FOR TRACK DEFECTS and TEMPORARY WORKS

4.1.2 Further information is being requested for any rail failures. This includes:
All details required on M 58A – include bedplate and fastening condition.
Rail headwear at failure.
Distance to nearest weld.
Best possible description of rail ends – photo even better.
All failures must be marked to show where they came from.
ASAP spray rail ends of failures with CRC and keep inside.

4.1.3 The following instructions [relating to the Otira Tunnel] have been given to the staff:
Installation of closure rails:
Rail failures will be repaired with a 4.3 m closure. Closure joints shall be immediately welded in place if welding resources are available. Otherwise, the joints will be plated and four bolted. When welding can be undertaken the 4.3 m closure will be replaced with a 6.3 m closure and immediately welded. The 4.3 m closure can then be reused at another location. Emergency joggle plates and any bolted joints shall be inspected daily.

4.1.4 The Otira Tunnel emergency procedures were amended on 1 September 2001. Three changes were made to the Train Control action flow chart:
The action required when a tunnel alarm is received and an emergency situation does not exist was clarified.
Two side notes were added to identify that the exact location of a train may not always be known.

4.2 The original 12 point Otira Tunnel track condition action plan arising from the October 2000 report had expanded to a 16 point action plan by October 2001. Tranz Rail supplied an update as at 1 October 2001 that showed action on 8 points was complete and that linked progressive action on the remaining 8 items was proceeding to program. The LTSA is monitoring progress on this plan as part of the audit process.

4.3 The Tranz Rail debrief of the incident on 16 July 2001 identified the possible need for an uphill 25 km/h temporary restriction in the tunnel, and the related need to reduce tonnage. As a result bulletin 594 was issued on 6 August 2001, which stated:

Note: Temporary Speed Restriction: Otira – Arthur's Pass Up Trains:
Unless specially required temporary speed restriction will not be less than 30 km/h approaching Bridge 50 as required in Instruction 2.4.2. Should there be a need for the temporary speed restriction to be less than 30 km/h advice is to be obtained from the Locomotive Asset Manager, Engineering Services,…re reduction of train tonnages.

4.4 On 19 October 2001, Tranz Rail advised the Commission that the Locomotive Operations Manager was required to carry out random audits of locomotive event records from banking locomotives operating between Otira and Arthur's Pass. It has taken place and will be ongoing, and that 5 extractions covering one week each were reviewed and no significant issues detected. Additionally, Locomotive Operations Manager briefed Locomotive Engineers on the speed issue. The above results indicate compliance has improved as a result of this briefing.

4.5 The actions taken by Tranz Rail have either addressed the safety issues identified or will address them within the action plan being audited by the LTSA, and no safety recommendations have been made arising from this investigation.

Approved for publication 05 February 2002

Hon. W P Jeffries
Chief Commissioner

Appendix 1

Code requirements

Rail

General

437. Closure rails must be a minimum of 4 m where these are welded or 6.4 m where they are to be bolted each end. Glued insulated joint plugs may be supplied and installed in lengths less than 4 metres.

440. Replacement rail should not be transposed when installed without authority of the Manager. Bring rails of unequal wear or of different sections to an even surface and gauge at joints by use of:

a) Union joints of the correct design. (temporary only)
b) An approved method of rail end welding and grinding.
c) An approved method of union field welding.
d) The installation of union rail of correct sections.

443. Bolt holes may be excluded in CWR or situations where a rail will be immediately welded.

Defective Rail

503. 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 Table 5 is initiated.

It is the policy of the Company to remove all defective rails within 60 days from date of detection.

Rail Joints

513. Bolted rail joints consist of standard, non-glued insulated joints and union fish plates held in position by track bolts having a tension sufficient to firmly support abutting rail ends. Bolted joints with vertical or gauge mis-match must be corrected by grinding or welding prior to the passage of a train.

516. In jointed rail territory all fishplated, and in CWR territory all non-glued insulated fishplates, must be secured with the full number of proper sized bolts.

522. Maximum allowable end batter in a joint must be measured with a 1 m straight edge placed centrally over the joint.

Table 6: Joint Batter and Mismatch Limits

Limits for batter and mismatch are:

Speed category	Total batter and Dip (mm)	Horizontal Mis-match (mm)
1,2[4]	**6**	**1.5**
3,4	**10**	**3**

528. Track fitted with emergency fishplates or clamps at a rail break must be speed restricted to 40 km/h when clamped or 60 km/h if bolted. Refer speed restriction section.

Speed Restrictions

881. Speed restrictions are required to manage the safety of the operation.

882. The appropriate speed is determined using Table 7 or by Track & Structures Managers and/or Gangers based on their knowledge of the Line Classification, track condition, site and normal line speed.

Table 7: Speed Restrictions For Track Defects5

Feature	Speed (km/hr)	Speed (km/hr)
Rail – broken rail or weld (not plated)	10 (Supervised)	
Clamped fishplate at break	40	60 (if bolted)
Fishplates with 2 bolts & bolted both rail ends; where rail < 8 metres	60	
Fishplates < 4 bolts > 8 metres	At T & S Mgrs discretion	

[4] The Midland Line was in this speed category
[5] Tranz Rail advised this Table also applied to track under repair and the Handbook has been amended to reflect this.