Report 96-117

Train 6210

Mis. 59 Irregularity

McKays

6 November 1996

Abstract

On Wednesday, 6 November 1996, at approximately 0648 hours Train 6210, a northbound suburban Electric Multiple Unit service, was stopped by a red signal aspect on the double-track section south of McKays. The Train Control Officer had almost completed the process of issuing a Mis. 59 authority to allow the train to pass the Departure signal at "Stop" and enter the single line section ahead when the locomotive engineer of Train 6210 saw Train 203, the southbound *Northerner* passenger express, approaching him on the single line section he was about to receive authority to enter. This fortuitous arrival of Train 203 avoided the possible head-on collision which may have resulted if the authority had been issued and acted on with Train 203 in the section.

The cause of the incident was the failure of the Train Control Officer to establish that no trains were occupying the block section for which the Mis. 59 was going to be issued.

Safety issues identified were the Train Control Officer's failure to follow the procedures required before issuing a Mis. 59, the lack of resilience of the procedures to avoid unacceptable consequences arising from such omissions, the Train Control Officer's fitness for duty and the suitability of the procedures for rostering Train Control Officers.

Transport Accident Investigation Commission

Rail Incident Report 96-117

Train type and number:	Suburban Electric Multiple Unit service 6210
Date and time:	6 November 1996, 0648 hours
Location:	McKays, 41.77 km North Island Main Trunk
Type of occurrence:	Signalling irregularity (Mis. 59 issue)
Persons on board:	Crew: 2 Passengers: 12
Injuries:	Crew: Nil Passengers: Nil
Nature of damage:	Nil
Investigator in Charge:	R E Howe

1. Factual Information

1.1 On Wednesday, 6 November 1996, Train 6210 was the scheduled 0555 hours northbound suburban Electric Multiple Unit (EMU) service from Wellington to Paraparaumu.

1.2 The progress of Train 6210 through the Double Line Automatic Signalling (DLAS) section to McKays[1], and then into the single line section from McKays to Paraparaumu worked under Centralised Traffic Control (CTC), was as directed by Train Control.

1.3 This section of track was under the control of the Wellington main desk Train Control Officer (TCO). A transcript of the Train Control radio transmissions relevant to this report is included as Appendix 1.

1.4 The TCO had two sources of information detailing the progress of trains under his control at any particular of point of time, the Train Control diagram and the Train Control computer screen mimic diagram.

1.5 Scheduled Tranz Rail operations at that time of day were shown on the pre-printed Train Control diagram forming a key part of the TCO's control system. This showed the following scheduled services for the period 0600 hours to 0700 hours (Figure 1):

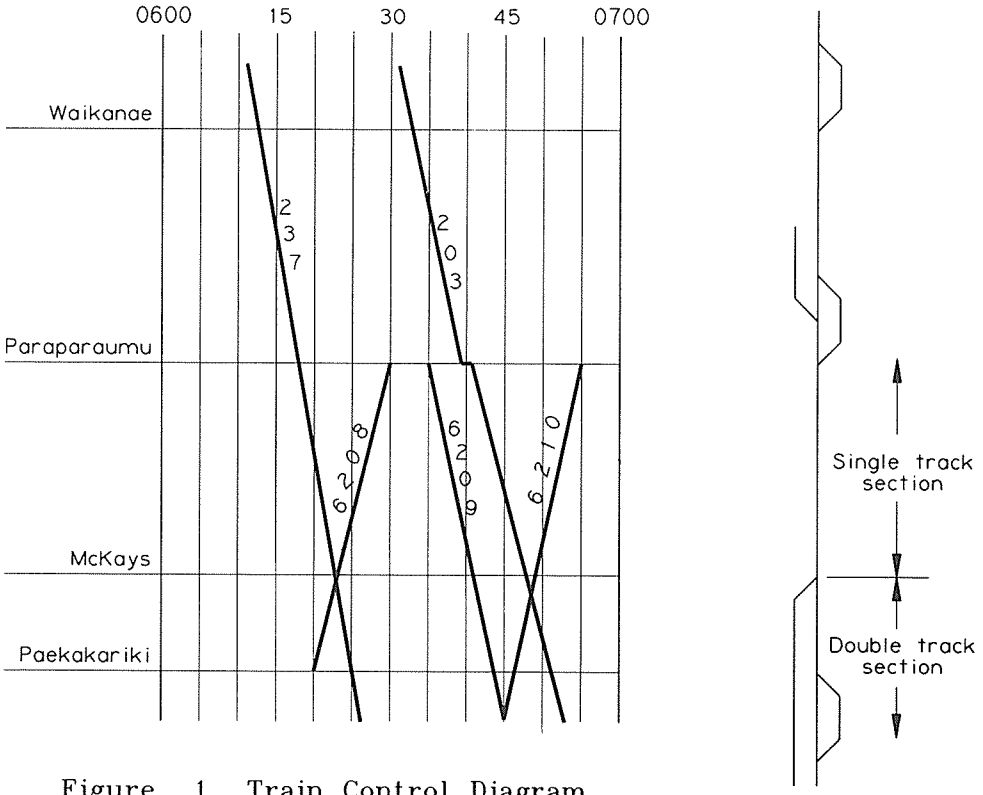

Figure 1 Train Control Diagram Scheduled Services

[1] McKays is the signalling locality adjacent to McKays Crossing.

1.6 The pre-printed schedule showed the northbound EMU (Train 6210) passing the southbound EMU (Train 6209) on the double track south of Paekakariki, and passing the southbound *Northerner* (Train 203) on the double track south of McKays before entering the single line section from McKays to Paraparaumu. The block section between Paraparaumu and McKays was signalled so that down[2] trains could follow one another through the section, separated and protected by appropriate intermediate signalling effectively breaking the block section into two separately controlled intermediate sections. Train 203 was following Train 6209 using this facility. Such following movements are common through this section to deal effectively with long haul and suburban services.

1.7 It was common for trains to run outside scheduled times for a variety of reasons, and in accordance with standard procedures the TCO updated his Train Control diagram with actual progress times for freight and mainline passenger trains, and drew in actual plots in red. (It was not normal practice to record progress times and plots for suburban services at intermediate points between Wellington and Paraparaumu.) On the day in question Train 237 was running approximately 10 to 15 minutes behind schedule, and Train 203 was approximately five minutes behind schedule at Te Horo, although back on schedule at Paraparaumu. At 0644 hours (the commencement of the actions of the TCO, and associated radio transmissions, considered directly related to this incident) the Train Control diagram showed the following integration of scheduled and actual train details (Figure 2):

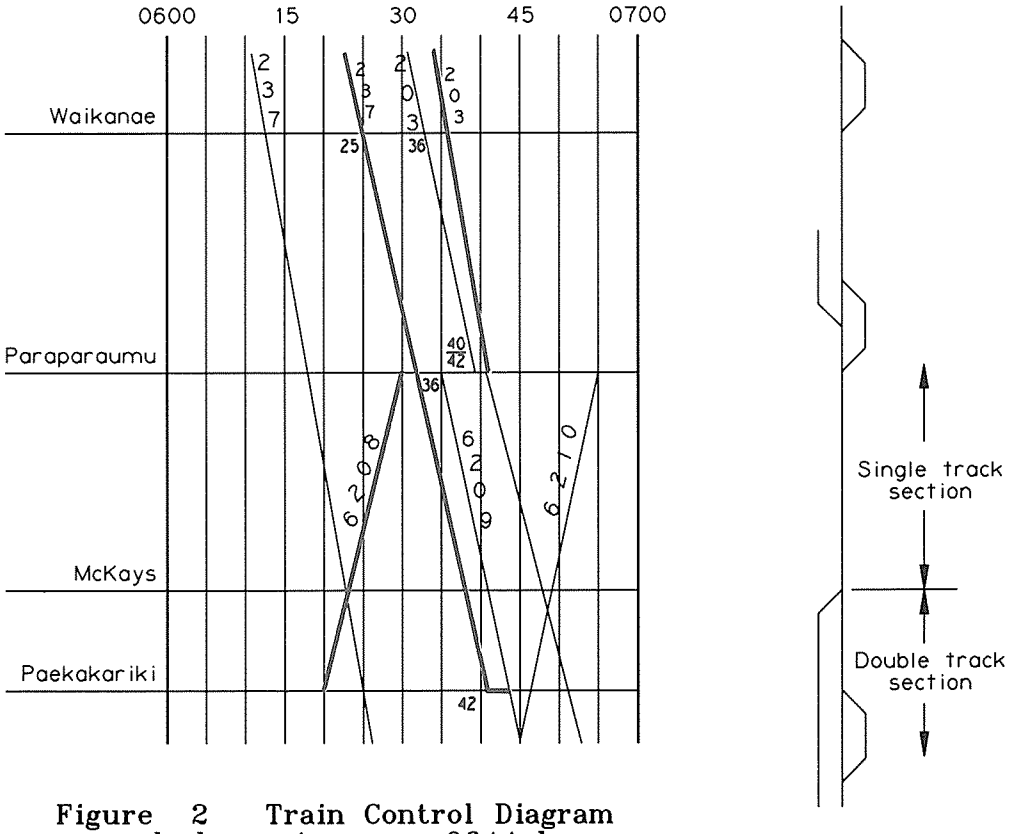

Figure 2 Train Control Diagram as marked up at approx 0644 hours

[2] Down trains travel from Auckland to Wellington.

1.8 The TCO was able to follow the progress of trains under his control on his computer screen mimic diagram which showed tracks and localities diagramatically, with the progress of trains indicated by moving illuminated lengths initiated automatically as trains entered or left various track circuit limits.

1.9 During the course of events between 0642 hours, after the TCO had cleared 2LA signal for Train 203 at Paraparaumu and entered its arrival and departure time (40/42), and 0649 hours, when the Locomotive Engineer (LE) of Train 6210 advised the TCO of the approach of a conflicting train on the single line section ahead, the Train Control diagram would have remained unchanged from that detailed in Figure 2.

1.10 The CTC database output listed all signalling events occurring for the period under evaluation, including changes in signal aspects and point settings and track circuits cleared or occupied. The relevant extracts for the area concerned are detailed in Appendix 2. The time datum for this output was 23 ± ½ minutes behind New Zealand daylight time (Train Control time) and a correction column has been inserted accordingly by adding 23 minutes to the CTC database time. Times quoted in this report from either the Train Control records or the CTC database are differentiated by the suffixes T and C respectively to recognise the ± ½ minute comparative accuracy, and the suffix 'hours' has been dropped for these times.

1.11 The sequence of significant events leading to the incident was:

	Time	Event	Comment
1.11.1	0641:54 C	TCO clears Down Departure signal at Paraparaumu (2LA).	This authorised Train 203 to enter the single line section Paraparaumu - McKays.
1.11.2	0643:47 C	Train 6209 clear of McKays.	
1.11.3	0644:31 C	TCO reversed No. 7 points at McKays thus setting up a route for Train 6210 to enter the single line section McKays - Paraparaumu.	This set up a physical route for Train 203 approaching McKays to enter the Up Main occupied by Train 6210. However Signal 8L, the Down Home Signal at McKays controlling the exit of Train 203, which was showing a "Stop" indication with appropriate prior aspects, could not be set to proceed for Train 203 to enter the Up Main as the signal does not have this capability.
1.11.4	0644:41 C	TCO's first attempt to clear the Up Departure Signal (8R) at McKays controlling entry of Train 6210 to the single line section.	Although able to set No. 7 points (despite the approach of Train 203) 8R Signal could not be cleared while Train 203 was occupying the section.

	Time	Event	Comment
1.11.5	0645:04 C	TCO's second attempt to clear 8R Signal.	
1.11.6	0645:38 T	'A'[3] box to Train Control: "What's our next one in"?	
1.11.7	0645:38 C	TCO's third attempt to clear 8R Signal.	
1.11.8	0645:43 T	TCO's reply to 1.11.6 including "203's on time" and "237's out now, I see he's out at Paekak".	The TCO stated he referred to the Train Control diagram before replying and not the computer screen.
1.11.9	0645:47 C	TCO's fourth attempt to clear 8R Signal.	
1.11.10	0646:00 T	TCO says "What's going on here?"	
1.11.11	0646:20 T	TCO confirms Train 6210 is at 8R Signal.	Although Train 6210 was approximately 5 minutes ahead of schedule the TCO did not record this on his Train Control diagram. This was in accordance with normal practice (refer 1.7).
1.11.12	0646:25 T	TCO tells LE of Train 6210 that he will issue a Mis. 59.	A Mis. 59 is an authority for a train to pass a departure signal at stop, in this case Signal 8R.
1.11.13	0647:40 T	TCO has prepared a Mis. 58 authority and is starting to read it out to the LE of Train 6210.	A Mis. 58 is the TCO's record of the authority he has given to pass a departure signal at stop.
1.11.14	0648:10 T	TCO completes reading out the Mis. 58. LE completes writing out his Mis. 59.	The Mis. 59 is active when read back by the LE and confirmed by the TCO. This was not done in this case due to the LE sighting the approaching Train 203.

[3] 'A' box refers to the Signalman in "A" signal box located in Wellington yard.

	Time	Event	Comment
1.11.15	0648:25 T	LE of Train 6210 sees a southbound train approaching on the single line section he is preparing to enter. TCO advised and appropriate steps to recover the situation initiated.	The southbound train was Train 203 travelling on a yellow indication on the intermediate signal with a red stop indication at the Down Home Signal north of McKays.

Mis. 58/59 Authorities

1.12 Mis. 58/59 authorities are specific procedures to allow a departure signal controlling entry into a single line area to be passed when displaying a "stop" indication because the signal has failed to operate. Train Control procedures relating to the issue of Mis. 58/59 authorities are included in Tranz Rail's Rail Operating Code, Section 6 Instruction 6.0 which states:

> **6.0 Mis. 58/59 Authorities**
>
> **6.1** These authorities are used to pass Departure signals only at "Stop" and they must not be used or altered to give authority to pass any other type of signal.
>
> Before preparing a Mis. 58 authority in the event of a Departure signal failing to operate, the TCO must locate any opposing train and the train immediately preceding the train for which the Mis. 58 is to be issued. In addition to establishing that the train concerned is clear of the block section for which the Mis. 58/59 is going to be issued, it must also be confirmed with the Locomotive Engineer that the train is complete.
>
> If a train crossing is to take place at the crossing station in advance, the Locomotive Engineer of the opposing train must be informed that a Mis. 59 is about to be issued. Locomotive Engineers must also be instructed that shunting movements outside the Departure signal (or in the case of a crossing station in SLAS outside the fouling point board) are not to be made until the train to which the Mis. 59 is to be issued has arrived. "Local Control" must not be given to or used at a station at which a train is waiting to cross a train proceeding on a Mis. 59 authority.
>
> In the exceptional event of it becoming necessary to issue a Mis. 58/59 authority for a train to pass through a section whilst another train is locked in a switchlocked siding in the section concerned, the trainmen of the train in the siding must, before the Mis. 59 is issued, be advised of the circumstances and instructed by train advice that the main line must not be fouled.
>
> Where the interlocking at a station is controlled by a signal box either with direct control, remote control or centralised traffic control, the TCO must not issue a Mis. 59 or authorise the passing of any signal in the "Stop" position until notified by the signal box that all is safe for the issue of the authority.

6.2 Points Indications

Local instructions posted in signal boxes may authorise acceptance of the illuminated "N" or "R" light displayed in the signal panel as proof that motor operated points are safe for traffic, without isolating and hand operating the points. In all other cases motor points must be isolated.

After signals are passed in the 'Stop' position it must always be assumed that any level crossing alarms in the section ahead may fail to operate. The speed of trains over these level crossings must therefore be approached with caution.

1.13 The specific regulations covering departure signals in areas of line worked under CTC were in Tranz Rail's Rules and Regulations in "Centralised Traffic Control (CTC) Regulations", Paragraph 5, Departure Signals, and are included at Appendix 3.

Personnel

1.14 The crew of Trains 203 and 6210 held current Operating Certificates for the duties concerned.

1.15 The TCO had 16 years railway experience of which the last 3 ½ years had been as a Controller. He had been trained, and was appropriately certified, for the Wellington main desk position and held a current Operating Certificate covering these duties.

TCO's hours of duty

1.16 The TCO had commenced his shift at 2250 hours on Tuesday, 5 November, and was due to complete his shift at 0700 hours on Wednesday, 6 November. The incident occurred at approximately 0646 hours, some 14 minutes before the completion of his shift.

1.17 The TCO had been hospitalised for a minor operation in early October, following which he returned to work on 7 October after a week off duty.

1.18 From 7 October to 5 November inclusive (30 days) the TCO had worked 27 shifts in the following pattern:

- 7 early shifts (0650 hours to 1500 hours)
- 5 day shifts (1450 hours to 2300 hours)
- 1 rostered day off
- 1 day shift
- 6 night shifts (2250 hours to 0700 hours)
- 1 late shift (1700 hours to 0100 hours)
- 1 day off
- 4 early shifts
- 1 day off
- 3 night shifts

1.19 For each of the two previous fortnights (fortnight ending 19 October and fortnight ending 2 November) the TCO had worked 12 of 14 shifts available totalling 100 hours and 101 hours for the respective fortnights. (The Wellington Train Control roster was based on an average of approximately 83 hours per fortnight involving a nominal 10 shifts. This was generally in accord with the collective employment contract covering operating staff based on 10 shifts and 80 hours per fortnight.)

1.20 Tranz Rail were training Wellington staff in the Auckland area prior to a proposed shift of the Auckland Train Control Office to Wellington, and Wellington staff were generally working extended hours and shifts to cover this short-term demand.

1.21 The hours worked by the TCO were typical of other Wellington Controllers. For the fortnight ended 2 November five of nine Controllers worked between 98 and 101 hours, and for the fortnight ended 19 October three Controllers worked between 98 and 105 hours. The maximum hours worked by any one Controller for the three fortnights to 2 November was 316 hours, i.e. an average of 104 hours per fortnight. The same member had worked an average of 101 hours per fortnight over an approximate three-month period.

1.22 The TCO's initial report made on the night of the incident stated that he observed what he thought to be Train 203 clearing McKays at which stage he reversed No. 7 points and attempted to clear 8R Signal for Train 6210. On later reflection the TCO stated that he had not interpreted the passage of Train 6209 incorrectly as 203; rather he had completely forgotten about the presence of Train 203. Some 2 ½ minutes before reversing 7 points the TCO had cleared 2LA signal at Paraparaumu to allow Train 203 entry into the single line section.

1.23 Following his inability to clear 8R Signal the TCO said he looked at his Train Control screen and interpreted the illuminated indication of the presence of Train 203 as a "block fault" associated with a defective insulated rail joint. He stated he had reported two failures in that area to the signals technician in the previous 12 months. (Tranz Rail's Manager, Signals and Telecommunications, had no record of any particular repetitive problem.)

1.24 The TCO stated his misinterpretation was made possible because he looked only at activities near McKays on the right top level of his screen, without also looking at activities near Paraparaumu at the left of the second level on his screen (refer Figure 3).

1.25 Following this misinterpretation the TCO stated "my mindset was telling me it was a block fault and so, as tired as I was at the time and right at the end of the shift, I failed to go through the procedures, I just didn't do it".

1.26 The TCO's sleep pattern had been disrupted before the incident. On the morning of Monday 4 November, the TCO was told by his supervisor that a "particularly good" staff appraisal he had received some weeks earlier would not result in the immediate pay increase that he was expecting. In his words, "When I found that out I took it hard, I took it home with me and stewed on it and I couldn't sleep. I stayed awake all day Monday as a result of that." He stated he felt a bit tired on his Monday night shift but felt he was "handling it okay". On Tuesday 5 November, he was still finding it difficult to sleep although he managed six hours sleep up to 1300 hours. He commenced his shift at 2250 hours feeling "fairly tired" and attracted a comment from a fellow Controller: "you look pretty awful".

1.27 The TCO described the shift as a particularly quiet night with everything "running smoothly" and "not having to think about a lot". He felt this may have added to the factors which caused him to overlook standard procedures.

1.28 The TCO was in good health and had no requirement for any medication that might affect performance. Medical checks following the incident confirmed he was not suffering from sleep apnoea.

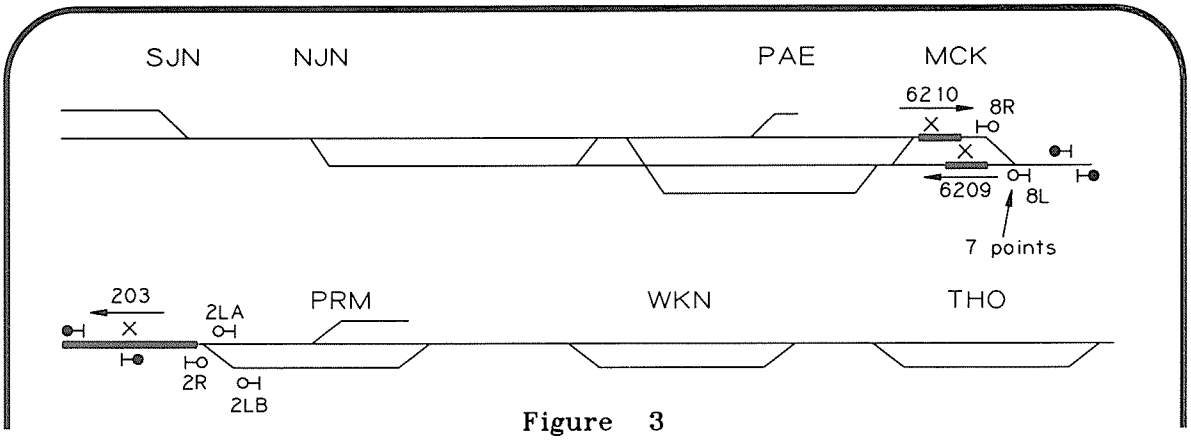

Figure 3

Screen display McKays - Paraparaumu as seen by TCO at 0644:31C

TCO reverses 7 points at McKays for train 6210 and makes a first attempt to clear 8R signal

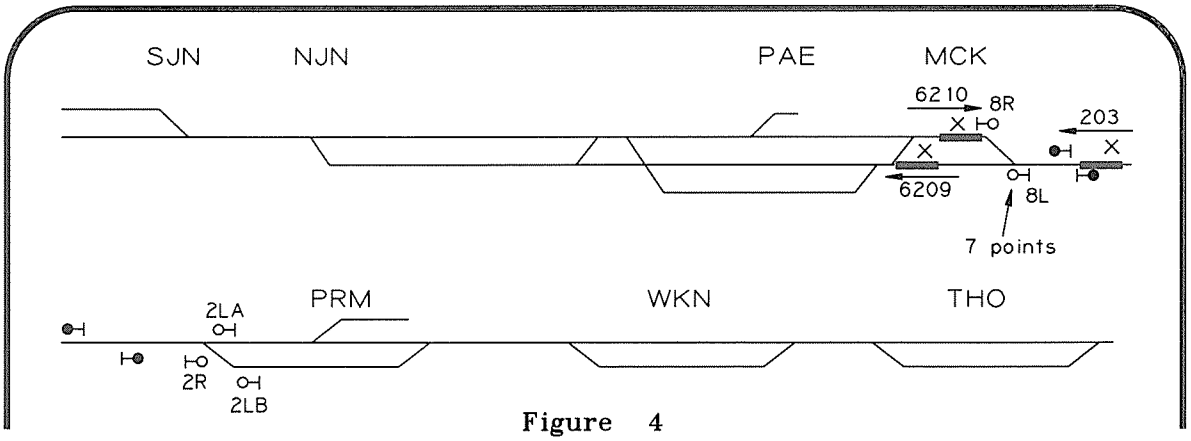

Figure 4

Screen display at 0645:38T

Query from "A" box relating to the progress of train 203
(and approximate timing of the second attempt to clear 8R signal)

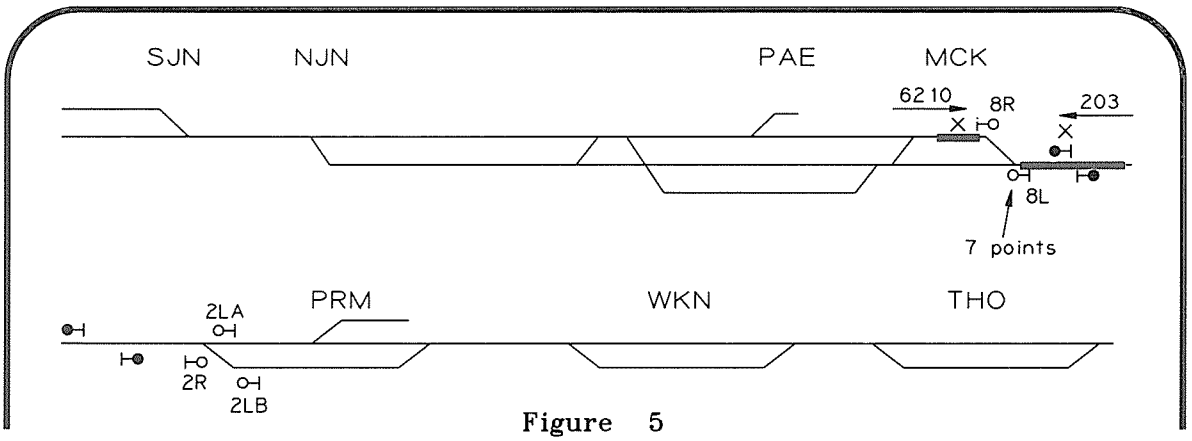

Figure 5

Screen display at 0646:25T (Train 6209 not shown)

TCO advises LE he will issue a Mis 59

LEGEND ▬ Illuminated screen section

NOTE : Approximate position of trains (X), Train N^{o} and N^{o}7 points added for clarity (not identified on screen)

2. Analysis

2.1 The events of the morning of 6 November before the reversing of No. 7 points were normal operating contingencies associated with the day-to-day running of Tranz Rail's operations and the TCO was experienced in dealing with them.

2.2 The TCO reversed 7 points and attempted to set 8R Signal to proceed between 0644:31 C[4] and 0645:47 C. These actions were initiated by the TCO as a result of him observing Train 6209 clear McKays on his Train Control screen at 0643:47 C (refer 1.11.2).

2.3 During this period the Train Control diagram on the desk in front of the TCO recorded the progress of the relevant trains as shown in Figure 2, and had he referred to the diagram it would have shown him the presence of Train 203 between Paraparaumu and McKays. The use of the Train Control diagram in this manner was standard and required practice, and the TCO's action in attempting to set up a signalled route for Train 6210 without such a check was the catalyst for the sequence of events which followed.

2.4 Between 0645:38 T and 0645:50 T the TCO did refer to the Train Control diagram to answer the query from "A" box (refer 1.11.8). Allowing for the ± ½ minute tolerance in timing, the sequence of events in paragraph 2.2 occurred between the time limits of 0644:01 T and 0646:17 T, i.e. the TCO may have referred to his Train Control diagram after or during the events but not before. The TCO's actions indicate that reference was probably made after the events.

2.5 The TCO's decision to issue a Mis. 59 was communicated to the LE at 0646:25 T, i.e. about 35 seconds after the TCO referred to the Train Control diagram to answer the request from "A" box.

2.6 Before issuing a Mis. 59 the TCO was required to locate any opposing train and the train immediately preceding the train for which the Mis. 59 was to be issued, and to establish beyond doubt that no trains occupied the block section for which the Mis. 58/59 was to be issued. Any preceding misinterpretations or misunderstandings would have been picked up by this procedure but it was not carried out.

2.7 Despite the fact that this procedure was not carried out the combination of the timing of the clearance of 2LA signal to allow Train 203 into the single line section, screen indication (albeit originally misinterpreted as a "block fault") and reference to the Train Control diagram when queried by "A" box should have ensured the TCO's awareness of the conflicting presence of Train 203.

2.8 The TCO initiated the sequence, which had the potential to result in a collision had the issue of a Mis. 59 been completed to Train 6210, when he reversed No. 7 points at 0644:31 C at which time the Train Control screen indicated the three trains in the McKays area (6209/6210/203) as shown in Figure 3. What the TCO missed was the clear indication of Train 203 between Paraparaumu and McKays.

2.9 At 0645:38 T, when the TCO referred to his Train Control diagram to answer the query from "A" box , the Train Control screen was as shown in Figure 4. Train 203 had passed the intermediate signal and then showed up over a small section at the right of McKays at the top of the screen.

[4] Refer paragraph 1.10 for explanation of time suffixes.

2.10 At 0646:25 T, when the TCO advised the LE he would issue a Mis. 59, the Train Control screen was as shown in Figure 5. The advance of Train 203 had been shown by an extended indication to the right of McKays, and this indication remained until Train 203 eventually cleared McKays.

2.11 During the crucial period 0643:47 C to 0646:25 T the indication mistaken for a "block fault" was not static and although the TCO may not have noticed the changes as they occurred, the significance of the changes should have challenged his mindset of a "block fault". The screen indication would not have changed from 0646:25 T to 0648:25 T as the process of issuing the Mis. 59 proceeded.

2.12 Either the TCO's misinterpretation of Train 6209 as Train 203 or his lapse of memory regarding the presence of Train 203, the progress of which he had authorised only minutes earlier by clearing 2LA signal, created a situation in which he was able to misinterpret the screen indication. These irregularities should have been picked up and clarified if the stringent requirements for issuing Mis. 59s had been carried out. Because they were not, a potential collision scenario developed as the issue of a Mis. 59 proceeded until overcome by the LE of Train 6210 seeing Train 203 approaching.

2.13 The TCO could not explain why he did not carry out the standard procedures with which he was familiar and which he used frequently. Factors which may have contributed to this were:

- The effect of the sleep deprivation reported by the TCO as a result of his concern regarding his deferred salary increase.
- The cumulative effect on his fitness for duty of the additional shifts being worked by the TCO.
- The mindset which resulted in the TCO being convinced that he was dealing with a "block fault", thus minimising the apparent need for check procedures to the extent that they were overlooked.

(It is relevant that an address by Mr Robert T Francis II, Vice-Chairman of the National Transportation Safety Board, United States, to the Third ICAO Global Flight Safety and Human Factors Symposium (Auckland, April 1996) referred specifically to a North American rail accident in which an experienced LE, faced with an opposing train bearing down on him when he knew he had the right-of-way, took no action to reduce speed and avoid a collision despite visual and verbal warnings, and Francis said "this sort of inflexible mindset is probably not as uncommon as we would like to believe".)

2.14 The safety issues arising from this investigation were the TCO's fitness for duty at the time of the incident and the lack of resilience of the Mis. 59 procedures to overcome such adverse human factors.

2.15 The TCO's fitness for duty was affected by his short-term sleep deprivation associated with work related stress and could have been affected by his medium-term shift pattern. Tranz Rail dealt immediately with the sleep deprivation as detailed in Section 4, Safety Actions.

2.16 The matter of hours at work for Train Control Officers was included in a recommendation to Tranz Rail arising from Railway Occurrence Report 96-105. This recommendation, made to Tranz Rail in August 1996, was to review procedures and contingencies for rostering Train Control Officers with particular regard to defining maximum shift hours and maximum hours between breaks, and make appropriate provision for certified relief staff. The total hours worked by some Wellington Train Controllers during the period August to November 1996 is a further indication of the need for action on this recommendation. Progress to date is discussed under section 4, Safety Actions.

2.17 Tranz Rail has tightened the procedures for issuing Mis. 59 authorities as detailed in Section 4, Safety Actions.

2.18 In view of the actions being taken by Tranz Rail no specific recommendations have been made as a result of this investigation.

3. Findings

3.1 Train 6210 and Train 203 were being operated normally prior to the incident.

3.2 The LEs concerned were appropriately certified for the duties being carried out.

3.3 The signalling systems were fully operational and functioning as intended.

3.4 The TCO was appropriately certified for the duties being carried out.

3.5 The TCO's failure to refer to his Train Control diagram before attempting to set up a signalled route for Train 6210 in conflict with Train 203 was the initiating factor in the incident.

3.6 There was no apparent reason for the TCO's misinterpretation of the standard Train Control screen indication of Train 203's progress as a "block fault".

3.7 The cause of the incident was the TCO's failure to carry out the required procedures to establish beyond doubt that no trains were occupying the block section for which the Mis. 58/59 was going to be issued.

3.8 The TCO's reported lack of sleep over the two days before the incident would have resulted in sleep deprivation.

3.9 Sleep deprivation to the extent reported could have adversely affected the TCO's alertness and fitness for duty.

3.10 The TCO's alertness and fitness for duty may have been adversely affected by the number of shifts he had worked in the month before the incident.

4. Safety Actions

4.1 The TCO was immediately removed from Train Control duties. Over the next three to four weeks he received counselling and was referred to a doctor and psychologist to assess and improve his physical and mental suitability for continued Train Control duties. During this period he attended a sleep management and therapy course run by Tranz Rail supervisory staff. Following his return to duty at the end of this period he had monthly medical checks for three months.

4.2 On 13 January 1997 Tranz Rail issued an additional instruction regarding Mis. 58/59 procedures which stated:

> As a means of confirming that the block section for which a Mis. 59 is about to be issued is clear the following procedure will apply:
> The Train Control Officer after establishing that the section is clear, must advise the Locomotive Engineer to whom the Mis. 59 will be issued the number of the last train through the affected section and the time it cleared.
> Where there has been no other trains through the section on that day such information to the Locomotive Engineer will suffice.
> The Train Control Officer is to endorse this information on the Mis. 58.

To assist in ensuring consistent endorsement Tranz Rail has introduced a standard stamp until the relevant forms are reprinted.

4.3 Tranz Rail's 1996 response to the Commission's recommendation regarding Train Control Officers rostering stated:

> Tranz Rail has formed a Train Control Consolidation Steering Committee and part of their brief is to review procedures and contingencies for rostering Train Control Officers.

4.4 In March 1997 Tranz Rail advised that a comprehensive proposal governing the hours of Train Control shift lengths, the maximum number of consecutive shifts and the minimum rest periods between shifts, had been submitted to Train Control staff and their industrial representatives and that they would update the Commission when it reached the acceptance stage.

4.5 While the need for such a consultative process is appreciated some interim control of consecutive shifts may be necessary if the maximum figures applicable to the August to November 1996 period are still occurring. This particular aspect should be able to be controlled by Tranz Rail without jeopardising any future proposal.

11 June 1997

Hon. W P Jeffries
Chief Commissioner

Appendix 1

Train Control Tape Transcript Wednesday 6 November 1996

Mike/Radio Channel 11/18

Time (NZDT)	Caller	Content
0645:07	TCO	What's going on there at McKays?
0645:27	TCO	Who's there?
	"A" box	"A" box.
	TCO	"A" box.
	"A" box	Have you got a line on 211?
	TCO	Yeah he's cancelled.
	"A" box	Cancelled.
	TCO	Yeah.
	"A" box	Someone was asking me. Yeah.
	TCO	Okay.
*0645:38	"A" box	What's our next one in?
*0645:43	TCO	Ah..... Ah, well 203's on time. Yeah ...ah... 237's out now, I see he's out at Paekak, so ah yeah 203, 237 after that but that won't be till after 9 o'clock.
	"A" box	About 9 o'clock?
	TCO	Okay? Thanks ta.
0646:00	TCO	S...t, what's going on here?
0646:06	TCO	6210, 6210 from Control Receiving.
	6210	You receiving.
*0646:13	TCO	Roger that, I've got some tracks down there at McKays. Are you ...are those barriers operating at McKays... Are you ...I take it you are at the Departure at McKays. Is that correct?
*0646:20	6210	That's correct.
*0646:25	TCO	Okay... um... Yeah I'm going to have to get you a Mis. 59 unfortunately, I can't ah ... clear a light there. Over.

Time (NZDT)	Caller	Content
*0646:35	6210	Yeah.
*0646:42	6210	Are you there Train Control?
0647:05	6210	6210, Train Control.
*0647:10	TCO	Yeah. Roger mate I'm just busy scribbling this one out and the points ...I've got indications on the points so I'll give you this Mis. 59 and you'll be right to go. Over.
*0647:25	6210	We'll get ready.
0647:40	TCO	Control 6210. Authority No 91 9...1 Wellington 6/11/96 Timed at 0648. To Locomotive Engineer train No. 6210 at McKays, today Wednesday. No. 6210 is authorised to pass the Up Departure signal at McKays at Stop and Proceed in accordance with fixed signals through the block section to Paraparaumu.
*0648:10		That's signed. [TCO's name]. Over.
*0648:13	6210	Give us the authority number?
*0648:20	TCO	Yeah, 91, 9...1 over.
*0648:25	6210	Yeah, we'll have to wait here anyway till that goods train on the other side of the crossing has gone anyway.
	TCO	Sorry, say that again.
	6210	We've got a train on the other side, diesel train on the other side of the crossing, the points should come back for him to go through.
	TCO	Oh, hell no, sorry, that's ah...no, I've made a blue there.. that's the Northerner sorry, yeah you're right. Just stand by.

*These times have been derived by timing the tape.

Appendix 2

Selected data from the CTC Database output detailing the sequence of events in the Paekakariki - Paraparaumu section relating to the incident. (Comments added to clarify events.)

CTC Base Time (23 min. behind NZDT)	NZDT (CTC + 23)	Place			Comment
0612:25	0635:25	PRM	A Track	Clear ← Occ'd	Train 237
0612:40	0635:40	MCK	D Track	Occ'd ← Clear	
0612:59	0635:59	PRM	6LB Signal	Control issued: Clear	For departure of Train
0613:00	0636:00	PRM	2LA Signal	Control issued: Clear	6209 from Paraparaumu
0613:03	0636:03	PRM	6LB Signal	Clear authorised change	(PRM)
0613:10	0636:10	PRM	2LA Signal	Clear authorised change	
0613:46	0636:46	MCK	Barrier Down Ind	Down ← Up	Approach of 237 to McKays (MCK)
0614:03	0637:03	MCK	C Track	Occ'd ← Clear	Train 237
0614:08	0637:08	MCK	B Track	Occ'd ← Clear	
0614:11	0637:11	PAE	McKays B Track	Occ'd ← Clear	
0614:42	0637:42	MCK	Barrier Down Ind	Up ← Down	Train 237 passed MCK
0614:48	0637:48	MCK	C Track	Clear ←Occ'd	
0614:48	0637:48	MCK	D Track	Clear ← Occ'd	
0615:14	0638:14	PRM	H Track	Occupied ← Clear	Train 6209 departing PRM
0615:37	0638:37	PRM	6LB Signal	Cancel ← Clear	
0615:37	0638:37	PRM	P Track	Occ'd ← Clear	Train 6209
0615:42	0638:42	PRM	G Track	Occ'd ← Clear	
0615:48	0638:48	PRM	R Track	Clear ← Occ'd	
0615:54	0638:54	PRM	D Track	Occ'd ← Clear	Train 6209
0616:05	0639:05	PRM	P Track	Clear ← Occ'd	
0616:05	0639:05	PRM	Time delay	On ← Off	
0616:05	0639:05	PRM	Time delay	Off ← On	
0616:11	0639:11	PRM	2LA Signal	Cancel ← Clear	
0616:11	0639:11	PRM	A Track	Occ'd ← Clear	
0616:11	0639:11	PRM	B Track	Occ'd ← Clear	Train 6209
0616:11	0639:11	PRM	C Track	Occ'd ← Clear	
0616:17	0639:17	PRM	D Track	Clear ← Occ'd	
0616:26	0639:26	MCK	B Track	Clear ← Occ'd	
0616:28	0639:28	PAE	K Track	Occ'd ← Clear	
0616:28	0639:28	PAE	10L Signal	Cancel ← Clear	
0616:29	0639:29	PRM	C Track	Clear ← Occ'd	
0616:29	0639:29	PRM	Time delay	On ← Off	
0616:29	0639:29	PRM	Time delay	Off ←On	
0616:38	0639:38	PRM	5 points	Control issued: Normal	
0616:40	0639:40	PRM	8L Signal	Control issued: Clear	
0616:40	0639:40	PRM	5 points	Moving ← Revers	
0616:49	0639:49	PRM	5 points	Normal authorised change	

CTC Base Time (23 min. behind NZDT)	NZDT (CTC + 23)	Place			Comment
0616:49	0639:49	PRM	8L Signal	Clear authorised change	
0617:05	0640:05	PRM	6LA Signal	Control issued: Clear	
0617:07	0640:07	PRM	6LA Signal	Clear authorised change	
0617:23	0640:23	PAE	S Track	Occ'd ← Clear	
0617:41	0640:41	PRM	F Track	Occ'd ← Clear	Train 203 approaching PRM
0617:52	0640:52	PRM	B Track	Clear ← Occ'd	
0617:52	0640:52	PRM	Q Track	Occ'd ← Clear	Train 203
0617:59	0640:59	PRM	F Track	Clear ← Occ'd	
0617:59	0640:59	PRM	G Track	Clear ← Occ'd	
0618:04	0641:04	PAE	A Track	Occ'd ← Clear	
0618:29	0641:29	PRM	H Track	Clear ← Occ'd	
0618:34	0641:34	PAE	McKays B Track	Clear ← Occ'd	
0618:34	0641:34	MCK	8L Signal	Control issued Clear	
0618:43	0641:43	PRM	A Track	Clear ← Occ'd	
0618:54 0618:57	0641:54 0641:57	PRM PRM	2LA Signal 2LA Signal	Control issued Clear Clear authorised change	TCO clears the Down Departure Signal at PRM for Train 203
0619:08	0642:08	PAE	B Track	Occ'd ← Clear	
0619:13	0642:13	PAE	A Track	Clear ← Occ'd	
0619:22	0642:22	MCK	D Track	Occ'd ← Clear	Train 6209
0619:24	0642:24	PAE	K Track	Clear ← Occ'd	
0619:28	064228	MCK	8L Signal	Clear authorised change	Down Home Signal for 6209
0619:37	0642:37	PAE	9 points free ind	On ← Off	
0619:38	0642:38	PRM	6LA Signal	Cancel ← Clear	
0619:38	0642:38	PRM	P Track	Occ'd ← Clear	Train 203
0619:38	0642:38	PAE	9 Points	Control issued Normal	
0619:44	0642:44	PAE	9 Points	Moving ← Revers	
0619:45	0642:45	PRM	Q Track	Clear ← Occ'd	
0619:46	0642:46	PAE	10L Signal	Control issued Clear	
0619:47	0642:47	PAE	9 Points	Normal authorised change	
0619:50	0642:50	PAE	10L Signal	Clear authorised change	
0619:53	0642:53	PRM	D Track	Occ'd ← Clear	Train 203
0620:01	0643:01	PRM	2LA Signal	Cancel ← Clear	
0620:01 0620:01 0620:01	0643:01 0643:01 0643:01	PRM PRM PRM	A Track B Track C Track	Occ'd ← Clear Occ'd ← Clear Occ'd ← Clear	Train 203
0620:01	0643:01	PRM	P Track	Clear ← Occ'd	
0620:07	0643:07	PRM	D Track	Clear ← Occ'd	
0620:19	0643:19	PRM	C Track	Clear ← Occ'd	
0620:19	0643:19	PRM	Time delay	On ← Off	
0620:22	0643:22	MCK	Barrier down ind	Down ← Up	Approach of 6209 to MCK
0620:25	0643:25	PRM	Time delay	Off ← On	
0620:34	0643:34	MCK	C Track	Occ'd ← Clear	Train 6209

CTC Base Time (23 min. behind NZDT)	NZDT (CTC + 23)	Place			Comment
0620:45	0643:45	MCK	B Track	Occ'd ← Clear	
0620:45	0643:45	MCK	Barrier Down ind	Up ← Down	Train 6209 passes MCK
0620:47	0643:47	PAE	McKays B Track	Occ'd ← Clear	
0620:51	0643:51	MCK	C Track	Clear ← Occ'd	Train 6209 clears circuits
0620:51	0643:51	MCK	D Track	Clear ← Occ'd	
0621:29	0644:29	MCK	B Track	Clear ← Occ'd	
0621:31	0644:31	MCK	7 points	Control issued Revers	TCO reverses points at MCK for Train 6210 to enter MCK - PRM section
0621:33	0644:33	MCK	7 points	Moving ← Normal	
0621:38	0644:38	MCK	7 points	Revers authorised change	
0621:41	0644:41	MCK	8R Signal	Control issued Clear	TCO's first attempt to give a light to 6210 (refer Figure 3)
0621:42	0644:42	PRM	B Track	Clear ← Occ'd	
0621:44	0644:44	PRM	2R Signal	Control issued Clear	
0621:46	0644:46	PRM	6R Signal	Control issued Clear	
0621:51	0644:51	PAE	McKays A Track	Occ'd ← Clear	Train 6210 approaching
0621:49	0644:49	PRM	2R Signal	Clear authorise change	
0621:52	0644:52	PRM	6R Signal	Clear authorised change	
0622:04	0645:04	MCK	8R Signal	Control issued Clear	TCO's second attempt
0622:04	0645:04	PAE	McKays B Track	Clear ← Occ'd	Train 6209 progress
0622:23	0645:23	PRM	A Track	Clear ← Occ'd	Progress of Train 203
0622:38	0645:38	MCK	8R Signal	Control issued Clear	TCO's third attempt and also the timing of the query from A Box (Figure 4)
0622:42	0645:42	MCK	8R Signal	Clear control timed out	
0622:45	0645:45	MCK	A Track	Occ'd ← Clear	Progress of Train 6210
0622:47	0645:47	MCK	8R Signal	Control issued Clear	TCO's fourth attempt, following which he advises LE at 0646:25 T that he will issue a Mis. 59 (Figure 5)
0622:53	0645:53	MCK	D Track	Occ'd ← Clear	
0623:47	064647	MCK	8R Signal	Clear control timed out	
0626:06	0649:06	MCK	7 points	Control issued Normal	At approximately 0648:00 the TCO was advised of the presence of a train in the single line section opposing Train 6210 and action was taken to correct the situation
0626:08	0649:08	MCK	7 points	Moving ← Revers	
0626:18	0649:18	MCK	8L Signal	Control issued Clear	
0626:19	0649:19	MCK	7 points	Normal authorised change	
0626:38	0649:38	MCK	8L Signal	Clear authorised change	
0626:38	0649:38	MCK	Barrier down ind	Down ← Up	
0626:54	0649:54	MCK	C Track	Occ'd ←Clear	
0627:16	0650:16	MCK	B Track	Occ'd ← Clear	
0627:16	0650:16	MCK	Barrier down ind	Up ← Down	
0627:18	0650:18	PAE	McKays B Track	Occ'd ← Clear	
0627:22	0650:22	MCK	C Track	Clear ← Occ'd	
0627:22	0650:22	MCK	D Track	Clear ← Occ'd	
0627:43	0650:43	MCK	7 points	Control issued Revers	
0627:45	0650:45	MCK	7 points	Moving ← Normal	

CTC Base Time (23 min. behind NZDT)	NZDT (CTC + 23)	Place			Comment
0627:47	0650:47	MCK	E Track	Clear ← Occ'd	
0627:51	0650:51	MCK	8R Signal	Control issued Clear	
0627:53	0650:53	MCK	7 points	Revers authorised change	
0627:54	0650:54	MCK	8R Signal	Clear authorised change	

Appendix 3

CTC Regulations covering Departure Signals

5. Departure Signals

(a) A Departure signal is a signal which authorises entry to a single-line block section from an interlocked crossing station.

A Loop Departure signal may have a Low Speed light or an Arrow Indicator associated with it for the purpose of authorising other movements that will not proceed onto the main line.

(b) If a Departure signal fails to operate, then Train Control must ensure that all "recall" or "indication checks" as described in the local instructions are carried out. If the signal still fails to operate Train Control may authorise either the passing of the Departure signal at "Stop" or the institution of pilot working, as may be considered necessary. Before authorising the train to pass the Departure signal any points concerned for the intended movement must be correctly set and where required by Train Control secured. The authority to pass the Departure signal at "Stop" will be given on Mis. 59 form (Authority to Pass Departure Signal at "Stop"), and will be the Locomotive Engineer's authority to enter the block section and, except when issued for a shunting movement, proceed through the block section concerned under the conditions set out on the form.

A separate Mis. 59 must be issued for each shunting movement past the Departure Signal.

If a Departure Signal has been passed at "Stop" Train Control may after being satisfied that it is safe to do so, either:

(i) Authorise the train to be set back within station limits in accordance with the appropriate C.T.C. Regulation; or

(ii) Give authority by the issue of a Mis. 59 for the train to proceed through the block section, or authorise the institution of pilot working; which ever may be appropriate to the circumstances.

If, after Train Control has been advised, the Departure signal goes to "Proceed" the train must not be permitted to depart without authority being first obtained from Train Control who may then authorise the Mis. 59 to be endorsed "Not required, signal operative".

The authority to pass the Departure signal at "Stop" will be entered on a Mis. 58 form by Train Control, who will telephone particulars to the Officer in Charge or the Locomotive Engineer of the train, as the case may be, for entry on a Mis. 59 form. The Locomotive Engineer is to ensure that all members of the train crew involved are aware of the issue of the Mis. 59.

The employee receiving the telephoned authority must at once repeat the instruction back to Train Control, who will confirm it.

When the train has reached the end of the block section (or, in the case of a Mis. 59 authority issued for shunting purposes, has passed the Departure signal) the Locomotive Engineer must write the word "Cancelled" across the Mis. 59 or tear it in half.

(c) If the Low-speed Light or Arrow Indicator associated with a Loop Departure signal fails to operate, the Signalman or member in charge of the movement must communicate with Train Control.

Train Control must satisfy himself that the points are set and secured for the intended movement and that it is safe for the movement to proceed.

Train Control must then arrange for the Locomotive Engineer to be advised of the circumstances and for the movement to be handsignalled as directed by the Signalman.

Tranz Rail **Authority to Pass Departure Signal at "Stop" *and Proceed through Block Section** Mis. 58

Authority No.	
Office of Origin	
Date	/ /19
Time	hours

Sent at	hours
Sent by	
Repeated back at	hours
Repeated back by	
Repeated back from	

To Locomotive Engineer,

Train No. ..... , at .....

Today, ... , No. ..... is authorised to pass the

..... DEPARTURE signal at .....

at "Stop" *and proceed IN ACCORDANCE WITH FIXED SIGNALS through the block section to .....

.....
Train Control Officer.

*To be deleted when issued for shunting purposes only.

Tranz Rail Mis. 59

Authority to Pass Departure Signal at "Stop" *and Proceed through Block Section

Authority No.	
Office of Origin	
Date	/ /19
Time	hours

To Locomotive Engineer,

Train No. ..... , at .....

Today, ... , No. ..... is authorised to pass the

..... DEPARTURE signal at .....

at "Stop" *and proceed IN ACCORDANCE WITH FIXED SIGNALS through the block section to .....

THE TRAIN MUST TRAVEL CAUTIOUSLY, THE LOCOMOTIVE ENGINEER BEING PREPARED TO FIND THE SECTION OBSTRUCTED OR DISPLACED RAIL OR POINTS WRONGLY SET OR LEVEL CROSSING WARNING DEVICES NOT OPERATING CORRECTLY.

.....
Train Control Officer.

*To be deleted when Mis. 59 issued for shunting purposes only.

Specimen of a Mis. 58 and Mis. 59 form.

5. *continued*

(d) Circumstances in which a Departure Signal can be passed at Stop in accordance with the Regulations:

(i) Upon receipt of the Mis. 59 authority from Train Control referred to in clause (b) hereof;

(ii) When pilot working has been instituted;

(iii) When it is necessary for a relief locomotive or train to enter the block section for the purpose of rendering assistance to a disabled train;

(iv) When a locomotive is required to return from a crossing station for a portion of the train left in the block section;

(v) When a train is required to enter an obstructed block section;

(vi) Loss of pilot key or half pilot key;

(vii) When a Work Train, Track Maintenance Machine, or Mobile Track Equipment is prevented from entering a block section due to a Departure signal either having failed or fixed at Stop because of the nature of the work being carried out then a train advice giving the necessary authority may be issued, a separate train advice being issued for each movement.

(e) When a Departure signal has been passed at "Stop" the train having received its proper authority to proceed must travel cautiously, the Locomotive Engineer being prepared to find the section obstructed, or displaced rail or points wrongly set and must not assume that any obstruction is protected. Level crossings in the section equipped with automatic warning devices must also be approached with caution as the alarms may not operate correctly.

Unless authority is given to the contrary Locomotive Engineers who have passed a Departure signal at "Stop", before passing over any points in the block section must examine them to see they are correctly set and secured so that the train may pass safely over them.