

**Report 07-110, collision, express freight Train MP2 and Work Train 22, Ohinewai,
19 June 2007**

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.



Report 07-110
collision
express freight Train MP2
and
Work Train 22
Ohinewai
19 June 2007

Abstract

On Tuesday 19 June 2007 at about 1105, express freight Train MP2 was travelling between Huntly and Te Kauwhata when it struck a gantry crane from Work Train 22. Work Train 22 was stationary and was working on the adjacent Down Main line with its cranes fouling the Up Main line. The gantry swung around and struck one of the crane operators, knocking him from the wagon and under the passing train. The operator was fatally injured.

The safety issues identified included:

- the unfamiliarity of staff working in double-line territory
- the absence of an appropriate induction for the person-in-charge and the rail recovery unit operators prior to working in double-line territory
- the absence of a hazard analysis and task briefing prior to starting work on the day
- the absence of any worksite protection on the adjacent main line
- unclear procedures regarding the application of appropriate protection rules
- the level of auditing or regulatory oversight of the safety system.

Seven safety recommendations covering these issues have been made to the Chief Executive of the New Zealand Transport Agency (formerly Land Transport New Zealand).

Contents

Abbreviations	iii
Data Summary	iv
1 Factual Information	1
1.1 Narrative	1
1.2 Site information	5
1.3 Approved Code of Practice for Cranes	7
1.4 Train information	7
The train control diagram	7
Hi-rail vehicle 46285 and MP2	7
1.5 WT22 and rail recovery unit information	8
1.6 Rail recovery unit personnel	10
The person-in-charge	10
The section length ganger	11
Operator EWR387	12
Operator EWR237	12
Operator EWR346	12
Operator EWR102	13
Operator EWR143	13
Operator EWR171 (deceased)	14
1.7 Locomotive engineers	14
Locomotive engineer WT22	14
Locomotive engineer on the ground	14
Locomotive engineer of MP2	15
1.8 The train controller	15
1.9 Off-site personnel	16
The area manager	16
Field engineer renewals	16
1.10 Staff certification and induction procedures	17
1.11 Form 5 Application for Work Train	17
1.12 Job plan book	18
1.13 Ontrack's safety observation procedures	18
1.14 External assessments	19
1.15 General rules	20
1.16 Methods of protection	20
Track and Time permit (Mis 60) protection	21
Foul Time protection (Mis 70a)	21
1.17 Train control audio recorder	22
1.18 Locomotive event recorder	23
1.19 Survey of track workers	23
General comments	23
1.20 Rule 915 Trolleys and Hi-Rail Vehicles – Requirements for On Track Movement (Mis 71)	24
1.21 Rail regulatory framework in New Zealand	24
Recent rail history	24
Licensing of the rail industry by Land Transport New Zealand	25
Safety case	25
Safety system	26
Management responsibility	26
Occupational safety and health	28
1.22 The Ministerial Inquiry into Tranz Rail Occupational Safety and Health, August 2000 (referred to as the Wilson Report)	28
Introduction	28
Which agency should enforce health and safety?	29

	Documented safety systems	29
	The approved safety system	29
	Scope	29
	Content	30
	Attitudes and influences	30
1.23	Human factors in transport safety.....	30
	Extracts from “Human Factors in Transport, 2005”, a paper by Dr Rob Lee	30
	Transport safety	30
	Human factors	30
2	Analysis	31
	Site protection.....	32
	Communication and crew resource management.....	36
	Induction and training.....	38
	Safety observations/external audits	38
	Speed of trains through work sites	39
	Manning of track gangs	39
	Regulatory framework and independent overview.....	40
3	Findings	41
4	Safety actions.....	42
	Operations in Focus issue 0737.....	42
	Form 5 Application for Work Train	43
	Job plan form.....	43
5	Safety recommendations	44

Figures

Figure 1	WT22 status as MP2 approached and passed (not to scale)	4
Figure 2	North from Bridge 278 towards the work site.....	5
Figure 3	Track, gantry and locomotive clearances at the collision site (not to scale)	6
Figure 4	Locomotive cab forward window of MP2 after impact (photo courtesy New Zealand Police)	6
Figure 5	Examples of hand signals	7
Figure 6	The rake of EWR wagons	9
Figure 7	Work area if Rule 905 protection had been in place on the Up Main line (not to scale)	21
Figure 8	Locomotive event recorder data incorporated into site diagram (not to scale)	23
Figure 9	Ontrack’s approved Rail Safety System.....	27
Figure 10	Track occupancy protection matrix	34

Abbreviations

km	kilometre(s)
km/h	kilometre(s) per hour
m	metre(s)
mm	millimetre(s)
MP2	express freight Train MP2
MP30	Train MP30
Toll Rail	Toll NZ Consolidated Limited
UTC	coordinated universal time
WT22	Work Train 22

Data Summary

Train types and numbers:	express freight Train MP2 (MP2) Work Train 22 (WT22)
Date and time:	19 June 2007, at about 1105 ¹
Location:	583.010 kilometres (km), Ohinewai (between Huntly and Te Kauwhata), North Island Main Trunk.
Persons on board:	WT22 locomotive crew: 2 rail recovery unit staff: 7 MP2 locomotive crew: one
Injuries:	WT22 locomotive crew: nil rail recovery unit staff: one fatal MP2 locomotive crew: nil
Damage:	minor damage to locomotive of MP2 and 2 rail recovery unit cranes damaged
Operators:	Toll NZ Consolidated Limited (Toll Rail) New Zealand Railways Corporation (Ontrack)
Investigator-in-charge	D L Bevin

¹ Times in this report are New Zealand Standard Time (UTC + 12) and are quoted in the 24-hour mode.

1 Factual Information

1.1 Narrative

- 1.1.1 On Tuesday 19 June 2007, WT22, consisting of a DC class locomotive and 6 EWR class rail recovery wagons making up the rail recovery unit, was scheduled to pick up used rail from both sides of the Down Main line between Te Kauwhata and Huntly on the North Island Main Trunk line. WT22 was crewed by 2 locomotive engineers. The work gang joined WT22 at the work site.
- 1.1.2 At about 0720, WT22 departed from Te Rapa and travelled north, long-hood leading², on the Up Main line to Te Kauwhata, arriving at 0810. The locomotive ran around the rake of EWR wagons and coupled onto the south end in readiness for travelling back to the work site on the Down Main line.
- 1.1.3 At 0736 the train controller contacted the person-in-charge³ of the rail recovery work by telephone and requested information on the location of the work site, the work to be done and the approximate time required. The person-in-charge responded that the work site was at Ohinewai and that the work involved recovering rail from alongside the Down Main line, but at that time he was not yet sure of the exact metrage they would be working at. He was shortly to meet the length ganger who was aware of the location of the rail to be lifted, and said he would contact the train controller in about 15 minutes with that information. The train controller told the person-in-charge that he would advance WT22 to Ohinewai and await further instructions.
- 1.1.4 At 0808 the person-in-charge contacted the train controller and advised that he was at 583.6 km and would be doing the rail pick-up off the Down Main line while working towards Huntly. The person-in-charge then asked when was the best gap between train movements to give the maximum time to undertake the work. The train controller and the person-in-charge agreed that a 2-hour gap after Train MP3, a southbound express freight service on the Down Main line, would be the most convenient before the next expected train movement on that line.
- 1.1.5 The train controller contacted the locomotive engineer and instructed him to meet the rail pick-up gang at 583.6 km. Before WT22 departed from Te Kauwhata the train controller also requested a check call from the work site at midday, at which time he would update them on movements on the Down Main line. The locomotive engineer acknowledged the instruction. Train MP3 passed through Te Kauwhata on the Down Main line at 0912 and WT22 departed behind it at 0920.
- 1.1.6 After WT22 arrived at the work site at about 0925, the length ganger contacted the train controller and said he was working with the person-in-charge and requested information regarding train movements on the Up Main line. The train controller advised him that MP2 was due in the area at about 1100 and would probably be the next movement on the Up Main line. The length ganger did not pass on this information to the person-in-charge.
- 1.1.7 At the start of the rail pick-up, the second locomotive engineer on WT22 left the locomotive cab and stood on the ground, almost opposite the locomotive cab and between the Up Main line and State Highway 1, which ran parallel to the railway lines (see Figure 1). He had a portable radio to communicate with the locomotive engineer in the cab for when the person-in-charge required the work train to be moved.

² The long hood was the non-cab end of a locomotive that housed the diesel motor and associated electrical equipment.

³ The person responsible for the safe operation of a work area.

- 1.1.8 The locomotive engineer of WT22 was sitting on the right-hand side of the locomotive cab, nearest to the Up Main line, and he could see the cranes operating behind him as they lifted rail from between the main lines. He became concerned as he watched the rail recovery unit gantries swing towards the adjacent main line, so at about 0945 he called train control and asked for information on expected train movements on the Up Main line. He was told that there was a train due at about 1100 and that the gang was aware of it. The locomotive engineer acknowledged that and took no further action.
- 1.1.9 At about 1045, after he had positioned WT22 for the next rail lift, the locomotive engineer telephoned the signal box controller at Te Rapa signal box⁴ and asked if any trains had passed there. He was told that a train was passing through Ngaruawahia on the Up Main line at that time and the locomotive engineer estimated that it would be approaching the work site in about 15 to 20 minutes. He later said he did not think the signal box controller used the train identification number during their conversation.
- 1.1.10 About 10 minutes later, the locomotive engineer of WT22 overheard a ganger near Huntly call train control on the radio channel. The ganger advised that Train MP30 (MP30) had passed him and requested time on-track for his hi-rail vehicle to follow the train on the Up Main line to 577.00 km. The locomotive engineer heard the train controller confirm with the ganger that MP30 had passed before the requested on-track movement was authorised⁵. The train was in fact MP2, not MP30.
- 1.1.11 The locomotive engineer realised that what he thought was MP30 was nearing the work area, so he tried to contact the locomotive engineer on the ground to advise him of the approaching train. He got no response from him, although he could see that the locomotive engineer on the ground had the radio in his hand. The locomotive engineer of WT22 was satisfied that the radios were working correctly because there had been no communication difficulties when they had repositioned the work train a short time previously. He said he thought the locomotive engineer on the ground had probably not heard him because of the noise from the work site and the adjacent roads.
- 1.1.12 He thought it was just before 1100 when he saw MP2 approaching from about one kilometre away, and contacted the locomotive engineer on the ground by radio to warn him. The locomotive engineer on the ground responded this time and told the locomotive engineer in the cab to contact the locomotive engineer of the approaching train and instruct him to proceed slowly past the work area. The locomotive engineer of WT22 radioed the locomotive engineer of the approaching train by using radio call sign "Train MP30", but there was no response.
- 1.1.13 The locomotive engineer of approaching train MP2 heard the call to MP30, but as he was driving MP2 he did not respond. He saw a train on the Down Main line after he rounded the curve. He was aware that a work train was working in the area, but the bulletin defined the work train's working rights as between Huntly and Te Kauwhata, so he was expecting to see it anywhere between those locations. When he did see it, he did not initially recognise it as the work train, thinking instead that it was a southbound freight train approaching. However, as he got closer he saw a man on the ground near the train and realised that in fact it was the work train. He sounded the locomotive whistle to warn them of his approach and continued at the authorised line speed of 80 kilometres per hour (km/h).

⁴ The signal box operator remotely controlled the signals for trains crossing the single-line bridge at Ngaruawahia and was aware of the location of trains by indications on the signal panel.

⁵ The train control audio recorder timed this call at 1058.

- 1.1.14 The locomotive engineer of WT22 tried to determine if the approaching train was slowing, but he could not see any dust or debris coming from the wheels, which would have indicated a brake application. From front-on he found it difficult to ascertain if the train was slowing or not. He saw the locomotive ditch lights begin to flash, which suggested to him that the locomotive horn had been sounded, although he had not heard it. The train was about 500 to 600 metres (m) away when he looked to the locomotive engineer on the ground and heard him yelling at the gang to warn them while hand signalling the approaching train to slow down.
- 1.1.15 The person-in-charge and most of the crane operators were by now aware of the train. As the locomotive engineer of WT22 looked back, he saw 4 of the extended cranes pulled clear of the adjacent line. However, the crane immediately behind his locomotive and the last crane in the rake were foul of the Up Main line as the locomotive of MP2 passed his locomotive cab window.
- 1.1.16 The locomotive engineer of MP2 had seen the person on the ground giving him caution hand signals and had made a brake application to slow the train. He thought he was about 450 m from the work train when he made the brake application, and from there he could see that the gantries were still rotated towards the Up Main line, although he initially thought they were clear of the Up Main line. When he realised that they weren't, and that his locomotive cab was going to strike the first of them, he jumped out of his seat and positioned himself for the impact in the middle of the cab behind the control panel. The locomotive cab window was shattered when the locomotive collided with the first gantry. After the locomotive had struck the second gantry, the locomotive engineer returned to his seat and brought the train to a stop. He was initially unaware there had been an accident involving a crane operator.
- 1.1.17 The person-in-charge had been standing between the Up Main and Down Main lines, between EWR346 and EWR102, while directing the rail lifts (see Figure 1). The operators wore hearing protection in the form of ear defenders because of the noise from the petrol-driven crane engines, so communication between him and the operators was by hand signals only.
- 1.1.18 During a lift, the rail-end near crane EWR387 had become jammed under another length of rail and been returned to the ground. While the person-in-charge was undoing the rail clamps attached to cranes EWR346 and EWR102 to readjust them, Operator EWR387 climbed down from his crane and also attempted to free the jam. The person-in-charge then looked up and saw the headlight of an approaching train about 500 m away. He yelled to the operators and motioned with his hands for them to "pull their cranes in". Cranes EWR237, EWR346, EWR102 and EWR143 were manoeuvred clear of the Up Main line before the train reached them, but crane EWR387 was still foul because the operator was on the ground. The gantry was stuck by the passing locomotive.
- 1.1.19 Operator EWR171, who was working on the last wagon of the rake, had his back to the person-in-charge, the other crane operators and the approaching train. Because of this and the hearing protection he was wearing, the person-in-charge could not attract his attention. The person-in-charge could see by the actions of Operator EWR143, who was the closest to Operator EWR171, that he was also trying to attract the attention of Operator EWR171 but without success. The train was only metres away from the person-in-charge when he dived across to the opposite side of the rake and out of the way.
- 1.1.20 The gantry on crane EWR171 was struck by the locomotive of MP2 and rotated several times. It hit the operator in the back on its first rotation and knocked him off the wagon into the passing train. He was fatally injured.
- 1.1.21 The locomotive engineer on WT22 radioed train control immediately to advise him of the accident and requested emergency services to attend.

1.2 Site information

- 1.2.1 WT22 had commenced work at 583.60 km and had moved about 520 m south, picking up rail as it did so, before the collision, which occurred at 583.010 km between Te Kauwhata and Huntly.
- 1.2.2 State Highway 1, a major 4-lane expressway, ran adjacent to the railway on the western side, while a major secondary road ran adjacent to the railway on the eastern side.
- 1.2.3 On any week day, 38 trains were scheduled through Ohinewai in a 24-hour period, 19 on each of the Up and Down Main lines. Of these, 10 trains were scheduled on the Up Main line and 5 trains were scheduled on the Down Main line between the hours of 0700 and 1600, the hours for WT22.
- 1.2.4 The maximum authorised line speed for express freight trains through the area was 80 km/h. There were no speed restriction or protection procedures in place for trains on the adjacent Up Main line while passing through the work area.
- 1.2.5 The northbound approach to the work site was a 1040 m radius curve beneath overhead Bridge 278 (see Figure 3) at 581.90 km. Bridge 278 was 1100 m before the collision site.
- 1.2.6 The measurement between the track centre lines of the main lines at the accident site was 3657 millimetres (mm). The outer profile of the DX locomotive cab extended to 1359 mm from the track centre line and the gantry arm, when rotated towards the Up Main line, measured 2620 mm from the track centre line. Figure 4 shows the locomotive cab profile and crane gantry clearances.

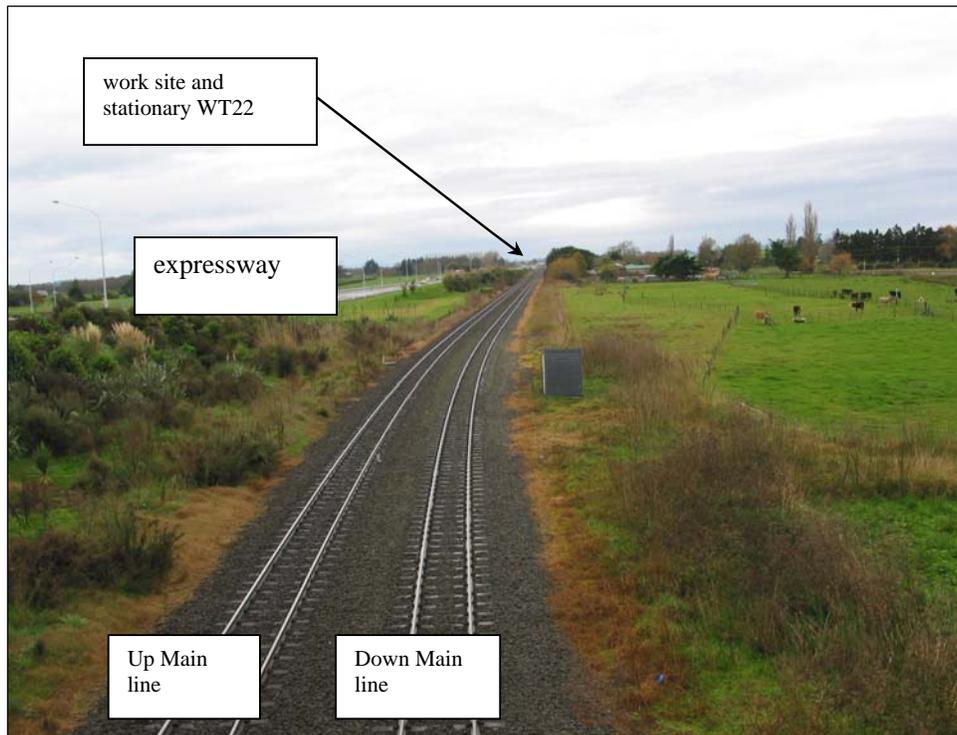


Figure 2
North from Bridge 278 towards the work site

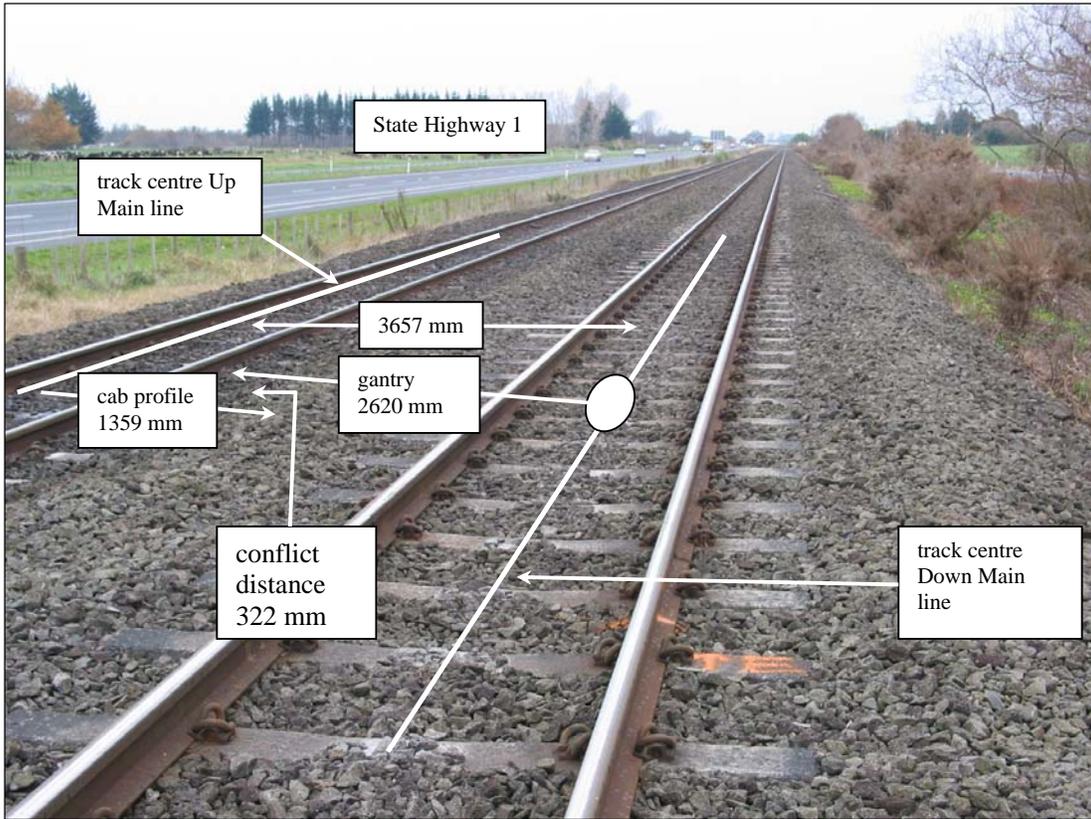


Figure 3
Track, gantry and locomotive clearances at the collision site
 (not to scale)



Figure 4
Locomotive cab forward window of MP2 after impact
 (photo courtesy New Zealand Police)

1.3 Approved Code of Practice for Cranes

- 1.3.1 Ontrack did not have an approved code of hand signals for use with the rail recovery unit. The use of hand signals was considered by Ontrack to be an informal process that was used by some persons-in-charge but not all.
- 1.3.2 The Approved Code of Practice for Cranes issued by the Department of Labour stated in part that both the Health and Safety in Employment Act 1992 and the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 required persons operating plant to be competent and employers to be able to provide evidence that their crane operators had the skills, knowledge and experience necessary to operate their cranes safely.
- 1.3.3 The Code also included a set of hand signals for use with cranes. Three examples from the Code that were appropriate for the operation of the rail recovery unit are listed below:

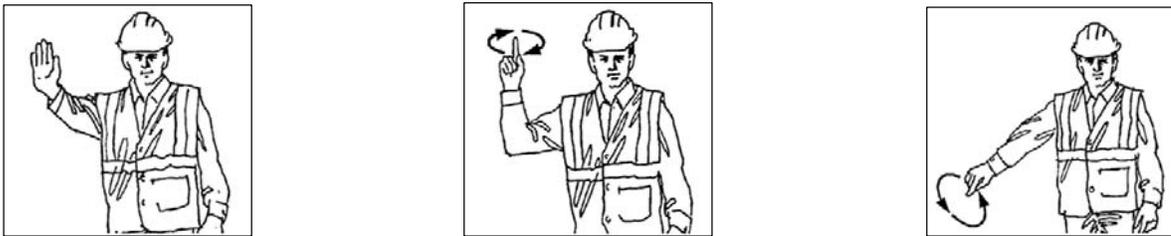


Figure 5
Examples of hand signals

1.4 Train information

The train control diagram

- 1.4.1 The train control diagram showed the schedule for all trains printed in green. The train controller drew plot lines on the train control diagram using a black pencil to show the anticipated progress of the trains. Lines in red representing each train were drawn across the train control diagram in the form of a graph of the actual movement of the train from one station to the next against time. If the train was on time, the appropriate red line should be directly over the green line showing the train's schedule.
- 1.4.2 MP2 was a Tuesday-to-Friday daily Mt Maunganui to Auckland express freight service, scheduled to depart Mt Maunganui at 0615 and arrive in Auckland at 1335. The train control diagram showed it was scheduled to depart from Te Rapa en route at 1045, but on the day of the accident had departed 15 minutes early at 1030. The train controller had initially recorded the train on the train control diagram as MP30⁶ in error, but later corrected it to MP2.
- 1.4.3 The previous train on the Up Main line from Te Rapa prior to MP2 had been Train 138, about 3 hours earlier.

Hi-rail vehicle 46285 and MP2

- 1.4.4 At 0800, a ganger in hi-rail vehicle 46285 called the train controller by radio from a point immediately north of Horotiu and requested time on the Up Main line to travel north to Huntly, clearing there at 1000. The train controller confirmed with the ganger that Train 138 had passed on the Up Main line then authorised the requested track movement. No mention was made of the next train movement on the Up Main line at that time.

⁶ Train MP30 was a Tauranga-to-Auckland express freight service that was scheduled to run on Mondays only.

- 1.4.5 At 1004 the ganger called train control from 567.50 km, south of Huntly, and requested an extension of time on the Up Main line to reach his destination. The train controller approved an extension but not for as long as requested, and instead instructed the ganger to be off-track and clear by 1035 and to confirm when he was.
- 1.4.6 At 1028 the signal box operator at Te Rapa contacted the train controller by telephone and advised him that MP2 was ready to depart. The train controller responded by instructing the signal box operator to let the train go as far as Ngaruawahia⁷, and saying that he would advise him when the hi-rail vehicle was clear in Huntly, at which time MP2 could be advanced.
- 1.4.7 The ganger in hi-rail vehicle 46285 called train control when he was clear of the track at 571.860 km, immediately south of Huntly. The train controller acknowledged this and instructed him to call again after MP2 had passed. The ganger confirmed that and the conversation terminated. The train controller then instructed the signal box operator to remove his signal blocks⁸ and advance MP2.
- 1.4.8 At 1056 the train controller received a further radio call from the ganger at 571.860 km, who advised that MP30 (actually MP2) had cleared and requested permission to on-track his hi-rail vehicle and follow the train on the Up Main line to 577.396 km, between Huntly and Te Kauwhata. The train controller confirmed with the ganger that MP30 had cleared, then authorised him to continue his hi-rail vehicle movement as requested.
- 1.4.9 This radio communication, including the references to MP30, was the one overheard by the locomotive engineer of WT22 at Ohinewai.
- 1.4.10 At Horotiu and Ngaruawahia, the locomotive engineer of MP2 encountered yellow (caution) signals⁹, which led him to believe he was following another train. He said he thought when he heard the radio calls to MP30 that MP30 was the train he was following. Once his train had passed Ngaruawahia, the signals reverted to “clear proceed” indications.

1.5 WT22 and rail recovery unit information

- 1.5.1 The authorised work site for WT22 extended on the Down Main line from 586 km to 581 km, between Te Kauwhata and Huntly, from 0700 to 1600. However, WT22 did not have exclusive use of the Down Main line and train control could at any time instruct it to move to Huntly to clear the line for following movements.
- 1.5.2 The Information Bulletin¹⁰ issued for the work did not authorise WT22 to foul the adjacent Up Main line and no protection conditions for that line were included. Protection for WT22 on the Down Main line was provided by automatic fixed signals in the rear in accordance with Double-line Automatic Signalling regulations.
- 1.5.3 The work involved the recovery of several 76 m lengths of used rail from both sides of the Down Main line. While recovering rail from between the main lines, the rail recovery unit crane gantries rotated to 90 degrees from the centre line of the crane pivot mount for a distance of 2.62 m towards the Up Main line, the end of the gantry fouling the Up Main line by 322 mm (see Figure 3). When fully rotated at 90 degrees, the gantry needed to be rotated back towards the centre line by 29 degrees to clear the profile of a DX class locomotive passing on the adjacent line.

⁷ Signalling at Ngaruawahia was controlled by the signal box operator in Te Rapa, and Signal 17 Up Advanced Starting Signal at Ngaruawahia was blocked at Stop by the signal box operator as instructed, thereby preventing MP2 entering the Up Main line, which was already occupied by hi-rail vehicle 46285.

⁸ Blocking – a process of holding signals at “Stop” to prevent train movements entering a section of line.

⁹ Caution signals indicate “proceed at normal speed, prepared to stop at next signal, section is clear but signal in advance is at “stop”.

¹⁰ Information Bulletins were issued for, among other things, authorising the running of work trains, and were usually issued the day prior to their being in effect.

- 1.5.4 The EWR class wagons of the rail recovery unit were owned by Ontrack and had been modified from standard US class flat deck wagons (see Figure 6). There was a total of 37 wagons in the class, all of which had been fitted with centrally mounted cranes to load and unload lengths of rail.
- 1.5.5 Task instructions for operating the rail recovery unit included a requirement for protective clothing and equipment, including hard hats and hearing protection, to be worn and for the team leader to give clear instructions to all staff as to how the work would be carried out. The hearing protection did not allow for verbal communication between the person-in-charge and the operators while the rail recovery unit was operating, so hand signals were used.
- 1.5.6 In addition to the person-in-charge, Ontrack's optimum manning level for the rail recovery unit was 2 persons per EWR wagon; one to operate the crane and the other on the ground to connect or disconnect the rail clamps. However, when this number could not be achieved, a manning level of one person per EWR wagon, as well as the person-in-charge, was accepted as the normal manning level.



Figure 6
The rake of EWR wagons

- 1.5.7 The rail recovery unit operators received no formal theory-based training to operate the rail recovery unit. Instead training was done on the job, often on the day. Operating the cranes was not considered a difficult task and staff could be brought in from other gangs to be certified to operate the equipment and to fill vacancies at the same time. Operator certification was held on personnel files.

- 1.5.8 Ontrack had no prepared check sheet for safety observations of the operation of the rail recovery unit, or other track machinery such as the concrete sleeper layer, ballast groups and track maintenance machine groups. It had not prepared these because it considered the person-in-charge was experienced. Observation reports were prepared where the operation of the machine was observed as part of another audit.

1.6 Rail recovery unit personnel

The person-in-charge

- 1.6.1 The person-in-charge had 37 years' experience in track maintenance and renewal work. He also had extensive experience working with the rail recovery unit in single-line territory. The person-in-charge and his track renewals gang were based in Taumarunui. He was accompanied by 4 members from this gang, all of whom were experienced with the rail recovery unit but also only in single line territory. He said he did not know if there was any additional training or certification required before track staff could carry out work in double-line territory.
- 1.6.2 Following a review of area manager boundaries, Ontrack had transferred track maintenance and renewal responsibilities in the double-line signalling territory area between Te Rapa and Te Kauwhata to the person-in-charge's area manager on 28 May 2007, 3 weeks before the accident. From that date track renewals work in that area became the responsibility of the person-in-charge and his renewals gang. They had since worked on 4 occasions in the double-line territory, with none involving the rail recovery unit, and on each previous occasion the person-in-charge had been accompanied on site by a ganger with local knowledge who was experienced in working in Double-line Automatic Signalling territory.
- 1.6.3 When the person-in-charge talked to the train controller from the work site, he was told that a work break of about 2 hours was available after the next train on the Down Main line. He understood that to mean that the 2-hour break included both main lines and he was not therefore expecting a train in either direction during that time. When WT22 arrived at the work site at 0925, the locomotive engineer confirmed with him the 2-hour work break and also told him that train control required a check call at midday. The person-in-charge said he did not contact train control again before commencing work and was unaware that MP2 was due at the work site at about 1100.
- 1.6.4 The person-in-charge was not carrying a portable radio as, when undertaking rail pick-ups, it was usual practice for the second locomotive engineer to be on the ground and use the locomotive engineer's portable radio to communicate with the locomotive engineer in the cab. The person-in-charge understood that although radio communication was established between the locomotive engineers, the responsibility for safety and watching for trains rested with him and, if he needed to, he could have communicated with train control through the locomotive radios.
- 1.6.5 The person-in-charge said he had not filled out a job plan form in the job plan book before starting the rail pick-up because the book he had was full and there wasn't a spare book in his vehicle. The completed job plan book could not be located following the accident.
- 1.6.6 The person-in-charge was responsible for both hand signalling the rail recovery unit operators and for the safety of the work site. He did not think this was a heavy workload for one person because he was able to delegate some tasks, such as the locomotive engineer on the ground taking responsibility for communicating by radio with the locomotive engineer in the cab.

The section length ganger

- 1.6.7 The section length ganger had 8 years' track maintenance and renewals experience covering both single and double-line territory. He was based in Hamilton and had worked on the rail recovery unit about 12 times.
- 1.6.8 It was known that the rail recovery unit team would be 2 members short on the day, so 2 staff from local gangs, operators EWR102 and EWR171, had been co-opted to supplement the team and the length ganger had driven them to the work site. Operator EWR171 (who was fatally injured) was not a regular member of his team, although the length ganger had worked with him on a few occasions.
- 1.6.9 The length ganger was not assigned to the rail pick-up gang and saw himself in a support role to provide transport. As such he was tasked with taking his vehicle to where the rail recovery unit pick-up would end to return the gang to their vehicles before continuing on with the 2 members of his gang to another job.
- 1.6.10 The length ganger had contacted train control prior to the arrival of WT22 at the work site. He told the train controller that he was working with the person-in-charge and advised the train controller of the location where they would be working. He had also requested information on expected train movements on the Up Main line and the train controller had told him that MP2 would probably be the next train at about 1100. The train controller had said that there was a possibility a coal train would be there before that, but then confirmed that MP2 would be the next train at 1100.
- 1.6.11 The length ganger said he considered the information he had received to be very general as it included details of 2 possible trains and, because he felt the train controller did not seem sure what the next movement might be, he had not passed on any information to the person-in-charge or anyone else. He had not been asked by the person-in-charge to contact train control.
- 1.6.12 When WT22 arrived, the length ganger assisted the operators to prepare the cranes for work, then left the site and returned to his vehicle, which was parked nearby. From there he watched the first 2 rail lifts to satisfy himself that everything was going all right and that operator EWR171 appeared competent, as he had not seen him work on the rail recovery unit before.
- 1.6.13 After satisfying himself that operator EWR171 was competent and that the work was progressing satisfactorily, he moved his vehicle to a site near where he expected the work to finish. He completed some paper work and heard, but did not see, MP2 as it passed on the Up Main line. Shortly afterwards he heard the emergency call over the radio in his vehicle cab and immediately walked down to the accident site, about 1 km away. He did not see the accident happen.
- 1.6.14 The length ganger said that had he been in charge of the work on this occasion, he would not have used "Compulsory Stop Protection" (Rule 905) because it was not necessary or mandatory. Instead he would have talked to train control and probably arranged under Mis 71 authority (see 1.19) for signal blocking on the adjacent main line while they were working so that trains could not advance into the work area without the authority of the ganger. He said that even if he had not requested signal blocking, he would have advised train control where the rail recovery unit was working and would have expected train control to advise him when trains were approaching.
- 1.6.15 He said that he had been unaware that this was the first time the person-in-charge had worked the rail recovery unit in double-line territory. Because of his experience working in double-line territory, had he been asked he would have given assistance and advice, although he had never been person-in-charge of a rail recovery operation himself and was mindful of the person-in-charge's 40 years' service compared with his 8 years, albeit his being in double-line territory.

Operator EWR387

- 1.6.16 Operator EWR387 had 5 years' track experience. During that time he had worked on the rail recovery unit between 20 and 30 times, but this was his first time in double-line territory. His crane was immediately behind the locomotive.
- 1.6.17 During a lift he saw that the rail end nearest his crane had become jammed under another rail length. When signalled by the person-in-charge, he lowered the rail then got down off the wagon. He signalled to the other operators to lower the rail then went to try to release the jammed rail. Once on the ground, he realised that the length they were attempting to lift was actually longer than the length of the wagons, so he started to work his way along the rake, disconnecting the rail clamps as he went.
- 1.6.18 The operator had got as far as the third wagon, EWR346, when he looked back towards Huntly and saw the headlight of an approaching train adjacent to the work train locomotive. As he watched, the approaching locomotive impacted with the gantry of his crane, which was still extended towards the Up Main line. He immediately jumped up onto EWR346 to get out of the way.
- 1.6.19 Once on the wagon, he looked north towards the rear of the rake and saw operator EWR171 had his back to everyone and that his crane gantry was still extended and fouling the Up Main line. As he watched, the locomotive of the passing train struck the crane gantry, which rotated 360 degrees and struck the operator in the back, knocking him from the wagon.
- 1.6.20 Operator EWR387 could not recall any safety briefing taking place before they had started work, but the person-in-charge had told them where the first lift was to be and had instructed them to ensure that the cranes were fuelled up.

Operator EWR237

- 1.6.21 Operator EWR237 had 37 years' track experience. He had extensive experience working on the rail recovery unit, but this was his first time operating it in double-line territory. His crane was on the second wagon behind the locomotive.
- 1.6.22 He had initially been unaware of the approaching train until he saw the person-in-charge gesturing to operator EWR346 to rotate his crane away from the Up Main line. At this time he turned around and saw the train on the Up Main line. He pulled his crane in then dived off the wagon away from the train. When he got up he heard others calling that operator EWR171 had been hit.
- 1.6.23 He said that there had not been a safety briefing before the work started, but they were usually made aware by the person-in-charge of expected train times.

Operator EWR346

- 1.6.24 Operator EWR346 had 2 years' track experience. He had some experience working on the rail recovery unit but this was his first experience of operating it in double-line territory. His crane was on the third wagon from the locomotive.
- 1.6.25 The gantry of his crane was rotated towards the Up Main line and he was standing on the wagon by the crane, unaware a train was approaching, when he saw the person-in-charge heading towards him, gesturing to him to rotate the gantry in. The person-in-charge grabbed a rope hanging from the crane and used it to swing the gantry clear of the Up Main line, then leapt up onto the wagon where operator EWR346 was.
- 1.6.26 The pin that normally locked the crane when it was rotated was bent, which allowed the person-in-charge to swing the gantry clear. Had the crane been locked in position by the pin, the person-in-charge would not have been able to clear it before the train passed.

- 1.6.27 The operator turned and saw the approaching locomotive collide with the extended crane gantry on wagon EWR387, smashing the locomotive front window as it did so. He heard another whack and turned around to see the gantry of crane EWR171 rotating, but he did not see it hit the operator.
- 1.6.28 The operator said that there had not been a safety briefing, but usually the person-in-charge did explain what was to happen before work commenced. The operator thought that everyone knew what they were required to do.

Operator EWR102

- 1.6.29 Operator EWR102 had 2 years' track experience and was one of the length ganger's staff. He had worked on the rail recovery unit on about 5 previous occasions, but this was his first experience of operating it in double-line territory. His crane was on the fourth wagon from the locomotive.
- 1.6.30 The operator was focused on the person-in-charge because he was the person responsible for controlling the lifting of the rail. He had watched as the person-in-charge came along undoing the rail clamps, then grabbed the chain on the gantry of crane EWR102 and began pulling the gantry back towards the wagon. The operator unclipped the pin to allow the gantry to rotate back towards the wagon.
- 1.6.31 He said he had not heard the train coming, but had guessed from the actions of the person-in-charge that something was wrong. He then looked up and saw the approaching train. He did not see the gantry on crane EWR387 get hit by the passing locomotive. He had remained on the wagon as the train passed because there was not time for him to do anything else. He did not see operator EWR171 get hit, but saw him fall from the wagon.
- 1.6.32 The operator had driven the length ganger and operator EWR171 to the work site. He said they all had an understanding of what they were doing and the operation of the machinery, so once the work train arrived it was just a matter of servicing the equipment and getting started.

Operator EWR143

- 1.6.33 Operator EWR143 had 4 years' track experience but also had additional rail operating experience. He had previously worked on the rail recovery unit about 12 or 13 times, but this was his first experience of operating it in double-line territory. His crane was on the fifth wagon from the locomotive.
- 1.6.34 He said they had been trying to lift a length of rail that had become jammed, so he had lowered the rail and released his clamp. He noticed operator EWR171 had his back to him. Operator EWR143 said that for some reason he had looked south and saw a train that he did not know about approaching. The locomotive was about 50 m from the work train locomotive and his crane gantry was extended towards the Up Main line. He thought about jumping but instead tried to get his gantry clear. He pulled the pin and began pushing his gantry around, at the same time trying to attract the attention of operator EWR171 by waving his arms and shouting at him. However, he could not make himself heard because of the crane engines and operator EWR171 was wearing a hard hat and hearing protection.
- 1.6.35 Operator EWR143 estimated that he got his gantry clear of the approaching train a few seconds before the locomotive passed his wagon. As he watched, the train continued on and struck the extended gantry of the crane on wagon EWR171.
- 1.6.36 He said that there had not been a safety briefing before the work started, but he had overheard the person-in-charge explaining things to one of the less experienced operators. He considered the remainder of the crew were aware of the job requirements, although they had not been advised of any train movements on the Up Main line.

Operator EWR171 (deceased)

- 1.6.37 Operator EWR171 had initially been employed as a track worker in January 2006 on a fixed-term contract. His term was extended in June 2006 and he became a permanent Ontrack employee in December 2006. His on-the-job training on the rail recovery unit had been signed off by his immediate supervisor on 7 March 2007.
- 1.6.38 He had passed the theory of the appropriate certifications but had yet to complete his on-the-job training. Ontrack's certification procedures required that personnel were to be trained in the theory elements for the rules, codes and associated instructions for the position in which they were to be engaged before being permitted to undertake any practical work.
- 1.6.39 Operator EWR171 had his back to the person-in-charge, the other rail recovery unit operators and MP2 as it approached and his attention could not be attracted, despite repeated attempts by his colleagues. The hearing protection he was required to wear would have prevented him hearing the warning shouts of the other rail recovery unit operators or the sound of the approaching train.
- 1.6.40 Ontrack's records showed that Operator EWR171 had only worked on the rail recovery unit once before, at the time his competency had been signed off.

1.7 Locomotive engineers

Locomotive engineer WT22

- 1.7.1 The locomotive engineer had been involved in locomotive-running duties since 1977 and had gained his first grade certification in 1987. He had been based in Te Rapa for all his locomotive service and was experienced in operating in double-line automatic signalling territory.
- 1.7.2 On Tuesday 19 June he had been rostered with another locomotive engineer on WT22. The running of WT22 required the locomotive to run long-hood leading at times, which reduced the visibility from the locomotive cab. As a consequence a second locomotive engineer was rostered to crew the train¹¹. The locomotive engineer said they decided between themselves who would do the driving and who would undertake the second-person duties.
- 1.7.3 WT22 had run to Te Kauwhata, where the locomotive had repositioned and coupled on to the south end in preparation for returning on the Down Main line to the work site, which they did after Train MP3 had cleared.

Locomotive engineer on the ground

- 1.7.4 The locomotive engineer had been involved in locomotive-running duties since 1975. He had been based in Te Rapa since 1995 and was experienced in operating in double-line automatic signalling territory.
- 1.7.5 He said that once at the work site, he had got on the ground and positioned himself on the side of the work train from which the rail was being recovered. There were no hard and fast rules regarding his responsibilities, but he was keen to assist and positioned himself to relay instructions between the person-in-charge and the locomotive engineer in the cab.
- 1.7.6 He said he could have stayed in the locomotive cab, but with the amount of work going on the portable radio could be a hindrance to the person-in-charge, so often the second locomotive engineer of a work train would offer to do the radio communication work; an offer that was usually accepted. He had not spoken to train control at any time.

¹¹ Toll Rail's policy required that when a locomotive was operated long-hood leading it had a 2-person crew.

- 1.7.7 The locomotive engineer said he could not be certain but thought he had heard the person-in-charge say that a train was due about 1100. The time had stayed in his mind and he felt if not the person-in-charge, then somebody else must have mentioned it, maybe the locomotive engineer of WT22, as he was sure Train MP30 had been mentioned, not MP2.

Locomotive engineer of MP2

- 1.7.8 The locomotive engineer had been involved in locomotive-running duties for about 30 years and had been based in Te Rapa for all of his service. He had gained his first grade certification in 1982 and was experienced in operating in double-line territory.
- 1.7.9 On Tuesday 19 June he had been rostered to take MP2 from Te Rapa to Auckland and return to Te Rapa with Train 231. He had commenced duty at 0900 and had departed Te Rapa at 1030.

1.8 The train controller

- 1.8.1 The train controller had been in the role for about 30 years and had about 10 years' experience in double-line automatic signalling territory.
- 1.8.2 The train controller said he telephoned the person-in-charge while he was en route by road to the work site to confirm the type of work to be done and to establish the time required to complete the work. The person-in-charge responded that he would be meeting with the length ganger and would get back to him in about 15 minutes to advise his requirements.
- 1.8.3 The train controller again heard from the person-in-charge, this time from the work site, at which time the person-in-charge confirmed the work would take place from the Down Main line. The train controller expected to hear from him again before work commenced, but he did not call back.
- 1.8.4 The train controller received a telephone call from the length ganger, who advised he was working with the person-in-charge and requested information on the next train movement on the Up Main line. The train controller told the length ganger the next train was MP2, which was due there at about 1100. He said he did not think there was anything unusual in the call and thought that perhaps the rail recovery unit wanted some time on the Up Main line. He understood that the length ganger was working with the person-in-charge and expected the information given to him have been passed on to the person-in-charge.
- 1.8.5 Before WT22 departed from Te Kauwhata, the train controller had called the locomotive engineer and instructed him where to meet the person-in-charge and rail recovery unit operators. At that time he had also requested a check call at midday so he could give the crew an update on the next movement on the Down Main line and arrange to move the work train out of the way if necessary.
- 1.8.6 The train controller said that, after WT22 had arrived at the work area, he received a radio call from the locomotive engineer requesting information on expected train movements on the Up Main line. The train controller told him the next train was due about 1100. The locomotive engineer said he would pass on that information to the rail recovery unit crew, who were walking around between the main lines as they unchained the rail recovery unit wagons, but the train controller told him they already knew.
- 1.8.7 The train controller said he thought he might have told the ganger at Huntly that the train that had just cleared was MP30 but it might have actually been MP2. He said that he may have put the wrong train number on the train control diagram initially, but was not sure why.

1.9 Off-site personnel

The area manager

- 1.9.1 The area manager had been involved in track maintenance for 17 years and in track management for a further 18 years. He was responsible for all track (including maintenance and renewals), structures, communications and signals staff from Te Rapa to Owhango, Okahukura to Stratford and Eltham to New Plymouth. On 28 May 2007 the double-line section north from Te Rapa to Te Kauwhata had been added to his area of responsibility.
- 1.9.2 The track renewals gang was based in Taumarunui and normally consisted of the person-in-charge and 5 others. However, on this day the gang was one operator short and to fill that vacancy and another for the sixth crane, the area manager was asked to provide 2 track maintainers from other gangs. These were the operators on EWR102 and EWR171.
- 1.9.3 The area manager said that most of the renewals gang's work had been in single line territory, but since 28 May they had done a couple of re-rail jobs in double-line territory. He said that before track staff could work in double-line territory, they had to be in possession of Level C certification, but this was the same certification that was required before staff could work in single line territory.
- 1.9.4 The area manager said that the person-in-charge was the track person in overall charge of the work and the work train activities, including the "loan staff" assisting on the rail recovery unit. The person-in-charge was also responsible for the safety of all staff on site as well as the coordination of the work train activities with train control, although he could delegate responsibilities if appropriate.
- 1.9.5 The area manager said he had no input into organising the work of the renewals gang, even though they were his staff, and the first he knew of the rail pick-up at Ohinewai was when he was contacted about 5 days beforehand and asked to provide staff to fill the vacancies on the rail recovery unit.

Field engineer renewals

- 1.9.6 The field engineer renewals said he was responsible for arranging work trains for the renewals gang but not the resource allocation. He was also responsible for procuring the rail recovery unit for the work from the national planner.
- 1.9.7 He said applications for work trains were made on a Form 5 Application for Work Train. The Form did not include a space for protection requirements and never had, to the best of his knowledge.
- 1.9.8 The engineer said that he became involved in arranging protection usually only during sleeper lays in double-line territory. This was because of the number of people and the amount of machinery on site. For other jobs, such as the rail recovery unit work at Ohinewai, it was left to the person-in-charge to liaise with train control regarding expected train movements.
- 1.9.9 The nominated person-in-charge for the job was consulted during the preparation of the Form 5 over the time required and other requirements for the job. On earlier jobs it had been arranged for the person-in-charge to be accompanied by a ganger with double-line territory experience and local knowledge.

1.10 Staff certification and induction procedures

1.10.1 All members of the Taumarunui-based renewals gang and the 2 Hamilton-based operators held the appropriate certification to operate the rail recovery unit in double-line territory.

1.10.2 Ontrack's Operating Procedures Supplement 10.3 Clause 3.7 Rail Personnel Induction, stated in part:

New appointees or existing personnel on internal transfer... or personnel affected by a change of role, must before commencing duties be introduced to the area of operations identified.

These inductions as arranged by the new appointee's Manager, must include

- All hazards common to the employee's role and any potential hazard unique to the operation of that locality

1.10.3 Ontrack had no records showing formal inductions had been undertaken by the person-in-charge or the Taumarunui-based members of the rail recovery unit prior to commencing work in double-line territory.

1.10.4 The induction process was part of Ontrack's Codes and Standards, which formed part of the safety case and had been approved by Land Transport New Zealand. However, with the change of infrastructure maintenance from Transfield Infrastructure Services Limited¹² to Ontrack on 10 February 2006, the audit regime changed from a generic focus on occupational health and safety and quality systems to a focus on the National Rail Safety Standards. The induction process had not been included in audits during the first year of Ontrack's tenure, but an audit of processes for authority to be doing work, including certifications and inductions, has been included in the current line of audits.

1.11 Form 5 Application for Work Train

1.11.1 The Form 5 Application for Work Train was prepared by the Ontrack person planning the work for which the work train was required, in this case the field engineer renewals. The application form included the day and date the work was to be carried out, a description of the work and location, the consist of the work train and the name and contact details of the person-in-charge. The completed application form was forwarded to Ontrack's office in Wellington for issuing the necessary bulletins authorising the work and the running of the work train.

1.11.2 The Form 5 used for the rail recovery unit work at Ohinewai did not have provision for requesting information regarding protection requirements. The preparation of the Form had been discussed between the field engineer renewals, responsible for planning the work, and the person-in-charge. At that time the person-in-charge had been wary of working in the double-line territory because the Te Rapa to Te Kauwhata double-line section had only recently been added to his potential work area and since then he had only done 4 other jobs in double-line territory, of which none had involved the rail recovery unit.

¹² The infrastructure maintenance service provider to Ontrack at that time.

1.12 Job plan book

- 1.12.1 The job plan book was a bound book of job plan forms. The person-in-charge was required to sign the prepared job plan form relevant to the job to confirm that the hazards and controls had been communicated to the work group prior to the commencement of work.
- 1.12.2 The work matrix provided at the beginning of the job plan book required that when a task was to be performed in a potentially hazardous working environment by inexperienced or new employees, a hazard analysis of the task was to be completed and a job plan undertaken before the commencement of the work.
- 1.12.3 At the time of the accident, the job plan form contained an “ask yourself” question “Protection Obtained?”, but this did not include a reference for adjacent lines. Changes made by Ontrack to the job plan form since the accident included a provision for protection requirements for adjacent lines (see Section 4.3 Job plan form).
- 1.12.4 The HSE¹³ Top Common Hazards, under the instruction “Discuss each of the common hazards and controls. Tick controls that are appropriate for the work site or task” included the following:

HAZARD	MECHANISM OF HARM	IMPACT	CONTROL MEASURES IN PLACE
Working on track or in yard	Traffic movement	Being hit by moving object	Remain alert to vehicle movements at all times. Face direction of oncoming traffic if possible. Double-track – be aware of movement both ways.

- 1.12.5 No job plan form or hazard analysis of tasks, as required by Ontrack’s procedures, had been completed prior to starting work.
- 1.12.6 There was no requirement for the job plan book to have an issue date. When completed, the book was forwarded to the area health and safety coordinator to see if any new hazards had been identified that needed to be added to the national hazard register

1.13 Ontrack’s safety observation procedures

- 1.13.1 Safety observations were practical assessments of rail personnel for the activities identified on their certifications and were to be completed by the end of the month in which they became due. If not, the activity type was deemed to have lapsed and required revalidation.
- 1.13.2 Two types of safety observation were applied:
- formal – used to assess formally the competence of rail personnel
 - casual – daily observation of personal work practices on an informal basis.
- Both types were used to evaluate a person’s application and knowledge of rules, regulations and instructions pertaining to their duties.

¹³ Health, Safety and Environment.

- 1.13.3 Formal safety observations were graded into 2 categories, Level A and Level B. Level A observations were made by any manager, supervisor or nominee suitably certified for the tasks being evaluated. Level B observations were made by managers, supervisors or authorised nominees who had access to the rule book, relevant codes and instructions from which the required knowledge could be gained to make an informed judgement.
- 1.13.4 Ontrack's procedures required personnel to be observed either individually or as part of a work team 3 times within a 24-month period, with a maximum of no more than 8 months separating observations. In addition, theory elements that applied to the operation were tested every 2 years by way of open-book, multi-choice question sets for the relevant certification. The person-in-charge's most recent recertification had been completed on 6 April 2006.
- 1.13.5 The person-in-charge's most recent safety observation prior to the accident had been carried out in November 2006. This included a review of such work site practices as applying bulletin instructions, conducting pre-shift briefings, applying correct work site protection, understanding the work site safety plan, identifying work site hazards and applying Compulsory Stop Protection. The person-in-charge's competency in these aspects of the safety observation had been signed off by the observer at that time.

1.14 External assessments

- 1.14.1 Section 37 of the Railways Act 2005 required the f Land Transport New Zealand to undertake safety assessments of rail participants to determine compliance with the requirements of the system standard and the Act. The Act allowed for 2 types of assessment:
- an ordinary safety assessment, the frequency of which was agreed between the Director and the licence-holder
 - special safety assessments, which were focused on specific safety issues.
- 1.14.2 The assessment team was led by an independent assessor with representatives of Land Transport New Zealand included in the assessment team.
- 1.14.3 The Director considered tailoring the assessment programme to match the nature and extent of the rail participants' rail activities, taking into account their safety record, but initially it was expected that an annual assessment programme would apply. However, those with a good safety record might only need assessments every 18 months or 2 years. Alternatively, the scope of the assessments could vary so that the annual assessments looked at one part of a business (in a cycle) and the whole business was covered every 2 years. This was an example of an approach that could be applied to larger operations that were maintaining a good safety record.
- 1.14.4 The Director was able to set the frequency of assessments in consultation with rail participants. Section 30 (i) of the Railways Act stated that each participant's safety case would set out the process by which the frequency of ordinary safety assessments as required under section 37 could be agreed. The New Zealand Transport Agency¹⁴ advised that the coverage of Ontrack's activities through the safety assessment process was planned on about a 3-year cycle, although there was no legislative requirement or rule requiring this.
- 1.14.5 The assessments of Ontrack undertaken in 2006 and 2007 had not included a work site assessment of rail recovery units or similar work train or track machine operations. However, the New Zealand Transport Agency advised that the safety assessment of Ontrack in 2008, following the accident, did cover the obtaining of protection during track work with heavy tools and equipment.

¹⁴ Formerly Land Transport New Zealand.

1.15 General rules

From Ontrack's Rail Operating Rules and Procedures:

1.15.1 Rule 1 – Safety of the Public and other Employees

The first and most important duty of every employee is to provide for the safety of the public and other employees.

1.15.2 Rule 12 – Staff to be prepared for Trains at all Times

Employees engaged on any duty connected with the line must be prepared for the running of trains at any time and without prior advice. The rules and regulations must be observed whether or not trains are expected.

1.16 Methods of protection

1.16.1 Rule 901, Job Planning, included a track occupancy protection matrix to assist staff to determine the types of protection available for their given situations. The matrix allowed for 6 work situations for which protection might be required, including maintenance work with heavy tools or equipment or broken track, but did not specifically mention rail recovery unit or work train¹⁵ activity.

1.16.2 Rule 901(a) stated that when planning protection arrangements, the person-in-charge must consider potential obstructions to other tracks and the possibility of trains entering the work area from other lines.

1.16.3 Rule 905 – Compulsory Stop Protection

Rule 905(b) "When to use Compulsory Stop Protection" stated in part:

Conditional Stop Boards and Advance Warning Boards must be used whenever planned work is going to involve breaking the track or will interfere with the safe operation of trains eg:

- welding
- rerailing
- maintenance with heavy tools/ and or equipment

Planned work also includes other work of more than 90 minutes duration, which is planned at least one day in advance so that the appropriate bulletin can be arranged.

1.16.4 Rule 905(b) required that an Advance Warning Board be positioned a minimum of 2000 m from the boundary of the work area and a Compulsory Stop Board be positioned a minimum of 500 m from the boundary of the work area.

1.16.5 Trains were not permitted to pass a Compulsory Stop Board until authorised by the person-in-charge. The locomotive engineer was required to stop his train at the Compulsory Stop Board and contact the person-in-charge by radio for authorisation to pass.

1.16.6 Figure 6 shows how protection in accordance with Rule 905 could have been positioned on the Up Main line in relation to the work area. The yellow board is the Advance Warning Board and the red board is the Compulsory Stop Board.

¹⁵ A train was defined as one or more vehicles capable of being moved. It could consist of a locomotive to provide power with various unpowered vehicles attached, or be on its own.

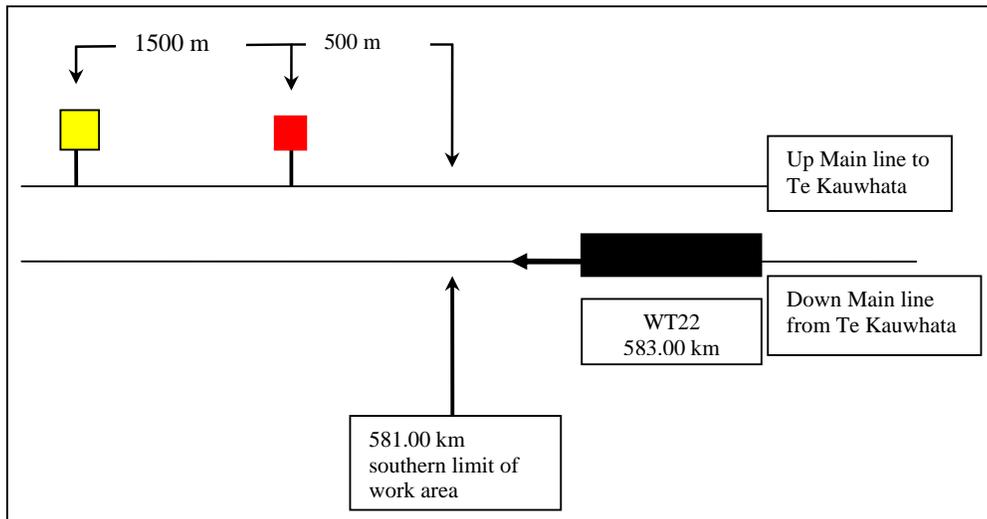


Figure 7
Work area if Rule 905 protection had been in place on the Up Main line
 (not to scale)

1.16.7 The person-in-charge’s knowledge of these rules was tested as part of his Level C recertification and safety observations on 6 April 2006. Levels A and B safety observations of the person-in-charge were completed on 1 November 2006. This complied with Ontrack’s Code requirements of one recertification every 2 years and 3 safety observations in 2 years.

Track and Time permit (Mis 60) protection

1.16.8 A Mis 60 was a numbered authority issued by train control to protect train movements on the main line where additional safeguards were necessary. Any portion of the main line could be temporarily closed to traffic by the issue of a Mis 60.

1.16.9 In double-line territory, train control was required to arrange for the signals at the entrance to the affected section to be held at stop during the period the Mis 60 was to be in effect, before it was issued.

1.16.10 When a Mis 60 was issued for maintenance work, the person-in-charge was required to obtain permission from train control before the work commenced. At the termination of the work, the person-in-charge was to certify to train control that the line was clear and safe for traffic. The Mis 60 remained in operation until that clearance was given.

1.16.11 The use of Mis 60s was usually advised by bulletin, but where it was necessary to implement the use of Mis 60s and this had not been notified by bulletin, train control was required to advise the locomotive engineers of any trains that would be affected or encroach on the limits of the Mis 60.

Foul Time protection (Mis 70a)

1.16.12 An individual requesting Foul Time under Rule 918 was required to advise train control of the period of time required, the start and finish locations and the reason for requesting Foul Time.

1.17 Train control audio recorder

1.17.1 The train control audio recorder was downloaded and a disk was supplied for analysis. Analysis of the disk revealed:

- 07:21: the train controller and locomotive engineer of WT22 conversed by radio and arranged for the work train to proceed to Te Kauwhata and await further instructions from the person-in-charge
- 07:36: the train controller contacted the person-in-charge by telephone to confirm the work site. The person-in-charge told the train controller that he was unsure exactly where the work was to be carried out, but he would be accompanied by the length ganger so would confirm with him and advise the train controller after that
- 08:08: the train controller and the person-in-charge conversed by radio, during which a suitable work period was agreed after the next train movement on the Down Main line
- 09:18: the train controller conversed by radio with the locomotive engineer of WT22, before its departure from Te Kauwhata, and requested a check call from the work site at 1200. This instruction was acknowledged by the locomotive engineer
- 09:24: the length ganger rang the train controller, advised he was working with the person-in-charge and requested information on train movements on the Up Main line. The train controller told him initially that either MP2 or a coal train would be there about 1100, before confirming it would be MP2, which the ganger acknowledged
- 09:38: the locomotive engineer of WT22 telephoned the train controller and requested information regarding train movements on the Up Main line. He expressed concern about the rail recovery unit operators walking around between the main lines. The train controller told him that the next train on the Up Main line was due about 1100. The locomotive engineer said he would advise the rail recovery unit operators but was told by the train controller that they were aware of it
- 1040: the ganger with hi-rail vehicle 46285 confirmed that he had off-tracked at 571.860 km near Huntly. The train controller acknowledged and instructed the ganger to call for more time on-track after MP2 had passed. The ganger repeated the instruction to call after MP2 had passed and the conversation was terminated
- 1058: the ganger contacted the train controller and advised him that MP30 had passed, and then requested time on-track in hi-rail vehicle 46285 to follow MP30 on the Up Main line to 577.396 km, between Huntly and Te Kauwhata. The train controller confirmed that MP30 had passed and authorised the hi-rail vehicle movement
- 11:04: the train controller received an emergency radio call from the locomotive engineer of WT22 advising him of the accident and requesting emergency services.

1.18 Locomotive event recorder

1.18.1 The locomotive event recorder from DXB5356, the locomotive on MP2, was downloaded. Analysis of the data revealed:

- 11:03:29: the front headlights and ditch lights were illuminated as MP2 approached Ohinewai
- 11:04:07: the locomotive horn was sounded for 4 seconds
- 11:04:12: the throttle was moved from notch 5 to notch 3; train speed was 79 km/h
- 11:04:14: a full service automatic brake application was made. Train speed was 80 km/h
- 11:04:32: the automatic brake application was released; train speed was 68 km/h and the throttle was in notch 3
- 11:04:46: the throttle was returned to notch 1; train speed had reduced to 47 km/h
- 11:04:54: the throttle was returned to idle; train speed had reduced to 43 km/h
- 11:05:01: a 90 kilopascals reduction with the automatic brake was initiated; train speed had further reduced to 41 km/h
- 11:05:41: MP2 stopped.

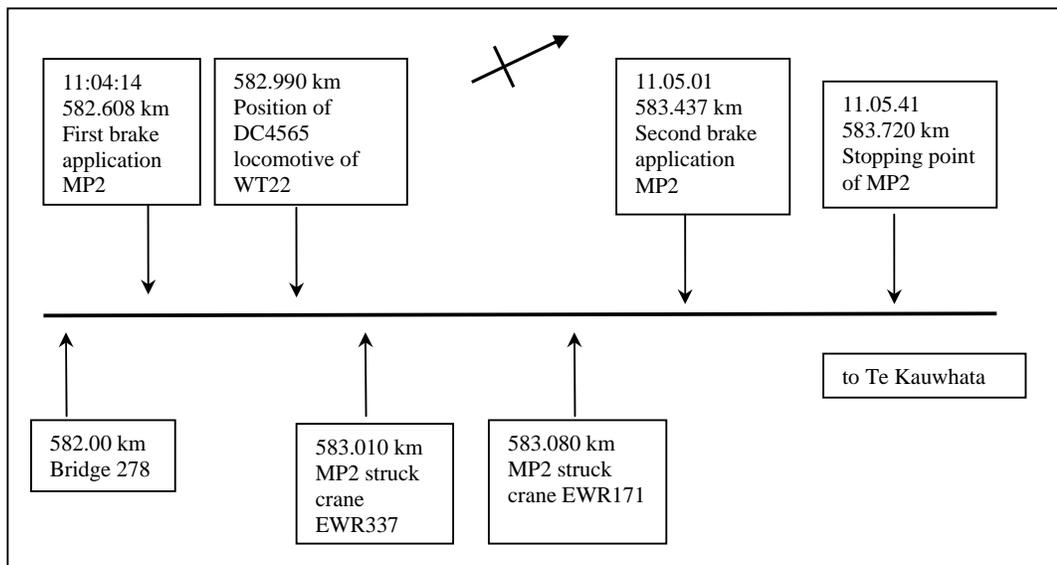


Figure 8
Locomotive event recorder data incorporated into site diagram
(not to scale)

1.19 Survey of track workers

General comments

- 1.19.1 As part of this investigation, 4 track workers with considerable experience in track maintenance work in double-line territory were interviewed about protection practices.
- 1.19.2 There was general agreement that the Compulsory Stop Boards protection under Rule 905 was not appropriate for work train operations such as discharges or rail recovery unit work, where mobility was an integral part of the work. The main reasons given against using the Boards were the distance to travel to position and retrieve the Boards, the time involved and the impact this had on resources.

1.19.3 The track workers said that in double-line territory where the adjacent main line was likely to be obstructed, the most common form of protection used was a Mis 71 under Rule 915. They said that when using Mis 71 protection, if they requested signal blocking from train control to protect the adjacent main line, they did not always complete the Mis 71 form, which meant there was no read-back confirmation of the agreed protection. Examples were given of using Mis 71 protection for work train discharges in double-line territory to protect staff on the ground from train movements on the adjacent main line.

1.20 Rule 915 Trolleys and Hi-Rail Vehicles – Requirements for On Track Movement (Mis 71)

1.20.1 Rule 915 stated in part:

(a) Enquiries

Every person-in-charge of a trolley, hi-rail vehicle or groups of such vehicles who proposes to on-track on the main line, MUST personally advise Train Control of their:

- identity
- on tracking location
- off tracking location
- nature of work
- protection required
- time required for the work

(d) Centralised Traffic Control and Double-line Automatic Signalling.

Train Control will arrange for blocking to be applied to prevent trains from entering the occupancy area.

When authorising movements Train Control will confirm:

- authority is either to proceed or work between
- section of track authorised
- commencement and clearance times
- section of track blocked

1.20.2 The person-in-charge obtaining authority for track occupation must complete a Mis 71 Track Occupation Cross Check with the instructions issued by train control, and read the instructions back to train control who will verify or correct them.

1.20.3 It was the responsibility of both the train controller and the person-in-charge to ensure that confirmation of the signal blocking was included in the cross-check. Blocked territory was not to be released to allow an opposing or following train to enter a section until advice had been received that the hi-rail vehicle or trolley was clear of the section.

1.21 Rail regulatory framework in New Zealand

Recent rail history

1.21.1 Government policy in the 1980s changed the status of all transport sectors (maritime and air as well as road and rail) through deregulation. The Government-owned integrated railway system, incorporating all infrastructure and rolling stock assets, was changed from a government department into a state-owned corporation in 1982. Subsequently, in 1990 the corporation was transformed into a public limited liability company, retaining all assets, except surplus land, for the running of the railway system.

Licensing of the rail industry by Land Transport New Zealand

- 1.21.2 In 1993, the New Zealand Railways Corporation was privatised when the Government sold the railway system incorporating both infrastructure and rolling stock to Wisconsin Central Railroad, from the United States of America with financial backing from a consortium of merchant bankers. Concurrent with that event, the Land Transport Safety Authority (the predecessor to Land Transport New Zealand) was mandated by the Government to administer railway safety legislation, oversee its application to railway operations and monitor ongoing compliance and performance.
- 1.21.3 A document called Rail Safety Licensing and Safety Assessment Guidelines (the guidelines), first published in 2000, was updated in April 2006 by Land Transport NZ following the passing into law of the Railways Act 2005. The 2006 guidelines (from which the following information was extracted) related to the safety management of railways in New Zealand and set out requirements of the Government with respect to safety. The guidelines drew attention to the requirement for each rail participant to take all practicable steps to ensure that none of the rail activities for which it was responsible, caused, or was likely to cause, death or serious injury to individuals.
- 1.21.4 In defining its policy and designing the applicable legislation, the Government adopted a co-regulatory approach, which was taken to mean that the technical and operating standards that formed a rail participant's safety system were the responsibility of the rail industry. To gain a licence, each applicant was required to show, through the submission of a safety case, that it had taken all practicable steps to ensure that all rail activities were safe. Reference needed to be made to the safety system and, in particular, comprehensive risk assessment. The risk creators (the rail participants and licence-holders) carried the responsibility for managing their operations safely.
- 1.21.5 Land Transport NZ, as the Government's nominated rail safety monitoring agency, administered the legislation, which required the application of an integrated safety management systems/safety assessment (audit) approach. This placed Land Transport NZ in a regulatory role, which included approving the minimum requirements for the scope and contents of a safety case and underlying safety system. Land Transport NZ chose not to set technical or operating standards.
- 1.21.6 Land Transport NZ chose to discharge its responsibility by monitoring the railway participants' performance in the achievement of their safety objectives. The mechanism for achieving this was the monitoring of key performance indicators and accident and incident occurrence data, and the application of a safety assessment regime¹⁶. Land Transport NZ, through the Government, had the power to intervene and make rules regarding technical and operating standards to ensure safety was maintained across the rail industry. In doing so the Minister would rely on Land Transport NZ for technical expertise in drafting rules and consulting the industry. No rules had been made for regulating the rail industry.
- 1.21.7 Land Transport NZ was able to tailor the safety assessment programme to match the nature and extent of each rail participant's rail activities, taking into account its safety record, but initially it was expected that an annual safety assessment programme would apply.

Safety case

- 1.21.8 All licence-holders were required to have an overarching safety case that covered all of the rail activities of all rail participants with which they had contractual relationships (for which they were responsible). Inter-operability arrangements with other rail participants were required to be covered.

¹⁶ Safety assessments confirmed whether or not rail licence-holders were operating in accordance with their approved safety cases and supporting safety systems.

- 1.21.9 Land Transport NZ was required to approve the safety case of each licence-holder. The safety case was a method of providing an assurance to Land Transport NZ that the rail participant was able to operate safely, that all key risks had been identified and assessed and that control measures were in place to ensure the safety of people and property with a view to continuous improvements in safety performance. Underpinning a safety case was the licence-holder's safety system.

Safety system

- 1.21.10 A rail safety system was a more detailed description of how the rail participant was going to conform to its safety case; in other words, it was a system containing safety and quality management manuals underpinned the rail participant's operations. The key idea behind such a system was to state how compliance was going to be achieved and show that it was being followed in practice.
- 1.21.11 Such systems defined standards and procedures consistent with accepted good railway operating practices for the activities being undertaken by a rail participant, and required assurance of compliance with those standards, practices and procedures to ensure safe consequences. Rail participants operating on the national rail system were required to refer to and adopt the National Rail System Standards administered by Ontrack. These Standards were designed to provide policy guidelines for the high-level safety system elements and ensure consistency with the operational practices of Ontrack and other network users.
- 1.21.12 The Rail Safety System Manual, dated 30 August 2004, was the principal document defining Ontrack's rail safety system and was designed to meet the requirements set out in the guidelines document (first published in 2000).
- 1.21.13 Ontrack had implemented a multi-level approach to safety management. The separation into the strategic and operational levels, together with the linkages between the various system elements, is illustrated in Figure 9.
- 1.21.14 At Ontrack's operational level, standards and procedures for design, construction, inspection and maintenance were detailed in various codes. The codes, together with supplements and supporting documents, embodied the principles for the safe operation and working of equipment on the national rail system. The codes also provided principles for the maintenance of the national rail system.

Management responsibility

- 1.21.15 Ontrack's Rail Safety System Manual section 3.2 stated in part:

All managers, particularly line managers, have a responsibility to ensure that all work carried out by their work teams meets all defined ONTRACK Rail Safety System standards, procedures and statutory requirements affecting rail safety.

APPROVED RAIL SAFETY SYSTEM

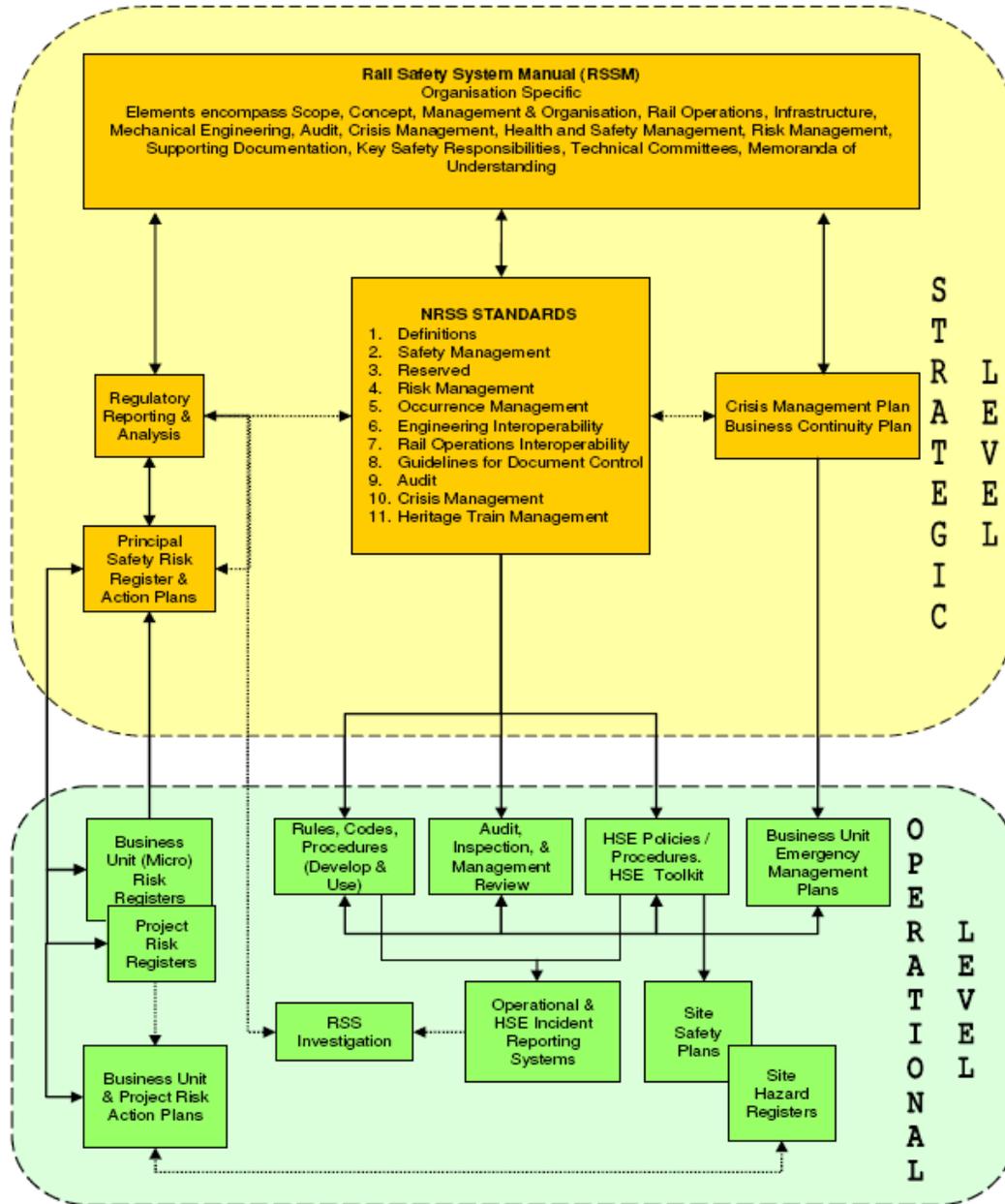


Figure 9
Ontrack's approved Rail Safety System

Occupational safety and health

1.21.16 Ontrack's Rail Safety System Manual section 3.8 Occupational Safety and Health stated in part:

Occupational safety and health requirements applying to Rail Personnel and the rail environment are detailed in:

- *The Health and Safety in Employment Act 1992*
- High level **ONTRACK** policies covering:
 - *Health safety and environment*
 - *Employee well being*
 - *Drug and alcohol testing*
- *Procedures and processes applicable to ONTRACK, ONTRACK Infrastructure Ltd and contractor employees*
- *Rail Operating Rules and Procedures, Rail Operating Code, engineering codes and document Q022 - Medical Standards*
- The Health and Safety Toolkit (adopted from Tranz Rail¹⁷).

These documents cover the following;

+

- Health and safety company policies and goals
- General health & safety rules (including protocols for site visitors, drugs and alcohol)
- The operation of safety committees and action teams
- *Job planning and implementation, including:*
 - *hazards identification & mitigation*
 - *the use of correct personnel protective equipment and high visibility clothing*
 - *rail corridor protection*
 - *management of contractors and site visitors*
 - *emergency procedures*
- Accidents and incidents – investigation, reporting and corrective action
- Health & safety training
- General emergency procedures
- Procedures applicable to contractors
- Procedures for HSE audit, *site safety inspections and safety observations*
- *injury management including ACC notification and rehabilitation*
- “fitness for work” including training, review, fatigue management, health and wellbeing.

1.22 The Ministerial Inquiry into Tranz Rail¹⁸ Occupational Safety and Health, August 2000 (referred to as the Wilson Report)

The following extracts are quoted from the Wilson Report arising from the above Inquiry. The extracts refer to the rail system as it was in the year 2000; the system that has evolved from then to what it is today.

Introduction

On 26 June 2000 Cabinet approved the Terms of Reference for an Inquiry into whether any systemic factors had contributed to a series of fatal accidents to employees of Tranz Rail Limited or its subsidiaries (Tranz Rail). The Terms of Reference... can be summarised as providing for inquiry into whether any such factors arise out of the safety regulatory regime governing Tranz Rail's activities, out of the systems in place under the regime, or out of a failure to implement effectively the required systems.

¹⁷ Tranz Rail was the predecessor to Toll Rail.

¹⁸ At the time of the Inquiry, Tranz Rail was both the rail operator and the owner of the infrastructure, including train control and signalling functions. On 5 May 2004 Tranz Rail was purchased by Toll Rail and on 1 September 2004, New Zealand Railways Corporation (Ontrack) acquired ownership of the infrastructure and train control and signalling functions.

Between May 1999 and May 2000 5 Tranz Rail employees had been fatally injured. These accidents were:

- a crew member of the Arahura was killed during an accident boat drill
- a locomotive engineer was killed in a head on train crash at Waipahi in Southland; a second locomotive engineer was seriously injured
- shunters were killed in Wellington, Woolston and Middleton

In evidence to the Inquiry, the Department of Labour estimated that the rate of fatal accidents among Tranz Rail staff is equivalent to 39.3 deaths per 100,000 employees. The New Zealand average rate of fatalities is estimated by the department at 4.9 per 100,000 employees. Accordingly, the workplace fatality record at Tranz Rail is about eight times the national average.

Which agency should enforce health and safety?

There are strong arguments that the LTSA¹⁹ should be responsible for both public and occupational safety at Tranz Rail together with Telarc, the auditor responsible for carrying out safety audits of Tranz Rail. However, the LTSA's primary statutory function is to issue licences and review the results of compliance audits, and therefore an enforcement role may be beyond the present resources and capabilities of many of its staff. The functions, approach and resources required to achieve and maintain a long-term compliance enforcement service are substantially different from those required for the services of licensing and auditing.

Documented safety systems

Underpinning approved safety systems is the concept that, if an organisation wishes to carry out a hazardous activity, it must make a case to the regulatory authority that it will do so safely. This requires identification of all the potential risks and how they will be managed. In essence, the regulated organisation writes its own specific rules governing the safety function and the regulator enforces compliance with these rules.

Overseas experience is that, while rail does have some high-technology systems such as signalling systems, the key to rail safety is not the control of complex technology, but ensuring uniformity and reliability in the widespread execution of largely routine tasks.

The approved safety system

The introduction of new legislation and the need for licensing did not in itself confer new or changed risks upon the operation of the rail services; it did, however, require the system to be expanded to reflect the requirements of the legislation.

The additions to the Tranz Rail safety system in response to the regulatory requirements were:

- risk assessment
- change management control during restructuring
- hazard identification
- workplace safety plans
- occurrence management
- crisis management

Scope

The *Approved Safety System* covers all aspects of the safe operation of rail service vehicles over Tranz Rail's network. It also covers all aspects of mechanical, infrastructure and service delivery activities that are not directly associated with the operation of a rail service vehicle.

¹⁹ Land Transport Safety Authority, predecessor to Land Transport New Zealand [now the New Zealand Transport Agency].

Content

The content of the *Approved Safety System* can be described as comprehensive and voluminous. This reflects the observation made at the start of this part of the report that safety in rail systems relies heavily on the widespread execution of numerous tasks, and specifying those tasks requires extensive documentation.

There is no definitive list available recording every single document within the *Approved Safety System*, but Tranz Rail estimates that the number of documents is in the range of 1,000 to 2,000 and the number of drawings is in the region of 100,000.

Attitudes and influences

The impression we gained is that, with occupational groups such as shunters, Tranz Rail has found it difficult to change attitudes to safety and that, where there are safety problems, this is because employees are reluctant to change. This reluctance may, in the view of Tranz Rail, be because of the length of service of many employees and the traditions that have developed around shunting.

While it is possible to point to attitudes that have developed around shunting and the need to change these attitudes, there are other factors at work. Indeed... Mr Rayner²⁰ observed that management reaction to each accident in the shunting yards was *to further amend working practice, to augment, at 90 pages, an already weighty handbook of operating instructions for shunting yard staff whose real value to the people for whom it was produced must be doubtful.*

In other words, there may be a belief that, by prescribing more and more rules, Tranz Rail seeks to ensure that it cannot be blamed because it is always possible to point to a rule that has been breached.

To like effect, a review conducted by ACC²¹ in July 2000, as part of the requirements for Tranz Rail to enter into the ACC Accredited Employer programme, observed that:

The employee culture is one where employees may not read and write widely. Reporting and information processes that require a large amount of paperwork have been recognised by the company as a barrier to effectively collating information and understanding issues. For instance, placing the site safety plan on the board in the staff room may not serve any purpose other than to meet the performance objectives of management.

1.23 Human factors in transport safety

Extracts from “Human Factors in Transport, 2005”, a paper by Dr Rob Lee

Transport safety

For almost every transport accident or incident, the subsequent investigation has shown that the main contributing factors were present before it happened and, in some cases, they were common knowledge. In all cases they could have, and should have, been identified and rectified before the accident or incident.

Human factors

The term “human factors” refers to the study of humans as components of complex systems made up of people and technology. Human factors are concerned with understanding the performance capabilities and limitations of the individual human operator, as well as the collective role of all of the people in the system which contributed to its output, including factors such as “organisational culture”.

²⁰Tranz Rail had commissioned Mr David Rayner, a retired Director of Safety and Standards and a member of the Board of Railtrack Plc in the United Kingdom, to produce a report into Tranz Rail’s occupational and public safety. A copy of the report was produced to the Inquiry.

²¹ Accident Compensation Corporation.

Human factors is about people, and not specific modes of transport. It covers many areas, including:

- perception
- memory
- learning and motivation
- communications
- human information processing.

Human factors' analysis in transport safety investigations is not an attempt to minimise individual responsibility. Its objective is to understand human performance in the context of the systems in which the people concerned are components, and to consider all the factors which may have influenced their behaviour.

To achieve progress in safety management, every accident and incident, no matter how minor, must be considered as a failure of the system and not simply as the failure of the person, or people, even though human errors will almost certainly be involved in the occurrence.

In a transport accident or incident investigation we need to investigate whether any errors we identify may have involved contributory factors such as:

- poor training
- poorly written procedures
- inadequate documentation
- poor supervision

As well as whether the demands of the particular situation were outside the boundaries of the individual human performance envelope.

2 Analysis

- 2.1 As with most accidents, there were a number of factors that contributed to the collision between MP2 and WT22. This report examines how 2 trains came to be occupying or fouling the same section of track at the same time; it examines the defences that should have been in place to prevent that; and it examines the defences that could have prevented the operator's death, even when all others had failed.
- 2.2 There were no extraordinary environmental factors that contributed to the collision. The track alignment was straight and level, with good view lines in both directions. Both locomotive engineers of their respective trains saw the other as soon as MP2 came into view, and had the situation been realised immediately there would have been ample time for MP2 to stop before reaching WT22, or at least to slow to a minimal speed that would have allowed the Up Main line to be cleared or minimised the speed at impact.
- 2.3 It was a normal day in the train schedule for that area, meaning that several trains would normally have been expected to pass through the work site on either main line on any given weekday. Significantly, the person-in-charge of WT22 was not expecting the arrival of MP2, and although the locomotive engineer of MP2 was aware that WT22 was somewhere in the area, he had no way of knowing the exact location of that train.
- 2.4 There was little doubt that once the system had failed and allowed 2 trains to occupy or foul the same section of track, all of the workers attached to WT22, and the locomotive engineer of MP2, were put at extreme risk. The description of the last-second frantic activity of the work gang to clear the Up Main line for the passage of MP2 was clear testament to that, as was the death of the crane operator on wagon EWR171.

Site protection

- 2.5 A review of the rules and procedures used on the day surrounding track occupancy at the accident site showed that MP2 was authorised to occupy the Up Main line at the site at the time of the accident. An examination of the locomotive event recorder confirmed that MP2 was being operated at its authorised line speed and in an appropriate manner.
- 2.6 The same cannot be said for WT22; its cranes were fouling the Up Main line without authority and at a time when MP2 was due to pass through the work site.
- 2.7 The person-in-charge understood during his conversation with the train controller that he would get a 2-hour break after MP3 had passed and took that as authority to commence work after the passage of that train. The requirement for a check call to train control at 1200 as advised to him by the locomotive crew, probably confirmed his understanding and led him to assume that protection of the work site, including both main lines, had been established with train control. This erroneous assumption was probably based on his previous single line experience, where he was used to having his work train automatically protected in centralised traffic control territory, merely by his train occupying that section of track and in so doing blocking the signals controlling entry to that section.
- 2.8 The person-in-charge was not familiar with operating the rail recovery unit in double-line territory, having just recently had a section of double-track added to his area of responsibility. The closest he could have come to this situation in single line territory would have been recovering rail from or adjacent to a crossing loop, an infrequent activity.
- 2.9 In the context of normal human behaviour, when individuals have worked for a long time in one work environment doing the same tasks, with no exposure to different external conditions, they tend to become rigid in their way of thinking and reacting to situations that arise. When they go into a new environment, they tend to revert to previously learnt behaviour, even though this may not be appropriate to their new situation.
- 2.10 In this case the person-in-charge was responsible for arranging protection for the work site. He was aware that the rail recovery operation would involve fouling the Up Main line. He had even discussed with the field engineer during the planning stage the fact that the operation was in double-line territory, yet when he was told by the train controller that there was a 2-hour window on the Down Main line, he simply made an assumption that this window included the Up Main line as well. The train controller did not know that the planned work was going to foul the Up Main line as well, because no one had told him and it was not mentioned on the information bulletin.
- 2.11 There were several options open to the person-in-charge to protect the Up Main line, depending on that category in which rail vehicle WT22 was classed. An examination of the track occupancy protection matrix (see Table 1) included in Rail Operating Rule 901 showed that it was not clear into which category WT22 fell. Looking across the top row of the matrix, there were only 2 possibilities: *Maintenance with heavy tools/equipment* or *Mobile Track Maintenance Vehicles*. The latter category did not fit because this section referred to self-propelled vehicles that, because of the nature of their work, were insulated, meaning that they would not activate automatic signals, including level crossings.
- 2.12 The Commission is of the opinion that the work train did not fit obviously within any category listed on the matrix. Also, the matrix is silent on the issue of working double-line territory where protection on both main lines might be necessary. A safety recommendation covering this issue has been made to the Chief Executive of the New Zealand Transport Agency.

- 2.13 Assuming that WT22 was supposed to fit into the category of maintenance with heavy tools/equipment, what protection options would have been available to the person-in-charge?
- Rule 905 – he could have arranged Compulsory Stop Boards to protect the Up Main line. Arguably, the work of the rail recovery unit could be described as planned work involving breaking the track *or interfering with the safe operation of trains* as described in Rule 905, and as such the use of compulsory stop boards should have been included in the information bulletin issued the day prior to the work. The clause *interfering with the safe operation of trains* was not immediately obvious from reading the matrix. It was contained in Rule 905, with which the person-in-charge would have to have been familiar to make that deduction. Compulsory stop boards, if adhered to, would have prevented this accident
 - Track and Time Permit (Mis 60) – a Mis 60 could have been asked for on the day or included in the information bulletin. A Mis 60 had an advantage for a work train moving within a longer work area, as in this case. The advantage was that Compulsory Stop Boards would not have to be placed, nor would they have to be moved as the work site moved, yet there was still a formal process requiring sign-off by all parties concerned. In this case the person-in-charge would have been required to obtain permission from the train controller before work started. A Mis 60, if adhered to, would have prevented this accident because the train controller would have blocked any signals controlling the entry of trains into the affected section, thereby preventing trains entering the section until authorised by the person-in-charge.
- 2.14 Regardless of the category in which the rail recovery unit was included, one of the above methods was required to be used to protect the work site. Which method was not specifically clear from the wording of the rules, although either would have provided a defence against the accident. The person-in-charge was certified by Ontrack as having knowledge of the rules and their application and theoretically should have been familiar with them, yet the procedure he used on the day that led to his erroneous assumption that he had a work window for both main lines, matched neither of the 2 processes.
- 2.15 In discussion with 4 Ontrack staff who frequently took charge of work trains in double-line territory, it became apparent that compulsory stop boards were rarely used in rail recovery or other work train activities. While some work train activities could be appropriately protected by the application of other protection rules, the use of compulsory stop boards in activities such as rail recovery work was generally avoided because their use was time and resource consuming when placing the boards and moving them with the train if the operation required.
- 2.16 Neither, it seemed, did the same staff use the Mis 60 procedure. On many occasions they simply called train control and asked for the section to be blocked on the erroneous assumption that this amounted to following the Mis 71 procedure. Not only was a Mis 71 not the correct procedure to use, they were not even following that procedure in its entirety. This informal procedure lacked the safeguard of compulsory stop boards or the Mis 60 process. What this amounted to was a routine violation of formal procedures that had become accepted over time, a violation that likely stemmed from an unclear rule, the track occupancy protection matrix contained in Rule 901.
- 2.17 The length ganger said he regularly used what he considered to be the Mis 71 protection procedure in double-line territory and said he would have done so had he been the person-in-charge of the work site at Ohinewai.
- 2.18 Even though the Mis 71 was intended to be used only for trolley and hi-rail vehicle movements, the form itself did not make this clear; only after reference to Rule 915 would the user have known this. However, although the use of the Mis 71 process in this situation was incorrect, it did provide the opportunity for arranging protection of the work site with the train controller by the use of signal blocking.

Type of protection	Foul of track on foot/off track vehicles	Maintenance with light tools/ladders	Trolleys and Hi Rail Vehicles	Maintenance with heavy tools/equipment and/or track broken	Mobile Track Maintenance vehicles	Major track/bridge/tunnel work
ITD (Mis 70) New Rule 917	Y	Y				
Foul Time New Rule 918	Y	Y				
Trolley and Hi Rail vehicles Rule 915			Y			
Conditional Stop Boards Rule 905		Y (planned work over 90")		Y	Y Also refer R914	Y
Manned protection Rule 906		Y				
Protection within station limits and sidings Rule 909	Y	Y	Y	Y	Y Also refer R914	
Mobile Track Maintenance Vehicles Rule 914					Y	Y
Track and Time Permit (Mis 60) Rule 24				Y	Y	Y
Track Warrant (Mis 88) TWC ²² Rules			Y	Y	Y Also refer R914	Y

Emergency protection Rule 904: When an obstruction occurs advise Train Control in order that any approaching train may be stopped. If unable to contact train control immediately or if instructed by Train Control Emergency Protection must be immediately arranged in accordance with Rule 904.

“Y” indicates that this type of on track protection is applicable

Figure 10
Track occupancy protection matrix

²² Track Warrant Control.

- 2.19 In effect the person-in-charge followed this informal procedure to arrange protection for WT22 but in an even less formal way. The person-in-charge called train control prior to arriving at the work site to talk about the best window of opportunity to conduct the work, but this was not the time to establish formally protection for the work site. He was supposed to call the train controller back when on site and ready to start work, which he normally would have been required to under the Mis 60 procedure; only on this occasion, and unknown to him, both the length ganger and the locomotive engineer had called train control, and through a series of miscommunications, protection of the Up Main line was never achieved.
- 2.20 Railway staff having to comply with a voluminous set of rules that might not be easily understood is not a new phenomenon. Andrew Hopkins in his book²³ makes a case study of the Glenbrook accident²⁴ in Australia. In response to public concern, the Governor of the State of New South Wales set up a Special Commission of Inquiry into the accident under the direction of retired judge the Honourable Peter McInerney²⁵.
- 2.21 Much of the Inquiry focused on the issue of rules, as it was alleged that the driver of the commuter train did not follow the rules and was therefore blamed for the accident. There are a number of quotes worth repeating in this report because they have some similarity to this case.
- 2.22 Hopkins wrote, “In any case the rules were not in a user-friendly form. They were written in complex convoluted ways designed to cover all the possibilities which occurred to the writer. This meant that people seeking guidance from the rule would need to sift through all the possibilities listed to see if the situation which confronted them was included. Each rule might be several pages long and read like a piece of legislation, the meaning of which could be discerned only by careful study, cross-referencing one part of the rule with another, and even cross-referencing one rule with another to determine what was the appropriate course of action in the circumstances. Given that many rail workers have limited literacy, these rules might as well have been in a foreign language.”
- 2.23 McInerney wrote that in some cases the rules were “so restrictive that they were incapable of being applied in operational situations and operational staff had no alternative but to violate the rules to get the job done”.
- 2.24 Hopkins wrote that workers, “regarded training sessions as ‘chalk and talk’ and often went away from training sessions feeling they had no idea of the purpose behind the rules. According to one witness, it was like learning a poem by heart without understanding the meaning. One driver said he could see no relationship between the content of the training and what he was actually doing on the job. Moreover the experience-based rules that drivers in fact relied on seemed, on the whole, to work. Another witness argued that accidents occurred when new drivers, who hadn’t had sufficient experience to draw on, tried to rely on formal rules which they did not “understand”. This view was endorsed by McInerney: “The reason for the relative safety of the New South Wales rail industry until recent years has not been due to the success of the rule-based approach to rail safety, but more to the fact that employees acquired their knowledge of safe working from experienced employees in the course of serving long periods of formal and informal on the job training”.
- 2.25 As mentioned above, the circumstances of the Glenbrook accident and this accident were different, one involving a track occupation by a work gang, the other a train being incorrectly authorised to pass a signal at stop, but there are similarities. The Rule 901 in this case was unclear. The person-in-charge was relatively new to double-line territory and the track protection rules associated with that. There is evidence of violation or ignorance of the rule by other track workers in order to get the job done.

²³ Safety Culture and Risk, The Organizational Causes of Disasters.

²⁴ Commuter train colliding with the rear end of the Indian Pacific train near Glenbrook, Sydney in 1999

²⁵ The Honourable Mr Acting Justice Peter Aloysius McInerney.

- 2.26 That is not to say there is not a place for rules, but they do need to be clear and workable, and above all staff need to be absolutely familiar with them and management need to foster a culture where the rules are obeyed, otherwise they serve no other purpose than to be a mechanism for the rule writer to apportion blame when not following a rule leads to an accident.
- 2.27 On dealing with the purpose of rules, Hopkins wrote, “The fact that the rules are so difficult to apply and that inspectors turn a blind eye to violations, raises the question of the real purpose of the rules. Several witnesses suggested that a major purpose was to ensure that someone could be punished when something went wrong”.
- 2.28 On the same matter, the Inquiry having looked at 8 recent accident inquiries within the New South Wales rail system, McInerney wrote, “I formed [the view] that the inquiries concentrated on which [rule] applied in the circumstances and whether the employees had been neglectful in choosing the correct one and properly applying it”.
- 2.29 Hopkins further wrote, “While the rules facilitate punishment, that can hardly be their purpose. There is something missing in the account. Another witness provided the missing link by suggesting that the purpose was protection of the organization. When an accident occurs and there is no rule that has been violated, the employer can be blamed for not foreseeing the possibility and doing something about it. Where a rule has been violated the employer can present itself as blameless because it has foreseen the accident and taken steps to forestall it.”
- 2.30 It is important to note that these comments refer to the Glenbrook inquiry and cannot therefore be attributed to the culture that exists within Ontrack. The inquiry into the Ohinewai accident did not go that far. However, Ontrack largely inherited the rules from the previous regimes that had operated the New Zealand rail system. It is possible that one or more of those regimes had at times operated under a culture of blame, and this would likely have manifested itself through the rules to which the industry still largely works today, although Ontrack said that the latest track occupancy rules were developed through a joint employee and union working party.
- 2.31 The Wilson report makes reference to the Rayner report, which said, “... management reaction to each accident in the shunting yards was to further amend working practice, to augment, at 90 pages, an already weighty handbook of operating instructions for shunting staff whose real value to the people for whom it was produced must be doubtful”.
- 2.32 The similarities with the New South Wales rail example are plain to see. If the New Zealand case is to be improved, and attitudes changed, it will take more than just fine-tuning the current system. The system will need to be critically reviewed in conjunction with a programme of culture change and training for management and employees. This will not be a short-term project.

Communication and crew resource management

- 2.33 Crew resource management can be described as using all available resources to best effect to achieve a desired outcome. The objective in this case was to recover the rail from the work site within the time available on track; everyone involved shared that objective. The mental aspect of the plan on how this was to be achieved was not shared between all those involved. The train controller was not aware that fouling the Up Main line was necessary to achieve the objective. The person-in-charge did not know that the train controller was missing this vital piece of information. This first breakdown in communication stemmed from the incomplete planning of the job.
- 2.34 The second breakdown in communication occurred during the conversation between the train controller and the person-in-charge prior to arrival at the work site. The train controller referred to a window of opportunity for the work train to occupy the Down Main line. An opportunity to remedy the person-in-charge’s erroneous belief that this applied to the Up Main line as well was lost when there was no closed-loop confirmation of what had been agreed.

- 2.35 The third breakdown was when the person-in-charge did not call back the train controller immediately before starting work at the site to arrange protection; instead, and uninitiated by the person-in-charge, 2 other members of the work gang (the length ganger and the locomotive engineer) contacted train control. Through these various communications there was no closing of the communication loop; that is, no positive information was passed back to the person-in-charge. Essentially, each person who communicated with the train controller, and the train controller himself, made a series of incorrect assumptions about who was privy to what information.
- 2.36 The fourth breakdown was when MP2 was referred to as MP30. This highlights the importance of clear and correct communication over a radio network to which several different parties have access; parties whose actions could affect the safety and efficiency of the rail network operation. The ganger's reference to MP30 could have been corrected by the train controller or the locomotive engineer of MP2, assuming that he had heard and recognised the incorrect reference to his train. However, the locomotive engineer of MP2 believed MP30 existed and was in front of him. If the error had been recognised, the locomotive engineer of WT22 could have picked up the correct number of the approaching train on the Up Main line and, by using the correct identification when he made his warning call, could have been able to avoid the collision.
- 2.37 A concept of good crew resource management is challenge and response. What this means is if anyone is concerned that the plan is not being followed, they can challenge the person-in-charge of the operation. Challenge does not mean in the adversarial sense, but more in an inquisitorial sense.
- 2.38 The length ganger initiated a form of challenge in contacting the train controller and asking about train movements on the Up Main line. He got the response from the train controller that MP2 was due. At this point the length ganger had 2 opportunities to avert the accident:
- he could have asked the train controller if protection had been arranged for the Up Main line; or
 - he could have relayed the information back to the person-in-charge.
- The length ganger did neither, and in not doing so 2 opportunities to avert the accident were lost.
- 2.39 Similarly, the locomotive engineer in the cab of the work train had obtained the same information from the train controller. He was in a better position to understand the risk that MP2 posed to the work gang, because he could see that his train was fouling the adjacent main line. He was sufficiently concerned to at least try to convey the information to the persons on the ground, but when his first attempt to radio the locomotive engineer on the ground failed, he did not persevere until it was too late. There were a number of options he could have employed to alert the gang to the danger, including repeating the radio call to the person-in-charge via the locomotive engineer on the ground, getting out of the cab and walking across to alert them, and sounding the locomotive horn continuously to attract their attention.
- 2.40 Once the presence of MP2 was known to the person-in-charge, the final communication failure was in not being able to gain the attention of the crane operator who was fatally injured. The noise level created by the rail recovery unit cranes and the surrounding activity made it necessary for the crane operators to wear ear defenders, which meant that they were essentially relying on hand signals to communicate. If a member of the work gang were not looking at the person-in-charge, as in the case of the deceased, communication was effectively lost. In the absence of an alternative means of communication, the requirement for the crane operators to keep their eyes on the person-in-charge was a critical one that should have been included in the certification process and the safety briefing. The requirement is typical information that should normally be included in a safety briefing but it couldn't have been as no such briefing had been held.

- 2.41 Although not contributing to this accident, an operation that relied on only visual communication should have had available a standard set of signals used across the entire network. This is especially critical where work gangs are changed or supplemented with workers from other gangs, as in this case, and might be operating under different signal operators. There were other forms of communication that have been available and used in other modes of transport for many years that could have prevented this loss of communication at a critical time, such as radio communication through headsets (or through ear defenders). Safety recommendations have been made to the Chief Executive of the New Zealand Transport Agency to address these 2 safety issues.

Induction and training

- 2.42 Recognising the limitations of human performance, it is important to design an operational system that makes allowance for those limitations and does not demand of a person anything outside the boundaries of the individual performance envelope. Some of the factors that contributed to this accident were:
- poor training
 - poorly written procedures
 - inadequate documentation
 - poor supervision.
- 2.43 When the person-in-charge had his area of responsibility extended to include a section of double-line territory, under the Ontrack procedures he was supposed to have received induction training because he was moving into a workplace that was significantly different; working adjacent to another main line with all the hazards that went with the task – trains passing the work site, for example. The question is, would an induction have made any difference? Possibly not, because the procedures for arranging protection of the adjacent main line were not clear, and there was evidence of non-compliance with the correct procedure for arranging protection. Nevertheless, a proper induction might have at least meant the person-in-charge arranging protection of some sort, even if it was not necessarily by following the correct procedure.
- 2.44 Also in question is whether the deceased crane operator had received sufficient training. He was assessed as being competent physically to operate the crane, but whether the importance of communication and watching the operation and being aware at all times of what was happening around him had been explained and retained is in doubt. It could not be explained why he was not paying attention to the person-in-charge at the time; it could have been for any number of the human factors mentioned earlier in this report.

Safety observations/external audits

- 2.45 The person-in-charge met Ontrack's safety observation and certification requirements and had been signed off as competent in matters relating to the work site.
- 2.46 External audits undertaken on behalf of the Chief Executive of Land Transport New Zealand during the previous 2 years had not included a work site assessment for work trains, rail recovery units or similar equipment.
- 2.47 The facts that Ontrack had certified the person-in-charge as being competent in work site procedures, but that he and other similarly qualified track workers were not following established procedures, and that the procedures around work site protection were unclear, is a safety issue that the Commission has recommended the Chief Executive of the New Zealand Transport Agency resolve.

Speed of trains through work sites

- 2.48 WT22 needed to foul the adjacent main line to complete the rail recovery task, but other work trains or maintenance operations might not have needed to. The Ontrack system allowed trains to pass through work sites at a maximum authorised line speed, 80 km/h in the case of MP2. The locomotive engineer of MP2 was expecting to pass a work train at some point, as identified in the information bulletin, and unless he had come across a compulsory stop board he could have done so at 80 km/h.
- 2.49 Any rail maintenance site has a number of additional hazards, including but not limited to the following:
- personnel focused on a particular task and less on the surrounding environment
 - maintenance equipment that could be left foul of the track
 - restricted view lines caused by machinery and equipment
 - noisy environment restricting communication.
- 2.50 In double-line territory it was feasible that a freight train could be allowed to pass such a work site at 80 km/h, in some cases with little warning should view lines be restricted by terrain or other features. Although in this case protection should have been put in place for the Up Main line, the fact that it had not meant MP2 was approaching the work site at maximum authorised line speed. If the system had required that MP2 pass the work train at a speed appropriate to the hazard it posed to the work gang, the locomotive engineer would have had more time to respond to the impending hazard, and the force of the impact with the 2 cranes would have been reduced. The chance of the deceased crane operator surviving would have been better, and at best he might have survived the collision unharmed.
- 2.51 The Commission believes that standard operating procedures for any track maintenance work site where multiple tracks exist, including crossing loops in single line territory, should require passing trains to be travelling at a reduced speed appropriate to the circumstances. A safety recommendation has been made to the Chief Executive of the New Zealand Transport Agency to address this safety issue.

Manning of track gangs

- 2.52 Ontrack's stated preferred number of maintenance staff to operate the rail recovery unit was almost double that which had been assigned to WT22. The maintenance gang associated with WT22 just met the minimum required by Ontrack's rules. The numbers meant that the person-in-charge was really the only person available to coordinate the lifting operation, unless the length ganger was included, which he was not. He was there solely to provide ongoing transport for the 2 members of his gang to their next work site after the rail recovery work was completed.
- 2.53 The person-in-charge was also the one responsible for the protection and general safety of the work site, a safety-critical task. Coordinating the lifting operations was a task that would normally require some degree of focus, to the detriment of his prime responsibility of protection and communication.
- 2.54 The person-in-charge was the person certified for his knowledge of rules, procedures and work instructions. While he might have been able to delegate accountability for certain tasks, he could not delegate his responsibility. He should have been provided with sufficient staff for him to be able to focus on his prime responsibility, but he was not. For this reason the Commission is of the opinion that the work gang was not appropriately manned.

Regulatory framework and independent overview

2.55 Currently the National Rail System Standards are kept and administered by Ontrack, which is one of several main participants in the rail system and a rail licence-holder. The National Rail System Standards referred to the Toll Rail standards and practices as the default in the absence of other “sound alternative” standards included in another operator’s rail safety system. For example, Section 6 of the National Rail System Standards, which is the engineering interoperability standard, stated in part:

Operators must ensure that their vehicles are designed, constructed, maintained and operated in accordance with good sound railway engineering practice, and the requirements of their Rail Service Licence and all national Rail System standards.

In the absence of sound alternatives contained in the Operator’s Rail Safety System approved as part of their Rail Service Licence issue by the LTSA and agreed by the Access Provider, Tranz Rail / Toll NZ codes, standards and practices effective at 30 June 2004, with subsequent amendments acceptable to the Access provider will apply with respect to all aspects of design, construction (including vehicle body strength, longitudinal strength and crashworthiness), inspection and maintenance. Note that these Tranz Rail / Toll NZ standards are currently generally accepted NZ rail industry practice applicable to the National Rail System.

2.56 Having national rail standards under the control of the participants in the rail system also adds another level of risk. The rail industry in New Zealand has undergone, and continues to undergo, some rapid change. At the time of this accident, ownership of the infrastructure belonged to the state and there were 4 major operators, as well as 71 minor operators. The industry had become more aligned to the other modes of transport in New Zealand. The self-regulatory system of the past served the rail industry well in earlier years. The co-regulatory approach explained by Land Transport New Zealand in its guidelines document might work depending on the level at which the regulator decided to get involved, which was dependent on its resources and the ability to do so.

2.57 The Wilson report referred to in section 1.21 of this report makes reference to the then Tranz Rail safety system as being “voluminous” and there being no definitive list recording every single document. The report goes on to say that estimates of the number of documents range from 1000 to 2000 and the number of drawings in the region of 100,000. In the absence of “sound alternatives”, some standards with which any other operator would have to comply would be buried within those documents.

2.58 More importantly, as those standards have evolved over the years, except those contained in the National Rail System Standards, they were not required to be referred to the regulator, Land Transport New Zealand. Although the documents and drawings referred to would have been divided between Toll Rail and Ontrack in 2004, when Ontrack was formed to own and maintain the rail infrastructure, it is difficult to imagine how Ontrack’s total safety system could have been monitored and assessed during the 3-year safety assessment cycle as agreed between Land Transport New Zealand and Ontrack. This could be one reason for the poor standards of training, poorly written procedures, inadequate documentation, unclear rules and violations going unnoticed by the regulator and Ontrack for some time.

2.59 The Commission is of the opinion that the level of regulatory oversight and intervention of the rail industry has not kept pace with the rapid change that has occurred within the industry in recent years. A consequence of a transport regulatory system not being compatible with the level and type of activity being regulated can be to raise the risk profile of that activity. The Commission’s concerns have been raised in previous reports²⁶.

²⁶ Occurrence reports 05-116 and 05-123.

- 2.60 Arising from occurrence report 05-123, on 26 September 2007 the Commission recommended to the Director of Land Transport New Zealand in part that he:
- take a more strategic approach to risk management of the rail industry, and in particular take more of a leadership role in setting, changing, and monitoring compliance with national standards for rail infrastructure and rolling stock, and the interaction between these components of the rail system (035/07).
- 2.61 On 26 September 2007 the Director of Land Transport New Zealand replied in part:
- Land Transport New Zealand has recently reviewed its regulatory activities within the co-regulatory New Zealand rail system and plans to take a more strategic, proactive and risk based approach to its monitoring of, and involvement with, the rail industry.
- 2.62 This accident serves as another reminder of the importance of adequate monitoring of safety standards, both internally by the licence-holder, and externally by the regulator.

3 Findings

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

- 3.1 Express freight Train MP2 was being operated within its authorised speed, and was authorised to occupy the section of track where the collision occurred.
- 3.2 The collision between MP2 and WT22 occurred because the crane operators had been directed to place the cranes they were operating foul of the adjacent Up Main line and into the path of the approaching MP2.
- 3.3 The person-in-charge of WT22 directed the crane operators to place their cranes foul of the adjacent Up Main line in the course of their work because he was under the erroneous belief that protection had been arranged covering his train for both main lines.
- 3.4 The process of planning rail recovery unit operations in double-line territory was not clear on work site protection, and instead of providing a clear work instruction that provided a check on all safety aspects of the operation, it relied on staff knowledge of complex and poorly connected sets of rules, standards and procedures.
- 3.5 Three safety issues contributed to the person-in-charge being under the erroneous belief that he had arranged protection for his work site:
- he had not been properly inducted into the procedures and hazards of working in double-line territory
 - he was working unsupervised on his first rail recovery operation in double-line territory
 - he made an assumption based on previous work experience in single line territory that work site protection in double-line territory automatically applied to both main lines.
- 3.6 Ontrack's system for assessing crew competency was not complete because the person-in-charge of WT22 had not been formally inducted into his new work environment, and violations of the work site protection rules had become routine with 5 other staff spoken to during the investigation and on that basis raises the question as to how widespread across the rail network it was.

- 3.7 In spite of 2 persons associated with the WT22 rail recovery operation being aware that MP2 was due to pass through the work site, and that the work train was at times fouling the passage of that train, neither had communicated this to the person-in-charge or taken decisive action to prevent the collision until it was too late.
- 3.8 The standard of crew resource management between the various groups involved in managing the work train activity on the rail network, including failure in effective communication at 4 levels of activity, was a significant factor contributing to the accident.
- 3.9 Hand signals between members of the work train gang being the only method of communication meant that there was no redundancy, which was not appropriate in the high-noise work environment.
- 3.10 The person-in-charge of the work gang safety and communication with train control would have been better performing those safety-critical functions only, rather than taking on another role that required his full attention.
- 3.11 The rule that allows trains to pass through work sites at maximum authorised line speed puts track workers at an unnecessarily high level of risk.
- 3.12 The operating rules with which Ontrack employees were working were in this case overly complex and of questionable value to inexperienced employees.
- 3.13 It was difficult to see how the level of audit, safety assessments and general monitoring of Ontrack's voluminous safety system agreed between the regulator and Ontrack could cover all aspects of the safety system within a 3-year cycle.

4 Safety actions

4.1 Operations in Focus issue 0737

- 4.1.1 On 11 June 2007, 8 days before the accident, Ontrack had issued an "Operations in Focus" issue 0737, reminding staff that:

Safe track occupancy relies on positive protection or a safety time buffer from trains.

The level of protection required is related to the type of activity being performed, and is detailed in Rule 901 – Job Planning

- 4.1.2 Ontrack's head office staff generated the Operations in Focus bulletins, which were then emailed to the quality assurance coordinator in Hamilton, who entered the bulletin into the Ontrack intranet. Area administration staff were advised and downloaded the bulletin and faxed it to local offices in their respective areas.
- 4.1.3 The quality assurance coordinator was on leave from Monday 11 June until Monday 18 June 2007. On his return he entered Operations in Focus Issue 737 into the Ontrack intranet and it was faxed by area administration staff to local offices on that day.
- 4.1.4 Weekly toolbox briefings in Taumarunui were conducted on Wednesdays so, although the bulletin was received in Taumarunui on 18 June, it would not have been included in a toolbox briefing until 20 June 2007, the day following the accident.

4.2 Form 5 Application for Work Train

On 11 October 2007 Ontrack advised that it had redesigned the Form 5, so that it now included a section “Could the work to be undertaken by the work train foul an adjacent line?” If the answer was yes, the Form was required to be accompanied by a completed Form 1 Application for Planned Work Protection under Rules 905 and 909 or a Form 2 Application for Planned Work Protection under Mis 60 or Mis 88.

In view of this safety action, no safety recommendation covering changes to the Form 5 has been made.

4.3 Job plan form

On 11 October 2007, Ontrack advised that following a review of the job plan form, the following changes had been made:

The words “including adjacent lines” had been added to the “ask yourself” question “Protection Obtained?” See addition highlighted in bold below.

ASK YOURSELF?			
Protection obtained? (Including adjacent lines?)			YES/NO
and additional common significant hazards had been added to the HSE Top Common Hazard List, including:			
Hazard	Mechanism of Harm	Impact	Control Measures in Place
Unfamiliar Work Location / area eg traction overhead, double-tracking, tunnels	Poor communication Failure to recognise hazards	Risk of injury to person, plant, property	Use of briefing from local experienced persons in charge Joint planning of work task using experienced persons Site visit by ganger and local person
Complacency / familiarity	Failure to recognise hazards Failure to follow procedures and safe work practices Shortcuts	Injuries / fatalities Damage to the environment Damage to property Public liability	Toolbox awareness training If appropriate ensure task rotation

In view of this action taken by Ontrack, no safety recommendations covering changes to the job plan form have been made.

4.4 On 2 July, Ontrack issued Operations in Focus issue 0738, which stated in part:

For the safety of yourself and your team the following rules must be followed:

Rule 901 mandates that whenever **you** or **your plant** occupy or are foul of the track you **MUST** ensure that there is protection in place.

Establishing the right type of protection for the work you are about to undertake is an important consideration when planning a job.

- 4.5 On 18 July, Ontrack issued Incident Alert 0743, which re-emphasised the use of appropriate protection for work in double-line territory. This stated in part:

Staff are reminded that the use of EWR wagons to recover or discharge rail between two main lines, between a main line and a crossing loop, or in most yard situations will cause the EWR crane to foul the adjacent line. Additionally other activities on the corridor involving the use of machinery and plant will potentially obstruct adjacent lines. In all such cases, under Rule 901, protection must be applied to all lines. There is no discretion – protection is mandatory.

Staff are also reminded of the need to undertake a formal Job Plan briefing and review of the Hazard Analysis of Task (HAT) that includes everybody that is involved in the work, so they have a full understanding and awareness of the hazards and controls.

- 4.6 On 28 April 2008, Ontrack advised in part:

The trial of radio communication during EWR wagon rail discharge and recovery operations is progressing. The trials are based on the standard Motorola portable radio used by ONTRACK – using Channel 5 (a spare channel) for EWR communications. Three trials have been completed – all being very successful. We are currently working through an issue with the use of Channel 5 in the Auckland region, this channel currently being reserved for another application, the likely solution being a new channel for this area. ONTRACK is preparing a report on the trials, with recommendations for consideration by a joint ONTRACK/RMTU²⁷ working party. Funding has been identified for the purchase of sufficient radios to cover EWR operations throughout New Zealand.

5 Safety recommendations

Safety recommendations are listed in order of development and not in order of priority.

- 5.4 On 6 October 2008 it was recommended to the Chief Executive of the New Zealand Transport Agency that he address the following safety issues:
- 5.1.1 Communication between members of work gangs in noisy environments can be seriously hampered by noise and the ear defenders worn by crew to protect against that noise, often making visual contact the sole method available for communicating. The uptake by the rail industry of technological advances such as radio equipment integrated into safety equipment has been progressed but has been slow. (024/08)
 - 5.1.2 There is no standard system of hand signals across the rail industry for use when directing operations involving cranes and other lifting devices, such as on the rail recovery unit. (025/08)
 - 5.1.3 The quality of crew resource management to achieve outcomes in this case, including the management of resources at different locations such as the train control centre, locomotive cabs and track work sites, sometimes using different communication methods, was of a poor standard, and previously published occurrence reports, as well as other, still open investigations, indicate that the standard of crew resource management across the rail industry is not adequate. (026/08)

²⁷ Rail and Maritime Transport Union.

- 5.1.4 Ontrack's system for ensuring staff competency and currency with rules and operating procedures has not been audited for 2 years, and in spite of the person-in-charge of the accident site at Ohinewai holding current Ontrack certification for his duties, he had not been properly inducted into a new work environment, he was not following documented procedures, and he together with other crew in similar roles was routinely violating documented procedures for work site protection. (027/08)
- 5.1.5 Trains passing through or adjacent to work sites in double-line territory can, under some circumstances, do so at maximum line speed, up to 80 km/h in the case of freight trains, and up to 100 km/h in the case of passenger trains, putting track workers at significant risk. (028/08)
- 5.1.6 The track protection matrix contained in the Rail Operating Rules and Procedures is not clear on requirements for work site protection in some cases, the rail recovery unit being one example. (029/08)
- 5.1.7 The level of compliance monitoring of Ontrack does not appear to be appropriate given the size and complexity of its safety system and the safety issues raised in this report. (030/08)
- 5.1.8 The rules-based system adopted by the rail industry in New Zealand is overly complex and relies heavily on employees' knowledge of it. The training and assessment programme for ensuring compliance did not in this case result in a safe operation. The lessons about rule complexity learned from the Glenbrook inquiry, and the similarities to the New Zealand railway rules system, suggest that the rule complexity issue might be widespread throughout the New Zealand rail system. (031/08)



**Recent railway occurrence reports published by
the Transport Accident Investigation Commission
(most recent at top of list)**

- 06-110 passenger train 4045, uncontrolled movement, between Britomart and Quay Park Junction, 9 October 2006
- 06-108 EMU Passenger Train 9268, struck slip and derailed, between Wellington and Wadestown, 26 August 2006
- 07-101 express freight Train 736, derailment, 309.643 km, near Vernon, 5 January 2007
- 05-123 empty passenger Train 4356, overran conditional stop board without authority following an automatic air brake irregularity, Meadowbank, 6 October 2005
- 05-116 collapse of Bridge 256 over Nuhaka River, Palmerston North-Gisborne Line, 6 May 2005
- 05-124 express freight Trains 834 and 841, collision, Cora Lynn, 20 October 2005
- 06-112 loss of airbrakes and collision, Tram 244, Christchurch, 21 November 2006
- 06-102 SA/SD passenger Train 4306, braking irregularity, between Westfield and Otahuhu, 31 March 2006
- 06-101 diesel multiple unit passenger Train 3163, fire in diesel auxiliary engine, Manurewa, 15 March 2006
- 05-127 Mainline shunting service M52, track occupation irregularity, Te Rapa, 27 October 2005
- 05-120 Express freight Train 142, runaway wagons, Mercer, 1 September 2005
- 05-128 Diesel multiple unit Train 3056, passenger injury, Papatoetoe, 31 October 2005
- 05-125 Taieri Gorge Railway passenger Train 1910, train parting, Dunedin, 28 October 2005
- 05-118 Express freight Train 245, derailment, Ohingaiti, 27 July 2005
- 05-115 Empty passenger Train 2100, train parting and improper door opening, Ranui, 1 April 2005
- 05-108 Diesel multiple unit passenger Train 3334, fire, Auckland, 23 February 2005
- 05-126 Express freight Train 246, derailment, South Junction, 30 October 2005
- 05-103 Express freight Train 237, derailment, 206.246km Hunterville, 20 January 2005
- 05-121 Express freight Train 354, near collision with school bus, Caverhill Road level crossing, Awakaponga, 2 September 2005
- 05-112 Hi-rail vehicle passenger express Train 200, track occupancy incident, near Taumarunui, 7 March 2005

Price \$38.00

ISSN 1178-4164