Special Commission of Inquiry Into the

Glenbrook Rail Accident

Final Report

April 2001

The Honourable Peter Aloysius McInerney

Special Commission of Inquiry into the Glenbrook Rail Accident

11 April 2001

Her Excellency Professor Marie Bashir A.O.,
Governor of the State of New South Wales
Office of the Governor
Macquarie Street
SYDNEY NSW 2000

Your Excellency,

I was appointed by Letters Patent issued on 9 December 1999, and varied by Letters Patent issued on 14 April 2000, 23 August 2000, 13 December 2000 and 27 February 2001, under the authority of the Special Commissions of Inquiry Act 1983 to inquire into and report to Your Excellency on the following matters:

1. The causes of the railway accident at Glenbrook on 2 December 1999 and the factors which contributed to it;

2. The adequacy of risk management procedures applicable to the circumstances of the railway accident; and

3. Any safety improvements to rail operations (including any relevant structural changes) which the Commissioner considers necessary as a result of his findings under matters 1 and 2 and as a result of consideration of the reports of the rail safety investigations and any coronial report into railway accidents at:

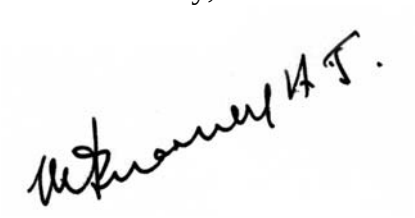
    - Redfern on 6 April 2000
    - Hornsby on 9 July 1999 and 11 January 2000
    - Olympic Park on 2 September 1999 and 14 November 1999
    - Waverton on 20 December 1999
    - Kerrabee on 18 August 1998 and
    - Bell on 15 October 1998.

By the said Letters Patent it was declared that sections 22, 23 and 24 shall apply to and in respect of the Special Commission the subject of Your Excellency's Letters Patent.

The Letters Patent, as so varied, stated "AND OUR further will and pleasure is that you do deliver any interim reports and your final report in writing of the results of your inquiry as expeditiously as possible, but in any case on or before 11 April 2001, to the office of Our Governor in Sydney".

I present my final report for Your Excellency's consideration.

Yours faithfully,



The Honourable Mr Acting Justice Peter Aloysius McInerney

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1. Introduction

The Glenbrook rail accident occurred on 2 December 1999 at 8:22 am. Seven passengers in the front compartment of the first carriage of the inter urban train were killed and 51 passengers were transported to hospital with injuries. Many other passengers sustained injuries which did not require their immediate hospitalisation but which have caused significant physical or mental impairment to them. On the same day I was flown by helicopter to the scene of the accident where I viewed the two trains in the collision position.

The Glenbrook rail accident was the most serious rail accident in New South Wales since 6 May 1990 when an inter urban train collided with a special steam train on the Cowan embankment near the Hawkesbury River north of Sydney in which six persons were killed and 100 passengers injured. The most serious rail accident prior to that occurred on 18 January 1977 at Granville when an eight car passenger train derailed and collided with the Bold Street bridge, causing the bridge to fall on the third and fourth carriages of that train resulting in the deaths of 83 passengers with injuries to a further 213 passengers.

The urgency with which the inquiry into the Glenbrook rail accident needed to be commenced was increased by the fact that in the period of approximately two years before the accident there had been a number of rail accidents involving derailments of trains or the deaths of trackside workers and Sydney had been chosen as the venue for the 2000 Olympic Games. The safety and reliability of the rail network was critical to the success of the Olympic Games.

The Glenbrook rail accident was a matter of intense public interest for these reasons and because the CityRail network carried approximately 900,000 passengers per week day, each of whom had an interest in the safety and reliability of the rail network.

On 9 December 1999 Letters Patent were issued appointing me as a Commissioner under the Special Commissions of Inquiry Act 1983 and on 10 December 1999, by Instrument of Appointment under the hand of the Attorney General, Christopher Thomas Barry QC and David Cowan were appointed as Counsel Assisting.

For the reasons stated above it was necessary to proceed with the inquiry with the utmost expedition. This involved obtaining a suitable hearing room and equipping it with facilities to accommodate the large number of parties who would be seeking leave to appear and with the technological equipment to produce and retain electronic copies of real time and historical transcript, the exhibits and documentary materials.

I wish again to acknowledge the assistance of the Chief Justice who made Court 10A available and the work done by Ms Janine Taggart of the Supreme Court staff in providing that court room with the equipment and facilities necessary for it to be operated as an information technology court room able to hold electronic copies of the large volume of exhibits tendered in evidence and the transcript. I also wish to acknowledge the assistance of Mr William Grant, Deputy Director General of the Attorney General's Department who willingly undertook the co-ordination and organisation of the

administrative and funding arrangements that needed to be put in place for the Special Commission of Inquiry.

Because of the public interest in the inquiry the media were encouraged to attend and a room with its own television monitor and live transmission from the hearing room was established for the assistance of media representatives attending the hearings. I wish to acknowledge the assistance in liaison with media representatives that was provided by the Supreme Court public information officer, Ms Kimberley Ashbee.

It was necessary not only for a hearing room to be obtained and equipped but for the Special Commission of Inquiry to establish an office and a staff and for me to be provided with personal staff to enable the work of the inquiry to commence.

Following directions hearings on 22 December 1999 and 27 January 2000 I directed that the hearings would commence on 14 February 2000, a little over eight weeks after the accident.

For reasons of strict economy it was decided not to retain the services of a Secretary to the inquiry. The difficult and burdensome administrative tasks of preparing for the hearings and obtaining evidence were carried out by the solicitor instructing Counsel Assisting, Ms Christine Johnpulle, Senior Solicitor, from the Crown Solicitor's Office, who was seconded to the Special Commission of Inquiry with assistance and advice from Counsel Assisting. This frequently involved Ms Johnpulle, particularly when the office of the Special Commission of Inquiry was being established, in working for extremely long hours, for days at a time, including weekends, and often in her own time.

In the first part of the inquiry, which dealt only with the first matter referred to in the Letters Patent as varied, namely the causes of the Glenbrook accident and the factors which contributed to it, 96 witnesses gave evidence and 92 exhibits were tendered. Except for two days upon which inspections were conducted, and one day allowed for counsel for the parties to prepare oral submissions, the Special Commission of Inquiry sat continuously from 14 February to 19 April 2000.

The public interest in the inquiry and the public concern about the safety of the rail network led to an interim report dealing with the first matter referred to in the Letters Patent. That interim report was delivered on 6 June 2000 to the Governor.

On 8 June 2000, directions were given for the future conduct of the inquiry. In order to formally consider the adequacy of the risk management procedures in force at the time of the Glenbrook rail accident, I directed each of the rail entities and the Director General of the Department of Transport to prepare and deliver detailed reports relating to the procedures that were in place and their respective assessments of the adequacy of those procedures.

I also invited each of the rail entities to include proposals that each had for the improvement of the safety of rail operations, and any other material which each thought may assist in relation to the second and third matters that I was required to inquire into and report on by the Letters Patent as varied. At the request of the rail entities I subsequently extended the time for delivery of those reports, and eventually each of those parties complied with the direction for detailed reports dealing with those matters. The

reports by the rail entities were each received on 10 July 2000. They were responded to by the Director General of the Department of Transport on 11 August 2000.

Subsequently, I received a letter, dated 16 August 2000, from the Premier, requesting a second interim report "by 31 October 2000 which would outline any important measures that may require legislation".

No public hearings were held between 1 September and 9 October 2000, at the request of the rail entities who were supported by the Department of Transport, because of the 2000 Olympic Games and the demands they made on their respective resources. Their application in this regard was not opposed by Senior Counsel for the families of the deceased and the injured persons.

Following the placement of advertisements and the sending of letters to interested parties, the public hearings of the Special Commission of Inquiry recommenced on 10 October 2000 and continued until 12 October 2000 when I adjourned for the purpose of preparing the second interim report. These hearings were concerned with the structure of the government railways. I later sat on 14 October 2000 to correct an erroneous newspaper report and 20 October 2000 to take the evidence of Mr David Hill, a former Chief Executive Officer of the former State Rail Authority.

The second interim report was delivered on 1 November 2000 to the Lieutenant Governor. The Parliament subsequently enacted the Transport Administration Amendment (Rail Management) Act 2000.

The public hearings of the Special Commission of Inquiry recommenced on 8 November 2000 and continued until 13 December 2000 when I adjourned for the purpose of preparing this final report. At the conclusion of the evidence and submissions there were 4,778 pages of transcript and 115 exhibits. A list of the exhibits is contained in Annexure E to this final report. The materials obtained in the course of overseas investigations and reports by the parties to the inquiry in relation to risk management and the improvement of the safety of rail operations exceeded 11,000 pages.

As is usual in commissions of inquiry, I left the assembly and presentation of evidence to Counsel Assisting subject to the direction that any witness who they thought was able to give relevant and admissible evidence to the inquiry should be called. Every person who indicated that he or she could give relevant and admissible evidence was called and all evidence in the inquiry was received in hearings which were open to the public, including the media. The inquiry was conducted in that manner from beginning to end.

I stated during the first part of the inquiry my concerns from time to time about the lack of co-operation that I received from the government rail entities to which leave to appear had been granted. I regretted what appeared to be an unnecessary and overly defensive tactical approach by the government rail entities given leave to appear. Although I was critical of what I perceived to be a lack of co-operation my criticism was not directed to their legal representatives. To the extent that their instructions permitted them to do so, I wish to record the assistance that I received from time to time from the counsel and solicitors for the all parties. The names of all counsel who appeared, the parties for whom they appeared, and the solicitors by whom they were instructed are contained in Annexure B to this final report. The Australian Rail, Bus and Tram Industry Union, New

South Wales Branch (hereafter RBTU), provided considerable assistance, through its legal representatives, to the inquiry. Both the trade union and National Rail Corporation Limited made helpful written submissions in relation to safety improvements to rail operations. I wish to acknowledge the contribution made to the Special Commission of Inquiry by that trade union and company, through their respective legal representatives.

I also wish to acknowledge the contribution made by the Legal Representation Office and counsel briefed by it. Its primary role was to ensure that the interests of the relatives of the deceased and injured passengers were represented. It also made a number of positive contributions to the Special Commission of Inquiry.

Having observed the way in which the government rail entities participated, or more accurately, failed to participate, in the first stage of the hearings, it was apparent to me that I was not going to be able to make any recommendations for improvement to the safety of rail operations that I was required to make based upon the material that was forthcoming from the government rail organisations. The only concession to the need for change was that Mr Garling SC for the State Rail Authority (hereafter SRA) conceded that safeworking unit 245 needed redrafting. Notwithstanding this, I have not been provided with any redrafted safeworking unit to meet the perceived deficiencies. The rail entities seemed to be unlikely to be able to provide necessary evidentiary material relevant to the recommendations, which the third matter in the letters patent as varied, required to be made for safety improvements to rail operations. Accordingly, it was essential if I was to make any recommendations, that I inform myself from other sources as to the way in which the problems I had earlier identified could be addressed.

For this reason, I sought approval from the Premier to travel, with Counsel Assisting, overseas to obtain material in relation to these critical matters prior to the next stage of the hearings. I conducted extensive investigations into the structures of railways and the rail safety and risk management systems in existence in the United Kingdom, France and Norway. Counsel Assisting also conducted extensive investigations into the said structures and systems in existence in the Netherlands, Germany and Canada. All of these investigations were conducted in June and July 2000. In September 2000 Counsel Assisting conducted extensive investigations on behalf of the Special Commission of Inquiry in Queensland, Victoria and South Australia. Either with Counsel Assisting, or with the benefit of materials obtained by them, I was able to inform myself about interstate and overseas practices in relation to rail safety management.

The overseas travel and the extensive meetings which I had were of enormous benefit to me in considering the steps which could be undertaken to improve the safety of rail operations and in formulating my recommendations. Annexure D identifies all the persons with whom meetings were held or who provided information. I acknowledge gratefully the assistance provided by them.

The overseas investigations disclosed a number of important matters relating to improving the safety of rail operations. They also demonstrated other notable features. Other railways had experienced problems managing the transition from integrated rail networks to networks where train operation and infrastructure ownership were separated.

As stated in the second interim report this was in order to fulfil the requirements of the European Union Directive 91/440 which required all member states to separate track

ownership from train operations and to allow free and open access to all carriers of international freight over the rail networks of the respective states. In Germany the restructuring was done on 5 January 1994 when Deutsche Bahn Aktiengesellschaft merged the railways of the former East and West Germany into a new railway company. A five year transition period was allowed for the reorganisation.

In France a separate infrastructure department was established within the French National Railways (SNCF) and the provision of services was divided into five businesses being long distance passenger services, regional passenger services, Paris region passenger services, freight services and small freight consignment business.

Although Norway was not a member of the European Union train operation and infrastructure management and ownership were separated on 1 December 1996. Train operation was assigned to Norges Statsbaner BA (NSB) and infrastructure ownership and management was assigned to Jernbaneverket (JVB).

In the Netherlands, the restructuring of the railway industry involved the establishment of a holding company with four separate divisions dealing with passenger transportation, real estate, train operation and infrastructure ownership. Traffic control was included in the infrastructure ownership division.

The most complicated restructuring in Europe occurred in the United Kingdom as a result of privatisation in 1993. British Rail was split into 98 different companies including an infrastructure owner, various train operating companies, various station operating companies, infrastructure maintenance companies and rolling stock maintenance companies.

In Canada, the Transportation Accident Investigation Safety Board Act 1989 created a board, now known as the Transportation Safety Board. The legislation and the manner of the Board's operation has provided me with some assistance in the formulation of the recommendations in relation to the Rail Accident Investigation Board.

By way of contrast to the approach taken by the New South Wales rail entities, the interstate and overseas rail organisations from whom such information was sought provided whatever material was sought or whatever material they thought might be of assistance both willingly and openly, and frankly acknowledged the difficulties which they were experiencing which in many cases were similar, if not identical, to the problems experienced in New South Wales. Great mutual benefit can be obtained from greater co-operation and exchange of information and ideas between New South Wales rail entities and those in other States and overseas. My observation was that each of the rail organisations in other states and overseas was only too willing to assist and provide such material, including material relating to where their practices had been deficient, so that others may learn from their mistakes. They took the commendable and proper view that in so doing they shared a common interest in rail safety.

The overseas investigations provided a great deal of material and enabled a perspective to be formed as to the directions in which rail safety management has been moving. This in turn has enabled me to form some firm views about the improvements that should be made within the rail organisations and in relation to overall safety management to improve safety performance on the New South Wales rail network.

The overseas investigations revealed that public expectations of the safety of rail operations had significantly increased in overseas countries, as it has done in New South Wales. This occurred at the same time, or perhaps because of, a significant increase in the use of railways. Media publicity surrounding any accident or incidents has increased the expectation that government will play a greater role in ensuring the safety of the travelling public.

Inquiries were established in the United Kingdom and in Norway to deal with two serious rail accidents which occurred on 19 October 1999 and 4 January 2000 respectively. In the United Kingdom Counsel Assisting and I met with Lord Cullen, who is conducting the Ladbroke Grove Rail Inquiry, the assessors sitting with him and Counsel Assisting him. The Ladbroke Grove Inquiry is required to address many of the safety issues which it has been necessary for me to consider. I also met, with Counsel Assisting, Judge Vibecke Groth, a member of the Borgarting Court of Appeal in Norway, and other members of a government appointed Commission of Inquiry which was examining similar safety issues to the ones which I was required to consider.

I am grateful to both these senior and distinguished judges for making the time available to meet with Counsel Assisting and me to exchange information in relation to the safety and other problems that they had identified in their respective rail systems and the means by which consideration was being given to the way in which these could be analysed and addressed.

In the context of overseas assistance I wish to specifically acknowledge the assistance provided by Professor James Reason of the University of Manchester and Mr Roger Taylor from Railtrack in the United Kingdom. Their assistance enabled Counsel Assisting and me to locate and meet with representatives from rail organisations in Europe and Canada. The information that they were able to provide enabled me to compare and contrast the practices that have been adopted and are being adopted in New South Wales with overseas practices and better formulate the recommendations for improvement to the safety of rail operations which appear in this final report.

Unlike similar public inquiries into rail accidents which were being conducted whilst I was conducting this inquiry, I have sat alone. This contrasts with the inquiry by Lord Cullen and two assessors into the Ladbroke Grove rail accident and the government appointed Commission of Inquiry being conducted by Judge Vibecke Groth and four engineers and a sociologist into an accident which occurred near Åsta in Norway.

Mr Norman Thompson from the Transport Safety Bureau within the New South Wales Department of Transport was seconded to the Special Commission of Inquiry for its duration. He has provided invaluable assistance to the Special Commission of Inquiry in many different ways. He has provided Counsel Assisting with necessary technical information to enable them to understand rail operations and, in turn, to inform me of such matters. He has also been a profound source of information on matters to do with safety management. I wish to acknowledge the considerable contribution made by him to the public benefit which I hope will flow from the inquiry and the three reports that the Special Commission of Inquiry has now delivered.

I wish to acknowledge the considerable assistance that I received from all of the witnesses who gave evidence. Their names are recorded in Annexure C to this final report.

It would be obvious that the marshalling and presentation of the large volume of evidence which I received could not have been undertaken by Counsel Assisting without the considerable assistance of the staff of the Special Commission of Inquiry. I have mentioned the solicitor instructing Counsel Assisting, Ms Christine Johnpulle, but I also wish to acknowledge the assistance of other solicitors, paralegals and secretaries who have worked for the Special Commission of Inquiry during its duration. Their names and the names of the officers of the information technology consultant which has provided assistance to the inquiry are contained in Annexure A to this final report.

The main burden of conducting this difficult inquiry rested on the efforts of Counsel Assisting, Mr Christopher Barry QC and Mr David Cowan. Their ability to master a great mass of material, often of a technical nature, and reduce it to its essentials never ceased to amaze me. It was also necessary for them to interview many witnesses, which was time consuming, and thereafter adduce evidence, which was done with efficiency and dispatch. Their broad vision as to the direction this inquiry should take was vital. Without their dedicated work, it would not have been possible to compile this final report.

Finally, I wish to acknowledge the assistance provided to me by my associates, Ms Mary O'Farrell (from December 1999 to January 2000), Ms Meg Kelly (from January 2000 to January 2001) and Ms Lauren Kelly (from January 2000 to February 2001), and my tipstaff, Mr Peter Moon. The demands made upon an associate and a tipstaff during the conduct of a public inquiry are much greater than would normally be imposed upon a judge's personal staff and their diligence and assistance is appreciated and acknowledged.

2. The Two Interim Reports

The first interim report dealt with the causes of the rail accident at Glenbrook on 2 December 1999 and the factors which contributed to it. Following the delivery of the first interim report, I received a letter dated 16 August 2000 from the Premier requesting a second interim report "by 31 October 2000 which would outline any important measures that may require legislation". The Premier stated in his letter that this second interim report would give the Parliament an opportunity to consider the interim report and its response before the end of the Spring sittings of Parliament in 2000.

To avoid the necessity of repeating in detail the first interim report I shall summarise the findings made in the first interim report.

The accident occurred at 8:22 am on 2 December 1999 when inter urban train W534 operated by the SRA of New South Wales collided with the rear wagon of the Indian Pacific. The locomotive and wagons of the latter train were owned by National Rail Corporation and Great Southern Railway respectively. At the time the leading engine of the Indian Pacific was commencing to draw away from signal 40.8, while the rear of the train was 426 metres further west located in a cutting approximately 700 metres east of Glenbrook railway station on the up main line to Sydney. The accident occurred in daylight hours on a fine, clear morning where the grade of track was 1 in 60.

In the section of track where the accident occurred the movement of trains was controlled by automatic signals. This signalling was designed using overlap track circuits so that a stop signal would be displayed until such time as a train had cleared an additional track circuit beyond the next signal in the direction of travel. A component of a power supply unit providing electricity to a train sensing electronic circuit failed. As the sensing circuit was on an overlap circuit its failure caused both signals 40.8 and 41.6 to fail safe in accordance with their design by displaying a stop or red indication.

The component in the power supply failed between the time the previous inter urban train passed through the relevant section of track at approximately 8:01 am and the time the Indian Pacific arrived at signal 41.6 located near the eastern end of Glenbrook railway station at 8:04 am.

When the Indian Pacific arrived at signal 41.6 the drivers of the train waited at that signal assuming that it was at stop because the Indian Pacific had caught up with the train in front. When it did not change, one of the drivers Mr David Willoughby, climbed out of the cabin and used signal post telephone 41.6 located on the side of the track to contact the signaller at Penrith to obtain authority to pass the signal at stop. Mr Willoughby had to go twice to signal post telephone 41.6 because, on the first occasion, he found it was locked. He had never previously come across a signal post telephone that had been locked. He had a key in the cabin of the locomotive to unlock it and it was necessary for him to return to the locomotive to obtain the key, then return to the signal post telephone and unlock it, before turning the handle to make contact with the signaller at Penrith. At that time this was the only authorised means of communication for this purpose between the Indian Pacific and the signaller at Penrith. The process delayed the Indian Pacific at signal 41.6 for seven minutes and 14 seconds.

The relevant operational rule, safeworking unit 245, required a driver who obtained an authority to pass an automatic signal at stop must proceed with extreme caution. The driver of the Indian Pacific, having obtained the necessary authority, proceeded with what he considered to be extreme caution to the next signal, signal 40.8, taking seven minutes and 45 seconds.

The fault had affected two consecutive signals resulting in signal 40.8 also being in the stop position. Mr Willoughby sought to use the signal post telephone located at signal 40.8 to obtain authority to pass that signal at stop but was unable to contact the signaller. He believed that he "couldn't get the person's attention who was on the other end of the phone" so he replaced the receiver, closed the door on the signal post telephone and returned to the locomotive. In accordance with the operational rule, having waited one minute, the train commenced to proceed to the next signal.

While these events were occurring the headway between the Indian Pacific train and the following inter urban train had been reduced by the Indian Pacific remaining stationary at signal 41.6 for seven minutes and 14 seconds and then taking a further seven minutes and 45 seconds to travel to signal 40.8.

The driver of the inter urban train, Mr Kevin Sinnett, had been forewarned prior to reaching signal 41.6 by the train controller at Sydney, Mr Michael Browne, that there had been a signal failure at signal 41.6 and advised that he should "just trip past it".

The driver of the inter urban train on arriving at signal 41.6 in the stop position, sought authority from the signaller to pass that automatic signal at stop. The language used was colloquial:

> I'm right to go past it am I mate?
>
> Yeah, mate, you certainly are.

This authorisation, the manner in which it was given, and the earlier conversation with the train controller led the driver of the inter urban to believe that the track ahead was clear.

The signaller at Penrith, Mr Damien Mulholland, did not know the location of the Indian Pacific at the time when he authorised the inter urban train to proceed. He assumed as he had not heard from the driver of the Indian Pacific and as a considerable amount of time had elapsed since the previous communication from the Indian Pacific, that it was clear of the section of track that the inter urban train was about to enter.

The signaller at Penrith had no visual means of locating the position of that train because the train indicator board in the signal box did not cover the area of track controlled by automatic signals. In the third stage of the hearings, when I was examining systems of communications, Mr Franklin Hussey was asked about computerised screens which show positions of vehicles and stated "…it is ironic that such a system exists in rail operational office in Dulwich, a suburb of Adelaide, and on that screen they would have seen the position of the Indian Pacific that morning." In other words, the owners of the locomotive pulling the Indian Pacific could ascertain in Adelaide the position of the Indian Pacific on a screen but the signaller at Penrith could not.

In the belief that the line ahead was clear the driver of the inter urban train proceeded in a normal fashion past signal 41.6 and was travelling at approximately 50 kilometres per hour when he saw the rear wagon of the Indian Pacific train located in the cutting a little over 100 metres in front of his train. Although he made an emergency brake application, it was not possible to stop the inter urban train from colliding violently with the rear of the Indian Pacific train.

The interim report identified 23 matters which caused or contributed to the accident. The topography of the area where the accident occurred was an obvious contributing factor. All the remaining 22 causes, however, related to deficiencies in the management of safety by the rail organisations involved. These may be summarised as follows.

The train indicator board in Penrith signal box did not enable the signaller to identify the location of the Indian Pacific at the time that he authorised the inter urban train to proceed.

The training and experience of the signaller at Penrith were defective in several respects. These included that:

i. He was unaware that consecutive signals could fail safe, to stop, if the fault affected the overlap section and assumed that the Indian Pacific would not be stopping at the next signal but would be proceeding to Penrith and be clear of the area when he authorised the inter urban train to proceed. He failed to use other means available to him to check the position of the Indian Pacific, including use of two-way radio, contacting trains going in the opposite direction or telephoning the station master at the next railway station, Lapstone, to determine whether the Indian Pacific had passed through that station. The obvious method was by trying to contact the Indian Pacific on the two-way radio. It transpired that the two-way radio would, if used, have enabled the signaller at Penrith to contact the driver of the Indian Pacific because the driver of the Indian Pacific and the signaller had a conversation on the two-way radio after the accident.

ii. He did not know the procedure for managing consecutive trains through an automatic section of track when a signal failure had occurred. This was not only a deficiency in his training but it also reflected the inadequate nature of the operational rule that was then in force.

iii. The language used by the signaller in his communications with Mr Willoughby and Mr Sinnett was colloquial and imprecise. Following the exchange with Mr Willoughby it was obvious that Mr Mulholland thought that the Indian Pacific would proceed at normal speed to Penrith and be well clear, and on that assumption he authorised the following inter urban train to proceed. From Mr Willoughby's perspective he thought that the result of the communication with the signaller, Mr Mulholland, was that he would proceed with extreme caution to the next signal then act in accordance with the operational rules if that signal was other than at proceed or caution. The conversations of the SRA employees demonstrated a lack of clarity, a lack of precision and a failure to comply with the communication protocols in which these men should have been trained and should have been required to use.

iv. Mr Mulholland had not been trained to provide the driver of the inter urban train, Mr Sinnett, with all the relevant information he needed, and in particular, the critical information that Mr Mulholland did not know the location of the Indian Pacific. Had that information been communicated to Mr Sinnett it is probable that he would have proceeded in a much more cautious manner.

The training of the drivers of both the inter urban train and the Indian Pacific was deficient. Mr Sinnett did not have proper training in the operation and effect of safeworking unit 245. This is apparent from the fact that he did not proceed, as the rule required, with extreme caution after passing an automatic signal at stop. Through no fault of his, Mr Willoughby had not been trained in the operation of signal post telephones to the extent that he had not been told that the press to ring button was not an essential feature of their operation and that the telephone would work perfectly well even if that button were missing. The assumption he made was that he would not be able to contact the signaller on that signal telephone because the press to ring button was missing, and this led him to abandon those attempts. If he had persevered and made contact with the signaller it may have alerted the signaller to the fact that the Indian Pacific was in the path of the approaching inter urban train, in time for the Penrith signaller to stop the latter train and avoid the collision.

The operational rule, safeworking unit 245, which was designed to guide the employees involved in managing trains through an automatic section of track following a signal failure was defective in its content and language. It did not deal with the situation of two consecutive trains in a section of track with such a long overlap circuit and, in addition, it was confusing and ambiguous. If any of the SRA employees had been properly trained in the procedure (and I doubt that they were) they did not understand the rule. The ignorance and confusion about the operational rule which manifested themselves at the time of the accident and during the course of the evidence in the first stage of the hearings, demonstrated that there were fundamental defects in the safeworking units as a primary means of managing the safety of railway operations and in the way in which those rules were expressed and taught. This subject matter formed a significant part of the final stage of the hearings.

The equipment provided for the communication of safety critical information was antiquated and inadequate. The crew member of the Indian Pacific was required to alight from his train, cross the tracks, then call on a signal post telephone by turning a handle to generate a current which would sound a buzzer in the Penrith signal box. The delay occasioned by the need to use signal post telephones was a factor which I identified as being significant in contributing to this accident. The inter urban train was fitted with a Metronet radio which permitted almost instant contact with the signal box. What was significant, however, was that one train had almost instant communications technology and the crew of the other train was required to use a system of communication with the signaller which was cumbersome and time consuming. Ironically, the Indian Pacific was fitted with modern communications technology, including a satellite telephone, but because of the provisions of the safeworking unit the crew was not permitted to use that technology to contact the Penrith signaller to seek authority to pass an automatic signal at stop, but had to use the signal post telephone. The combination of the two incompatible methods of communication meant that the headway, or time between the two trains, was necessarily reduced.

There was a lack of consideration of the safety implications of the actions which were undertaken and this was probably the single greatest defect in the safety management of the rail organisations involved. There is no evidence before me to suggest that employees were properly trained, or that training was regularly reinforced therefore there was no understanding that the degraded operational environment arising from the signal failure at Glenbrook introduced additional risk to rail operations. Consequently, there was a lack of awareness among the various railway personnel regarding the care that was required to be taken in managing trains through the section to ensure that the risk of collision was properly controlled. This was even more important given that the main focus during normal operations was to maintain on time running. Consequently, in the absence of effective training and regular reinforcement of the importance of carefully managing a degraded system to ensure that safety was the highest priority, it was only to be expected that the operational staff would be motivated by their normal every day goal of ensuring on time running.

It was this emphasis on on time running which I consider motivated Mr Browne, the train controller at West control, to contact Mr Sinnett, the driver of the inter urban train, and advise him "it's only an auto, so just trip past it." It was also a desire to keep the inter urban commuter train running in accordance with its timetable which, to my mind, influenced Mr Mulholland, the Penrith signaller, to assume that the Indian Pacific was clear and that he should authorise the inter urban train to pass signal 41.6 even though, at the time, he did not know where the Indian Pacific train was located. This lack of proper appreciation of the safety considerations in an inherently dangerous operation was a very significant contributing factor to the accident. The employees involved were neither irresponsible nor reckless men. The problem was they had not been trained and no emphasis had ever been placed upon the primary importance of safety in the conduct of rail operations.

Mr Simon Lane, the Chief Executive Officer of the SRA at the time of the Glenbrook accident, stated:

> Firstly, it was my view [in 1997] that the organisation had been fairly one dimensional for a long time in its approach to improving the performance of the organisation, and so, in a sense, the issue of on time running performance in a sense was king, and historically the performance of the CityRail services have compared, I would suggest, on an international comparison extremely well, with the best of the old suburban railways in the world, certainly much more reliable than any of the suburban systems in the UK by a long way, …

Mr David Edwards, the National Safety Manager of National Rail Corporation Limited which owned the locomotive pulling the Indian Pacific, gave this evidence:

> Did you get the impression, from what you have seen of the circumstances of this case, that it may be that safety was sacrificed for the purpose of on time running?
>
> Yes, I do receive that impression.

These views about the priority given to on time running were not only held by persons in senior managerial positions. A number of drivers gave evidence to similar effect. Mr

Ronald Field, the driver who prepared the train that was driven by Mr Sinnett said: "Your Honour, on time running is everything."

Mr Alex Claassens, a representative of drivers on a number of SRA committees, gave evidence about disciplinary procedures:

> Are some of your colleagues who are drivers punished, in effect, for being late either directly or indirectly?
>
> In extreme cases where the driver's delayed the train, or whatever, then he will be sent a bung which is – I can't think the correct term of it, but it is a memo which basically asks you to explain where you have done the time and why you have lost, why you delayed the service, or whatever.
>
> Is that regarded as being a type of disciplinary matter?
>
> That is the first step in the disciplinary process, yes.
>
> What is the next step?
>
> Well it depends. You may then get charges arising out of that. If somebody in management believes that you didn't do enough to try and get that service back on time, for whatever reason, then they may send you some charges and then out of that you could, you may get a fine, or you may get a day's suspension, but they are extreme cases though. It doesn't happen often.
>
> But from your observations, are drivers continually reminded about the desirability of on time running?
>
> Most certainly.
>
> Does it seem to be a matter at the forefront of the minds of many of them?
>
> Drivers generally always try to do what they can to ensure on time running. Nobody wants to get home late and at the very least, even a driver, so yes it would be fair to say it is up the front of everybody's mind, yes.
>
> Do you think it has been given too much weight?
>
> Personally I think it has…

Mr Charles Jarvis, another driver, referred to on time running as "the holy grail in which the authorities are in pursuit."

Where on time running is accorded a greater priority than the safety of rail operations, then accidents such as the Glenbrook accident are, from time to time, more likely to occur. It is necessary for the individual rail organisations and government to put safety management systems in place which ensure both on time running and the safety of rail operations.

The Letters Patent as varied required me to report to the Governor on any safety improvements to railway operations which I considered necessary as a result of the findings made in the first interim report. I have summarised above the findings made in relation to the first matter, namely the causes of the rail accident at Glenbrook on 2 December 1999 and the factors which contributed to it. Those findings and the deficiencies which were there identified formed the focus for the next stage of the hearings.

In April 2000, while the hearings in relation to the causes of the railway accident at Glenbrook on 2 December 1999 and the factors which contributed to it were proceeding, the government requested me to accept a variation to the original Letters Patent which expanded my remit to include relevant structural changes to the rail industry and required me to consider, when recommending safety improvements to rail operations, the reports of rail safety investigations and any coronial report into eight further railway accidents. This variation was made, as I understand it, because of the ongoing public disquiet about the safety of rail operations created by the continuing occurrence of rail accidents apart from the Glenbrook rail accident and, in some cases, after the Glenbrook accident. I have earlier referred to the concerns about the ability of the rail network to meet the demands likely to be imposed upon it by the 2000 Olympic Games.

It was apparent to me that the Glenbrook rail accident disclosed grave and serious deficiencies in the management of rail safety in New South Wales. It was equally apparent that the rail organisations involved were either unprepared to address those problems or did not know how to go about them. This was evident from the fact that during the first stage of the hearings hardly any question was asked of any witness by Senior Counsel appearing for the SRA although the evidence that was being adduced was very damning of the safety practices of the employees for which it was responsible. I am not being critical of counsel personally because no doubt he so acted in accordance with instructions from his client, namely, to limit involvement in the hope that the employer's responsibility for the unsafe practices of the employees would be overlooked.

Mr West QC for Rail Access Corporation (hereafter RAC), when making submissions as to the causes of the Glenbrook rail accident, did not attribute any responsibility to RAC or any of the rail entities. He submitted the cause of the accident was that a train was wrongly permitted to pass a signal at stop and that the train was driven too fast in the circumstances. His submission was that there was a system in place to deal with a signal failure in an automatic section of track but that the two individuals, Mr Mulholland and Mr Sinnett, failed in discharging their obligations to comply with the procedure. This was clearly an attempt to lay the blame for the accident at the feet of the operational staff involved. It failed to deal with why Mr Mulholland and Mr Sinnett took the actions they did and whether there were any deficiencies in their training. There was no critical self examination of the adequacy of RAC's systems for safety management.

I received a letter dated 16 August 2000 from the Premier requesting a second interim report "by 31 October 2000 which would outline any important measures that may require legislation". I had intended to hold hearings in respect of the adequacy of the risk management procedures applicable to the circumstances of the Glenbrook rail accident and any safety improvements to rail operations, including relevant structural changes, and deal with each of those matters in the final report. Instead, to comply with the Premier's

request I dealt with matters involving structural change as a discrete issue in the second interim report.

The request for a second interim report by 31 October 2000 created considerable pressure upon Counsel Assisting and me as the rail entities had requested, and I had agreed, not to conduct any public hearings between 1 September 2000 and 9 October 2000 because the rail entities would be fully committed to the task of meeting the demands to be placed upon the rail network by the 2000 Olympic Games during that period. In the result, I recommenced the hearings on 10 October 2000 and limited my consideration to the issue of structural change in the hope that I would be able to produce a second interim report dealing with that issue in accordance with the Premier's request. The second interim report was delivered to the Lieutenant Governor on 1 November 2000.

The evidence dealing with the issue of structural change fell within a narrow compass and consisted, in effect, of a proposed model for restructuring that was identified and described in the evidence of Mr Ronald Christie, the Co-ordinator General of Rail. There was no challenge to Mr Christie's evidence and the rail entities played no part in that stage of the hearings dealing with structural change. There was no evidence of any alternative model to Mr Christie's proposal. Senior Counsel Assisting informed me in opening that stage of the hearings that he understood there to be some measure of agreement between the rail organisations about the way in which the industry could be restructured to improve the efficiency and safety of its operation. No one indicated any contrary view. It was therefore my understanding that there had been some measure of agreement between the rail entities.

When it became apparent that counsel for the rail entities proposed not only not to ask any questions of Mr Christie but to put no submissions in relation to his proposals I sought to ensure that my understanding of the position was correct. It transpired that the failure to put any questions to Mr Christie and the failure to make submissions was not because of any agreement by the rail entities to all of the changes which Mr Christie proposed, but because of a positive decision not to participate in that stage of the hearings. There was no cross-examination, nor were there any submissions, which enabled me to determine whether any of the rail entities either agreed or disagreed with Mr Christie's proposals. When called on by me to indicate whether his client agreed or disagreed with Mr Christie's proposal Mr Garling SC for SRA stated:

> My instructions Your Honour don't permit me to indicate whether it agrees or disagrees.

Mr West QC for RAC stated:

> Your Honour I have no instructions on any matter that we disagree on.

Mr Gleeson QC for RSA said that he had no questions of Mr Christie and no submissions to put on the issue of structural change.

Thus the rail entities contributed nothing to the second stage of the hearings.

Had the government not approved overseas travel to enable me, with Counsel Assisting, to investigate overseas models for the structure of railway industries and systems for the

regulation of rail safety, I would have been unable to evaluate and critically analyse the strengths and weaknesses of Mr Christie's proposals and to form my own views about what was necessary.

Mr Christie's first proposal was to merge RAC with Rail Services Australia (hereafter RSA) in a new statutory authority.

Secondly, he advocated the establishment of an Office of the Rail Regulator to regulate and co-ordinate the performance and safety of the rail entities. Under Mr Christie's proposal, the Office of the Rail Regulator would not only exercise a co-ordinating function, he would also set standards of performance in the areas of train operations and safety which would meet public expectations in relation to punctuality, cleanliness and safety. Although his proposal was that the Office of the Rail Regulator would set standards of performance, including standards of safety performance, the conduct of railway operations in accordance with those standards was a matter with which each of the rail organisations would be required to conform. It was also part of the Office of the Rail Regulator's function, under this proposal, to audit the proposed new statutory authority and SRA and to publish results in relation to their performance, thereby giving transparency to the operation. The results would thus be made public. Financial sanctions, in the form of penalties, would apply if standards were not met. Bonuses would be paid to all staff if performance standards were exceeded.

It was also a part of Mr Christie's proposal that the Office of the Rail Regulator would be responsible for managing rail safety and rail accident investigation.

He proposed that his position as Co-ordinator General of Rail be formally established pending the creation and implementation of his other two proposals for the merger and the Office of the Rail Regulator, but subsequently be abolished.

There were two areas in which I disagreed with Mr Christie's model. The first was in relation to the independence of the Office of the Rail Regulator from the Minister for Transport. It was my view that the Office of the Rail Regulator should be accountable to the Minister for the efficiency, reliability and quality of train services.

The second area where I disagreed with Mr Christie's proposals was in relation to safety regulation and rail accident investigation. Mr Christie's view was that the Office of the Rail Regulator should be responsible for rail safety and rail accident investigation. Those parts of Mr Christie's proposal in my opinion could not adequately protect the travelling public. The tension between the twin imperatives to have the trains running on time and to ensure that there are no safety deficiencies which may cause injury or death to passengers, prevent one person or entity being responsible for both matters. The history of rail operations both here and overseas has demonstrated that a robust and independent safety regulator is an essential feature of a safely operated rail network. Combining performance regulation and safety regulation does not provide the protection which the public expects from government in respect of the risk of injury or death while travelling or working on the railways. Further, it is imperative that the Rail Accident Investigation Board be independent of both the rail regulator and the safety regulator, either of whom may have contributed, directly or indirectly, to the causes of a particular rail accident.

The second interim report recommended that the SRA be responsible for the control and management of timetable and train movements and other functions of network control operations within the area of operation of the present CityRail network and that the newly merged infrastructure owner and maintainer, which I had recommended be a statutory authority but which was created in the form of a state owned corporation called the Rail Infrastructure Corporation (hereafter RIC), be responsible for those network control functions in all areas of New South Wales other than those controlled by the SRA.

The second interim report also recommended the establishment of an Office of Rail Regulator as a performance regulator whose function was to serve the interests of the travelling public by improving standards of performance of the new rail infrastructure organisation and the SRA of New South Wales.

The second interim report recommended the establishment of a Rail Safety Inspectorate and a Rail Accident Investigation Board but that the development of the legislation dealing with the establishment of those two bodies not be commenced until after the delivery of this final report, with the responsibility for safety regulation and accident investigation remaining with the Department of Transport until the new bodies were established.

The second interim report further recommended the establishment of the Office of the Co-ordinator General of Rail on an interim basis until such time as the service regulatory activity of the Office of the Rail Regulator and the safety regulatory activity of the Rail Safety Inspectorate and Rail Accident Investigation Board were established and functioning.

I also recommended that the development of legislation dealing with the establishment of a Rail Safety Inspectorate and a Rail Accident Investigation Board not be commenced until after the delivery of this final report. This was done because the time available for the second interim report did not permit a careful consideration of all the material then available and I wished to have the benefit of further evidence in relation to those matters which were dealt with in the third stage of the hearings, which commenced on 8 November 2000. The second interim report was delivered to the Lieutenant Governor on 1 November 2000 and legislation has subsequently been enacted in the form of the Transport Administration Amendment (Rail Management) Act 2000 to introduce most of the structural changes which I either recommended or endorsed in the second interim report. I recommended the merger of RAC and RSA so that the infrastructure owner and the infrastructure maintainer would be part of the same organisation.

Before proceeding further, I shall deal with management of rail safety in order to place in context my later findings in relation the adequacy of the risk management procedures applicable to the circumstances of the Glenbrook rail accident and the eight other accidents, the reports of which I am required to consider.

3. Management of Rail Safety

Short History

The second interim report outlined the history of railway administration in New South Wales and observed that the first railway in this State being the line from Sydney to Parramatta was opened on 26 September 1855. This was a considerable achievement in a colony which had been established at the end of the eighteenth century. It was only 30 years after the Stockton and Darlington railway opened in the United Kingdom in 1825. It was a further 11 years after 1825 before the United Kingdom parliament enacted legislation to regulate the safety of railway operations.

It may have taken even longer for parliament to become involved in safety regulation had it not been for the fact that the first railway death of a member of the public occurred at the opening ceremony of the Liverpool to Manchester railway in 1830 when Mr William Huskisson, MP, the Secretary of the Board of Trade, was killed by a locomotive at the opening ceremony.

In the United Kingdom government safety regulation involved the regulation of a private industry. In New South Wales, since the Railways Act 1854 the government has predominantly owned and regulated railways operating in this State.

In the United Kingdom the government, not being the direct owner of the railways, did not have the same control over rail operations that existed in New South Wales and there was a large number of very serious rail accidents in the United Kingdom. This led initially to the establishment of a select committee of the House of Commons leading to the enactment of legislation in 1871 to establish Her Majesty's Railway Inspectorate and ultimately to a Royal Commission into railway accidents in 1874.

Although records were not available relating to the safety of rail operations in New South Wales in the last century, a measure of the extent to which the feats of engineering in the construction and operation of railways failed to be matched by similar achievements in rail safety can be gleaned from the book *The Safety of British Railways* by H Raynar Wilson. According to the author, during the four years from 1872 to 1875 there were 112 incidents where points were not properly set which resulted in the deaths of seven passengers, injury to 413 passengers, the deaths of five employees and injury to 43 employees. During the same period, there were 58 collisions, involving seven deaths and 488 cases of injury, between trains following one another on the same tracks and a further 88 collisions at junctions involving 13 deaths and causing injury to 788 passengers and employees. In addition there were 331 collisions within fixed signals at stations or sidings. These resulted in the deaths of 47 passengers and 18 employees and injury to 2,410 passengers and 215 employees.

The response of the United Kingdom rail industry to such a large number of deaths and injuries was the development of a standard rulebook to be used by all railway companies and, with the exception of some small railway companies, that rulebook was adopted in 1876 as a standard rulebook. For over a century the use of a rulebook became the primary means of managing rail safety in the United Kingdom.

New South Wales had adopted the United Kingdom's approach to rules as early as 1855 when regulations for the operation of the Sydney to Parramatta railway were modelled on those of the Eastern Counties Railway of England. This adoption of the United Kingdom rule book continued and, in many cases the wording of operational rules in New South Wales are similar to those in the United Kingdom. The rule in the United Kingdom where a train was stopping at a station or when there was an obstruction at a station, first promulgated in 1867, was as follows:

> When a train is stopping at a station, or when there is an obstruction thereat, the main and distant signals must be at danger, and the driver of any following train or engine must, when he sees a signal of danger exhibited at the distant signal post, immediately turn off steam and reduce the speed of his train so as to be able to stop at the distant signal, but if he sees the way is clear he must proceed slowly and cautiously within the distant signal, having such control of his train as to be able to stop short of any obstruction there may be between the distant post and the station.

The first interim report annexed the operational rule, safeworking unit 245, which applied to the circumstances of the Glenbrook rail accident. Section C of that rule stated:

> When a train passes an automatic signal at stop, the driver must proceed with extreme caution to the first signal ahead of the signal at stop, prepared to stop short of any obstruction, and obey the indication of that signal. If it is displaying a proceed indication, the driver must proceed with extreme caution to the second signal ahead of the signal at stop and obey the indication of that signal.

The safeworking units did not provide an effective mechanism to ensure safety in the circumstances of the Glenbrook accident or the eight other accidents, the reports of which I am required to consider. Safeworking units have never proved to be overly effective in managing safety. In its report, the Royal Commission into railway accidents in 1874 said this:

> It has frequently transpired when accidents had led to public inquiries, either by coroners or by the Board of Trade, that the regulations of the company were well conceived to prevent the very casualty under investigation, but that these regulations had been wholly in abeyance.

When one considers the wording of the 1874 United Kingdom regulation and the wording of safeworking unit 245 it is not difficult to see why the regulations are frequently wholly in abeyance when accidents occur. The operational staff either have not understood them or have not followed them. The response of the railways has often been to point to the rule then blame the individual operational staff involved without considering the extent, if any, to which they were properly trained in the procedures to be followed or whether the rule was appropriate and expressed with sufficient clarity to be comprehensible to them. Mr Kevin Band, the Executive General Manager, Safety of Queensland Rail, stated that after some of the Queensland operational rules had been rewritten and employees had the intent of the rule explained to them:

> …I was actually amazed at the amount of people who told me they now understood the rule despite spending 20, or 30, or 40 years in an industry where the rule was there, they never really understood it and to me it proves that there is an opportunity to make it better.

The practice of developing operational rules appears to have developed as an adjunct to technical standards for rail operations. Railways have historically been dominated by the engineering profession, particularly the civil and mechanical engineering disciplines. The current Acting Chief Executive Officer of the SRA and Co-ordinator General of Rail, Mr Christie, is an engineer. The bread and butter of such disciplines are tried and proven technical standards which must be complied with.

It is no wonder, therefore, that railway operational rules have been developed and implemented in the rigid, inflexible manner with which engineering standards are regarded. Furthermore, there is an innate synergy between the technical side of railway operation and the operational rules, with rules frequently having their origin in the need to contend with failures to the technical components of the railway.

In this respect, the identification of the need for an operational rule, and its initial drafting, are likely to have been done by engineers. Whilst the engineers may have had a perfectly sound rationale for the rule, or as they are called in New South Wales, safeworking units, this may not have been appreciated by the operational personnel who were required to implement the rule. Furthermore, the engineers responsible for the identification of the need for the rule, and probably its drafting also, were not likely to have the necessary operational experience to assess the practicality of the rule.

There are two serious consequences which flow from this so far as safety is concerned. The first is the propensity for operational staff to violate or adapt the stipulated rule to the actual circumstances with which they are faced in day to day operations. The second is that when the operational rules were tested in practice they were often found wanting with a resultant incident or accident.

When an incident occurred which demonstrated a deficiency in the existing operational rule or safeworking unit, the frequent response was to amend the rule or establish a new rule. Some consideration of that approach would have revealed that it was unlikely, if not impossible, to develop safeworking units or operational rules that would deal with every situation. Notwithstanding this, the practice was to continue and it ultimately led to a body of employees becoming involved in the development of procedural rules to deal with each new circumstance or incident that developed.

This process had three consequences. The first was that the rules became extraordinarily lengthy and complex. The second was that, in time, the knowledge or understanding of the origin of the rule or procedure, and consequently why it was needed, was lost. Indeed, the SRA was unable to provide to the Special Commission of Inquiry any details of the prior history of safeworking unit 245. The third was that, in some cases, the amount of detail made the rules 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.

Ultimately, the safeworking units, or operational rules, became so complex that consistent and common interpretations of the rules was no longer possible. Ms Fiona Love, the Manager of Australian Rail Training, said that experienced employees could all give examples in practice which would produce inconsistent interpretations of the meaning of safeworking units with the result that the trainer would need to telephone the safeworking section of the SRA to find out what the rule really meant.

Ms Love stated in evidence:

> ...The trainers and the trainees were in constant conflict in relation to the intent of the rules. It was very difficult to train the rules because everyone in the room would have different examples of attempts to apply the rules in variable circumstances where the application of the rules would result in different outcomes, and safeworking training became hours and hours of debate about the quality and appropriateness of the rules.

She later said:

> Finally there would be calls for the author and the trainer would have to leave the room and ring the safeworking section for a ruling on the intent. The trainer would then return to the classroom and deliver the ruling on the intent.

Ms Love later agreed that the ruling obtained may well depend upon which particular person in the safeworking section answered the telephone. It would follow that notwithstanding rulings being obtained, different training groups may be given different interpretations of the same rule.

I saw examples of this approach to safety at work in some of the eight accidents, the reports of which I am required to consider, where a number of different safeworking units might have applied. In such circumstances it is only to be expected that operational personnel will apply the most expedient or most frequently used safeworking unit, rather than properly assessing the danger which needed to be addressed and applying the most effective safety precaution to deal with that danger.

It could be said the only function performed by the safeworking units was a disciplinary one to ensure the punishment of employees who were involved in an accident or an incident and who did not comply with the provisions of the applicable safeworking unit whether they understood it or not.

It should have been obvious to the rail organisations that if several different interpretations were open then the rule should be reviewed and redrafted. The whole purpose of an operational rule is to enable employees to know how to do their job in particular circumstances and, importantly, to know what other employees are doing when carrying out the same operational procedure. If different employees have different interpretations, they are in effect operating in the same environment but under different operational rules. This is inherently dangerous.

What is remarkable is that there have been long periods of time in New South Wales where relatively few accidents have occurred. According to Leonie Paddison, the author

of *The Railways of New South Wales 1855 – 1955*, between 1926 and 1948 there was not a single incident of death to a passenger due to a train accident.

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 safeworking from experienced employees in the course of serving long periods of formal and informal on the job training. It was this master and apprentice approach which provided new recruits with the requisite body of knowledge which enabled railway employees to conduct their activities with reasonable safety. They often worked in pairs with more experienced employees. However, between 1983 and 2000, Mr Barry Camage, the Train Operations Manager of the SRA, stated that the number of SRA employees had been reduced from 40,300 rail employees to less than half that number. At the same time, there have been significant increases in passenger numbers.

Even without the increased demand for rail services which has occurred in recent years, the conclusion must be drawn that employees have less available time to train less experienced employees on how to perform their duties, with the result the system of on the job training no longer effectively ensures safeworking practices are passed on from more experienced to less experienced personnel.

There is no evidence before me to suggest any consideration was given to adjusting the methods of training during the time about which Mr Camage spoke, to ensure that safeworking personnel properly understood and applied the operational rules and procedures. It should have been obvious to the rail management at this time, that the reduction in staff numbers would adversely affect the long standing methods by which new personnel in the railways would spend significant amounts of time with highly experienced railway personnel learning the intricacies of safe operation. In the absence of this master and apprentice type of training system, there was a clear need for training methods to be adapted and altered to ensure that new recruits, increasing numbers of whom had no prior experience in the rail industry, developed the necessary knowledge and understanding to perform their duties safely.

I was told that there are approximately 900,000 passenger journeys and 200,000 tonnes of freight movement on the New South Wales railways each week day, and in the Sydney metropolitan area alone there are 2,521 passenger and freight movements each day. Dr. Richard Day, General Manager, Rail Development, whose duties with the SRA required him to project the likely demands on the system in the future, estimated that the number of passengers would increase in ten years from the present figure of 900,000 to between 1.2 million and 1.5 million passenger journeys per week day.

The increasing demand placed upon the rail network and the decreasing staff numbers have produced the result that the ability of employees to acquire knowledge of how to operate safely with other employees has diminished. This in turn has had the result that the underlying deficiencies in the management of rail safety have become more apparent producing accidents of the kind the reports of which I have been asked to consider and making the serious accident which occurred at Glenbrook on 2 December, 1999 more probable.

It was not simply the number of staff, and the capacity that created for employees to have the opportunity to instruct and train other employees on the job, that previously enabled the rail network to operate safely. Until 1996 the railways had an integrated structure and there were many employees who had long family histories of railway employment. The railway employees were like an extended family and had a degree of commitment to the large organisation for which they worked and for each other. They also took pride in their work which provided cohesion in the way in which its operations were conducted and ensured the necessary degree of co-operation and communication which was essential to the safe movement of trains. These factors contributed to the rail network operating reasonably safely for many years even though the primary formal means of ensuring safety, the safeworking units, did not provide a means of ensuring safe outcomes.

The management of safety on the New South Wales railway system was largely left to the integrated government rail organisation. A review of the relevant railway legislation reveals that provisions in the legislation from 1858 to 1912 generally related to specific circumstances, such as provisions of alternative safe transport for passengers when maintenance was being undertaken, misconduct of railway employees, malicious action by any person, and the investigation of railway accidents. From 1931 to 1988 the legislation made no reference to safety. The Transport Administration Act 1988 conferred a general obligation on the former SRA that it operate its railway and other transport services safely. There were also specific provisions covering installation of safety devices at level crossings and establishment of regulations covering security, safety and order on railways. The 1988 Act also introduced offences for railway employees under the influence of drugs or alcohol as well as the regime for drug and alcohol testing.

In the period following the 1988 legislation there were a number of accidents throughout the world which served to change community expectations in relation to the management of safety. Dr. Sally Leivesley, an expert retained by the Department of Transport, gave evidence about how this process developed in the United Kingdom. She said in the last century there was not the public perception that there was a right to a safe environment or to safe public transportation. That view changed with developments in mass communications and increased with the capacity of the media to display graphic images of disaster to large proportions of the population.

According to Dr. Leivesley, a number of particular disasters increased the public awareness of safety issues and increased the demands upon government to protect the public. The public had been led to believe that nuclear power stations located near heavily populated areas were at the pinnacle of safety management. The accidents at the Chernobyl nuclear power station in the former Soviet Union and the accident at Three Mile Island in the United States of America raised public concern about safety management in hazardous industries.

Other accidents in the United Kingdom and elsewhere contributed to the public disquiet about levels of safety in dangerous industries. The fire on the Piper Alpha oil rig, the death of several chemical plant workers at Flixborough, the Kings Cross railway station underground fire, the Zebrugge ferry accident, the Challenger space shuttle explosion and other similar catastrophes contributed to public concern about safety management in transport and other hazardous industries. The result was that governments required

organisations which were conducting activities which were potentially dangerous, and particularly those which could produce multiple fatalities and injuries, to prove in a written and tested form that they were conducting their operations safely.

The public perception that government owed a duty to the public to ensure that potentially dangerous activities were being conducted safely became a public expectation in transport related activities. One major catalyst for this in the United Kingdom was the accident which occurred on 12 December 1988 when a crowded commuter train ran into the rear of another train which was stationary in a cutting just south of Clapham Junction railway station. This caused the first train to be derailed to its right and strike a third oncoming train. The accident resulted in the deaths of 35 persons and almost 500 being injured, 69 of them seriously.

The public inquiry that resulted produced a number of recommendations, including the monitoring and independent auditing of systems in all safety related aspects of the activities being conducted by British Rail, the review of safety management by outside consultants who were required to look particularly at problems of communication within the organisation and required that British Rail report at six month intervals to Her Majesty's Railway Inspectorate on its implementation of the report's recommendations. The report contained many recommendations relating to matters of training, communications, automatic train protection and the updating of the rule book and books of instructions.

The result of these events was that the travelling public began to expect increased regulation and management of public safety. In the words of Dr. Leivesley "…it is the leaders of governments and of organisations that are seen to be responsible for the quality of risk management or care of the public."

When a decision was made in the early 1990s by United Kingdom government to privatise British Rail there was an understandable public concern about the way in which public safety would be protected. In the United Kingdom, the response to that concern was the adoption of a safety case approach to managing safety in the rail industry. The safety case had been developed in the off shore oil industry as a result of recommendations made by Lord Cullen in his report on the Piper Alpha disaster. Briefly, Lord Cullen recommended that operators of off shore installations be required to carry out a formal assessment of major hazards and develop appropriate controls for these hazards. This safety assessment was to be presented to the safety regulator as a safety case and updated regularly whenever there was a major change in circumstances.

This led to British Rail in 1992 establishing a railway group standard called safety validation of organisational change to ensure that a systematic process was used to transfer safety responsibilities from one organisation to one or more new organisations. It was specifically designed to ensure that no responsibilities were inadvertently omitted and that each organisation had the resources and competence within it to manage the safety of the operations transferred to it. The standard also required proof the safety systems and procedures were in existence at the time that the new organisation had responsibilities transferred to it.

The safety validation process required that within each rail organisation the responsibilities for the safety of each of the staff engaged in safety critical work be

clearly defined; that with each position there was a safety policy statement including details of duties, the training necessary to fulfil the position, and the qualifications required for the position; that the lines of safety responsibility and accountability were clearly defined; and that the organisation had adequate resources to carry out the safety validation process.

Mr Terrence Worrall, the General Manager and a Director of Thames Trains Limited, gave evidence about the way in which the safety validation process worked. He said:

> The existing organisations which were to be changed were required to list the safety responsibilities that existed by post within their respective organisations. The owners of the new organisation, and in most circumstances a new structure of management, were set up prior to actually being implemented, such that they then had the opportunity to consider what they were taking on board. They would then consider the structure of their new revised organisation. They would consider the safety responsibilities attached to that organisation. There would then be an alignment of what was being disposed of and what was being maintained, and indeed what was actually being disposed of, and a safety panel process was set up whereby the disposing department and the buying department, for the want of a better phrase, would sit down with the safety panel and would answer a series of questions with regard to the way in which safety responsibilities had moved from one organisation, or maybe more, into one other organisation, a new organisation.
>
> By virtue of that questioning process, there were a number of incidences where serious gaps were detected which were able to be filled by remedial measures before the organisation was implemented.

Further, according to Mr Worrall:

> The whole objective of such a process is to make sure that not only do you not miss anything, but when you have reorganised, restructured, that the individuals who occupy particular positions within the respective organisations truly understand their restructured individual responsibilities, where they fit into the overall structure and who is accountable for what, and it boils down to three words – roles, responsibilities and accountability.

In the United Kingdom increased public expectation in relation to rail safety, combined with the decision to privatise British Rail, produced the review of rail safety involving the processes of disposition, validation and the requirement for the preparation of safety cases for each rail organisation operating on the United Kingdom rail network.

Rail Safety Act 1993

In New South Wales no process akin to the United Kingdom safety validation approach took place when the industry was disaggregated in 1996. This was because in New South Wales a different procedure had earlier been used. This was the system of accreditation by the Department of Transport under the Rail Safety Act 1993.

As the year of enactment suggests, the process of independent government review of rail safety preceded disaggregation by some three years. This was the New South Wales government's response to the increasing public expectation that safety in public transport would be properly managed and that government was accountable for the competence with which persons providing public transportation services managed the safety of their operations. This legislation was significant because it provided for the first time for the safety performance of railways to be monitored by the Department of Transport, independent of the railways themselves. Mr Worrall, who has had considerable experience in the management of rail safety both here and overseas, said that many would regard the Rail Safety Act 1993 as being ahead of its time. He said:

> It was certainly ahead of anything we had in the United Kingdom. I believed it to be well structured. And whilst with hindsight one can always see it wasn't perfect but, nevertheless, it was a very sound basis with accreditation principles and whatever built into the process.

Mr Simon Lane, who was appointed the Chief Executive Officer of the SRA in 1997 and who had relevant background and experience in the management of rail safety for such a position, said of the 1993 Act:

> I think that was probably at the time ahead of where we were in the UK but it was in the disaggregation in 1996 that I don't believe that proper consideration was given to the relative responsibilities, and therefore, the safety arrangements that needed to apply post July 1996.

It appears that there were at least two matters which produced the legislative response to be seen in the Rail Safety Act 1993. The first was that, as a matter of government policy, the view was taken that regulatory powers should be separated from operational agencies. The second was the accident which occurred at Cowan embankment in 1990 where an inter urban commuter train collided with the rear of a steam train killing six people and injuring a further 100 people. The steam train was not owned or operated by the SRA but was a train operated by an independent organisation staffed primarily by volunteer workers. There was no mechanism available to the government which enabled it to monitor or enforce the safety performance of private rail operators which were operating on government owned rail tracks. With the establishment in 1991 of the National Rail Corporation there was another operator, which commenced operations in 1993 on the New South Wales rail network, and over which there was no effective government control in relation to its safety performance.

The Rail Safety Act 1993 established a scheme which provided for all railways in New South Wales to be accredited by the Department of Transport; for the annual auditing of their safety performance against the terms of their accreditation; for the reporting of prescribed safety incidents to the Department; and for certifying the competence of railway safety workers. The Act also required railways to investigate any accident or incident which occurred on their railway that could affect the safety of its operations, and that the reports of such incidents be forwarded to the Director General of the Department of Transport. There was also provision for the Minister to direct an independent investigation into an accident or incident, and six of the eight other accident reports which I am required to consider have been subject to independent investigation as a result

of a ministerial direction under that Act. It was and remains an important piece of safety legislation.

Section 3 of the Act sets out the object of the Act. The section is as follows:

> 3(1) The object of this Act is to promote the safe construction, operation and maintenance of railways.
>
> (2) To facilitate the achievement of this object, this Act provides for:
> (a) the establishment of the scheme for the accreditation of owners and operators of railways and for the certification of the competency of railway employees performing railway safety work; and
> (b) the development, and monitoring, of safety performance standards for and with respect to the safe construction, operation and maintenance of railways; and
> (c) the carrying out of regular safety compliance inspections, the reporting of notifiable occurrences, the holding of inquiries into railway accidents and other incidents and the adoption of other measures aimed at securing rail safety.

The objects of the Act appear laudable but a number of difficulties have arisen. I shall deal with the issue of accreditation of owners and operators first. Section 12 of the Act provides to the effect that accreditation is to attest that the accredited person is considered to be of good repute and in all other respects a fit and proper person to be responsible for the safe construction and maintenance or safe operation of a railway or rolling stock; that the standards proposed by the accredited person have been accepted by the Director General; and that the accredited person has demonstrated the competency and capacity to meet the standards submitted by the accredited person and accepted by the Director General for the purposes of the safe construction, operation and maintenance of a railway.

The section also provides that accreditation is dependent on the organisation satisfactorily demonstrating that it has the competency and capacity to meet standards relating to several matters. These include financial viability, managerial and technical competency, suitability of rolling stock, appropriateness of safeworking systems, availability and competency of railway employees, and availability and adequacy of infrastructure generally. Also specified are the standards for railway track, associated structures, signalling systems and other relevant facilities and public risk insurance. Each of these standards must be established to the degree and in the manner required by the Director General in respect of a railway of the kind specified in the accreditation.

It is clear that, by the Rail Safety Act 1993, the government endeavoured to introduce into New South Wales a regulatory regime based on ensuring that railways retained the responsibility for managing their own safety, by requiring them to submit their own safety standards and then making those standards enforceable once an accreditation had been issued by the Director General of the Department of Transport.

The evidence was that this process of accreditation became a paper driven exercise where the Director General was reliant upon information received by applicants for accreditation. According to Mr Paul Hayes, the Director of Policy of the New South

Wales Department of Transport, the Director General relies largely on the goodwill and co-operation of an applicant for accreditation. That is a less than perfect system because the Department of Transport does not have the resources to verify independently each element of an application for accreditation before accreditation is granted. This has led to a situation where because accreditation has been granted on this less than comprehensive basis, the infrastructure owner, RAC, has sought to undertake its own safety assessment of train operators to verify they are in fact capable of operating safely on RAC infrastructure.

As one might expect, section 14 requires an applicant for accreditation to submit to the Director General a comprehensive safety management plan that identifies any significant potential risks from the activities of an owner or operator of a railway and the safety management plan must specify the systems, audits, expertise and resources that are to be employed by the applicant to address these risks.

It is clear that one of the intentions of the Act was to introduce a risk management approach to safety in section 14, although this has not been achieved, at least not in relation to SRA and RAC. This section requires the applicant not only to identify the risks which may arise from its activities, but to also specify the measures by which these risks are to be controlled.

Section 14 goes on to provide to the effect that once a person is accredited the safety management plan must be revised annually and the revised plan submitted to the Director General at least 28 days before each anniversary of the accreditation.

Although section 13 requires an applicant for accreditation to furnish such information as the Director General reasonably requires in the circumstances to enable the Director General to effectively determine the application for accreditation, there is no mechanism by which the Director General can, in effect, go behind the documentation provided by an applicant for accreditation to determine whether the safety management plan is, or is likely to be, effective in respect of the operations being conducted or to be conducted. Further, once accredited the safety management plan must be submitted annually. However, the Director General has no power to reject the annual safety management plan as unsatisfactory or deficient. The only power the Director General has is to refuse the application or to suspend or to cancel the accreditation of a person already accredited.

Another weakness in the process is that once accreditation is granted it is ongoing unless suspended or cancelled by the Director General. It is impractical to think this would in any way operate as an effective sanction. In reality, this is no sanction at all. The Director General of the Department of Transport is responsible to the Minister for Transport. If the Director General were to decide that the SRA, for example, did not have an adequate safety management plan or was not conducting its activities safely, the suspension or cancellation of its accreditation would leave 900,000 passengers a week day inconvenienced. The same would apply in respect of the infrastructure owner, RIC if its accreditation as an infrastructure owner were suspended or cancelled.

The practical result of there being no effective sanction is that the best that the Director General can hope to achieve under the present system is to negotiate improvements with an owner or operator. The risk associated with negotiated outcomes is that they often produce compromises and public safety is not an area where compromise is appropriate.

The Rail Safety Act, 1993 was among the most advanced thinking in the world at the time, but it left the Department of Transport in the position of having to regulate rail safety by consultation and negotiation, rather than through the more common regulatory processes of applying sanctions for failure to adhere to the law. While consultation and negotiation can be sufficient, the lack of effective sanctions leads to the safety regulator being powerless to compel compliance with accreditation standards and this is demonstrated by the fact that the rail organisations from time to time have ignored the Department's requests for action.

The terms of the Rail Safety Act do not suggest that it was contemplated that there would be a disaggregation of the former SRA into four separate entities as was done in 1996. The Act did not contain any provisions which could have been used to regulate such a significant change to the structure of the New South Wales railways. No amendments were made to the Rail Safety Act 1993 to deal with the safety implications of disaggregation. Nor were there any provisions in the Transport Administration (Rail Restructuring and Corporatisation Act) 1996 which demonstrated that any attention was given to the risks and safety implications of such a significant restructuring.

Since 1993 there have been significant advances overseas in the management of safety in the public transport area. The Rail Safety Act 1993, although ahead of its time, reflected an engineering model in the management of rail safety. The engineering model of safety management has been in existence almost since the inception of railways and relies heavily on technical standards and prescriptive operational rules to control the risks associated with the rail operations. The engineering model of safety, which was heavily dependent on justification of resources expenditure for technical solutions for safety risks, formed the basis for the development of the hazard list which is still used in New South Wales railways as the foundation for identifying risks in rail operations. An examination of this list indicates that technical failures, for which technical solutions can be found, predominate.

Apart from the fact that the engineering model only identifies part of the safety risks that need to be properly analysed, another unsatisfactory feature of the model is that when engineering solutions are sought as a means of controlling an identified hazard, the allocation of resources is generally decided on the basis of a cost benefit analysis. One of the techniques for doing this is the ALARP methodology which is used to determine whether or not to expend resources on engineering solutions to identified hazards on the railway. ALARP is an acronym for "as low as reasonably practicable". It was influential as a methodology in the early 1990s. A good illustration is the consideration given in the United Kingdom to the introduction of automatic train protection (hereafter ATP) in the aftermath of the Clapham Junction accident. The cost of installing ATP was then regarded as far too great.

I am not critical of persons who considered expenditure in accordance with the ALARP principle in the early 1990s. There is no doubt that when there are competing demands for the expenditure of public resources, even in the area of public safety, better value in terms of the number of lives saved can be obtained by expending money on roads than the same amount of expenditure on railway infrastructure. Equally, there is no doubt that many more people die on the roads than die in rail accidents. However, it seems equally clear that the public expectation of government in relation to the safety of railways does not allow for that type of comparative analysis. Rightly or wrongly, that is the public

expectation and governments that fail to listen either take the risk that preventable accidents may not occur or suffer the consequence at the ballot box.

Nor am I critical of the proponents of the engineering model and their views of the ALARP principle as a basis for decision making. The reason why it developed and the way in which community expectations have changed was identified by Dr. Leivesley in her evidence. She stated:

> The engineers in the early days had to have a way in which they could get facilities built and accepted and, as low as reasonably practicable was a way in which the commercial imperatives could meet with the risk management but, in my view, it was a compromise, and I think because the community has now started to say that they will not accept death and injury as a basic and inherent part of … transportation, that, what I call social outrage, I think is forcing the thinking to start to move the risk into a much lower profile, which means that, as low as reasonably practicable can allow an engineering decision to accept, perhaps, what is calculated as a one in a million risk.
>
> The community will say 'we don't want to be the one in a million' and what the community is saying is 'we don't accept deaths and injuries in this organisation, or from this organisation'. So I think now that as low as reasonably possible may go through a change to where people are accepting what I have suggested to you as a near zero risk requirement on the organisations.

In my opinion it is quite wrong as a matter of principle to be allocating a value for human life and making safety decisions on that basis. I do not believe the community expects safety decisions to be made on the basis of a value being placed on human life. How does one set the price? It can never be other than an arbitrary figure. The second concern that I have about the ALARP approach is that it can provide a justification for not making every endeavour to manage safety properly. Organisations can pay lip service to the notion that "safety is our first priority" or other high sounding phrases, but avoid worthwhile safety improvements upon the basis that they are too expensive. Inactivity and complacency have no place in safety management. The object of all individuals and organisations involved in safety management should be to strive for continual improvement. There is no encouragement for this to be done in the regulatory regime imposed by the Rail Safety Act 1993 by reason of the process of accreditation which I have discussed.

Developments in safety management overseas point to the importance of human factors, organisational and managerial issues and the development and maintenance of a strong safety culture as being matters of fundamental importance to the proper management of safety in any large organisation. The Rail Safety Act 1993 does not reflect those developments and requires amendment to ensure that safety management is not limited to a mechanical exercise of formal hazard assessment and implementation of appropriate controls. In practical terms the best way of dealing with that deficiency in the Rail Safety Act 1993 is by amending the Act to provide a new Rail Safety Inspectorate with the necessary functions, powers and sanctions to properly regulate the safety of the rail industry.

There is one area of the Rail Safety Act 1993 which, in my opinion, serves no useful purpose. That is the provisions dealing with the certification of the competence of individual railway employees by the Department of Transport for the performance of railway safety work. Their competence is the responsibility of their respective employers. The role of a rail safety regulator is to ensure that the employer has mechanisms in place that achieve this objective. Mr Hayes referred to the current certification of the competence of railway employees by the Department under the Act as a Sir Humphrey Appleby exercise by which he meant that a lot of activity took place but there was no action in terms of delivery of a safety outcome. He said that such a scheme only exists in New South Wales and that the Department issues certificates of competency to some 12,000 employees.

Counsel Assisting asked Mr John Hall, the Executive Director of the Transport Safety Bureau within the Department of Transport, about the number of staff that the Bureau had to conduct that activity. It had a total of 23 staff, including himself, divided into different areas. Twelve of these staff were devoted to rail safety. Three of them specialised in rolling stock matters, two specialised in infrastructure matters, two specialised in operational matters, three had responsibilities in relation to safety policy, including dealing with ministerial questions, and two provided administrative support. The Transport Safety Bureau is not only responsible for the safety of public transportation on the rail network. It is also responsible for the safety of public transportation in buses, taxis, hire cars and some marine safety matters. The remaining ten staff are devoted to the latter areas. When one compares the obligations imposed by the Rail Safety Act 1993 on the Department of Transport and the resources which it has to carry out what is required of it under the legislation, it is obvious that the resources available are inadequate to achieve the expected level of inspection and monitoring.

I have not carried out the exercise of dividing 12,000 employees by the number of hours available to the twelve staff responsible for rail safety but the amount of time involved and the level of the assessment must have necessarily been extremely limited.

In my opinion there are two things wrong with the process of certification of the competency of railway employees. The first is that it can only be a cursory and formal process unless there are sufficient resources allocated to enable the Transport Safety Bureau to conduct thorough competency assessments. Secondly, and more importantly in my opinion, the Transport Safety Bureau or the Department of Transport should not be involved in the certification of individual employees in any event. The legal duty on every organisation is to ensure that its employees are competently trained. In addition the systems of work and the places of work are required by the common law to be reasonably safe. It is the employer that is responsible to employees and to the public for the competence and safety of the way employees carry out their work.

Not only should it not be the role of an organisation such as the Department of Transport to certify the competence of individual employees, it is undesirable that it do so. It is undesirable because it suggests that the responsibility for the competence and safety of the employees is with someone other than the employer. As a matter of law that is not right. As a matter of public safety it is undesirable. The proper function of an independent rail safety regulator, presently the Department of Transport and, as recommended in the second interim report, the Rail Safety Inspectorate, is to ensure that

there are proper systems in place for ensuring the competency and safety of employees, and for checking by inspection and interview of employees and their supervisors that the systems that are said to be in place are in fact in place and are working. In my opinion, the existing legislation should be amended so as to remove the requirement for certification by the Department of Transport of the competency of individual employees. A further amendment should make it very clear that this is a matter for the employer and that accreditation and renewal of accreditation depends on it being established to the satisfaction of the independent Rail Safety Inspectorate.

A further criticism of the existing legislation is that it does not provide any mechanism for dealing with safety matters which involve train operators and infrastructure owners or disputes between two or more of them. The danger is that no one is responsible for resolving disputes between different rail organisations affecting safety. The safety regulator may need to ensure co-operation to achieve a safe outcome when any such disputes arise. To do this, it requires appropriate powers. There were many examples of such disputes in evidence. One related to the dispute between RAC and SRA in relation to the auditing of Network Control. Another related to the dispute between RAC and some rail operators regarding the introduction of the Metronet radio system for all trains on the New South Wales rail network. A further example was the dispute between SRA and RAC in relation to infrastructure work which SRA considered imperative to improve the reliability of its train services but RAC, as infrastructure owner, was not prepared to give it the priority which SRA believed was necessary.

The present legislation simply makes matters worse. In part it creates conflict between the Department of Transport, the infrastructure owners and operators. This is because of section 17 which provides:

> An applicant for accreditation as an operator who does not own the railway on which the applicant proposes to operate must demonstrate to the satisfaction of the Director General, that the applicant possesses appropriate rights to operate a railway on the railway specified in the application.

The infrastructure owner could impose conditions in relation to access which the train operator regards as discriminatory or unreasonable. If the train operator does not agree to the conditions, access rights to the track could be declined with the result that the train operator could not obtain accreditation because it would not be able to satisfy the Director General of the Department of Transport that it "possesses appropriate rights to operate a railway on the railway specified in the application". This provision gives the infrastructure owner the means to indirectly control the way in which train operators manage their business in relation to safety and other areas of management. This was never intended to be a part of the open access regime. Nor was it intended to be part of the system for rail safety management under the Rail Safety Act that the infrastructure owner could become a de facto safety regulator. Although a dissatisfied train operator may have legal avenues of appeal, the existence of the ability to impose conditions which may effectively prevent accreditation being obtained gives the infrastructure owner powers not intended to be included in the open access regime.

This is another unintended consequence of the 1996 disaggregation. Section 17 should be deleted and the legislation should make it clear that safety accreditation is the exclusive responsibility of the Rail Safety Inspectorate and not a matter for the indirect

control or influence of the infrastructure owner. The legislation should be crystal clear in this respect. The rights of contracting parties should be governed by the contracts between them. Where safety issues arise, which are not governed by those contracts, the mechanism for ensuring there is no compromise to public safety should be through the legislative power conferred upon the Rail Safety Inspectorate. If, as a matter of policy, a government believed that it would be inappropriate for the infrastructure owner to include in its access agreements standards higher than those fixed by the Rail Safety Inspectorate, the Act could provide to the effect the infrastructure owner could not include in its access agreements any more onerous standards.

The next criticism that I have of the existing regime relates to the system of annual auditing. Transport Safety Bureau audits have to date been necessarily limited in scope and largely paper audits due to its lack of resources. The main weakness of this system is that rail organisations being audited can take whatever steps they need to satisfy the requirements of the audit then let the safety matters slide until the next audit is undertaken. The only method of ensuring that this does not occur is the continuing presence of a Rail Safety Inspectorate.

Mr Hayes, described the limitations on the Transport Safety Bureau in the following terms:

> I think if we look at the administrative and operating environment currently faced by the regulator, there are very many tasks without sufficient time to ensure that there is focus on what the primary objective should be, and that comes down to ensuring the public safety process and administration is foremost, as opposed to other matters… In summary, there is a lot of noise, a lot of hats involved, and perhaps trying to run a sprint where a marathon is essential for the larger objective.

The next criticism that I have of the existing legislation is that it does not contain any mechanism by which the government regulatory body can establish an industry wide safety requirement. The deplorable history of communications technology in this state provides an example of the area where a Rail Safety Inspectorate with appropriate legislative powers would require all train operators, all persons carrying out work on tracks or other infrastructure and all persons involved in the management of train movements to have the same compatible radio communications system. The same is true in relation to trains being operated with defective brakes or speedometers about which there was some evidence. The failure to comply with any industry wide safety requirement that may be specified by the Rail Safety Inspectorate should, in my opinion, be an offence under the Act which could be prosecuted by the Rail Safety Inspectorate with the potential for a heavy penalty to be imposed.

Any amendments to the Rail Safety Act to accommodate the criticisms that I have made should be done in such a way as to reflect advances in rail safety management which have occurred since 1993.

As a result of academic work in this area pioneered, amongst others, by Professor James Reason of the University of Manchester, modern safety management involves not only a risk management approach but also the control of active and latent conditions. Active failures are those which are made by individuals and produce direct and immediate

consequences. These are often referred to as human error. Latent conditions arise from managerial, organisational or external factors and may remain dormant for a long time before a combination of circumstances gives rise to a safety related incident, sometimes of catastrophic magnitude. The existing legislative framework created by the Rail Safety Act 1993 has produced too much emphasis upon an engineering approach to safety management.

The Glenbrook rail accident provides several illustrations of the way in which active failures and latent conditions can combine to create an accident. One illustration will suffice. The signaller at Penrith made the active failure of authorising the second train to pass signal 41.6 at stop when there was another train in the section in front. A latent condition was that a decision had been made many years earlier not to mimic the presence of trains in automatic signalling areas on train indicator boards. Accordingly, the signaller lacked the precise visual aid that would have warned him of the presence of the train in the section in front. The latent condition remained dormant until other circumstances combined with it to cause the accident.

The existence of latent circumstances was one reason why Dr. Leivesley doubted the validity of statistical material as a measure of safety management. Statistical material does not provide an accurate guide to whether an organisation is adequately managing latent conditions which could cause accidents. All it tells you is that a certain number of accidents has or has not happened. An organisation could operate for many years without the necessary coincidence of circumstances that can give rise to a serious accident involving multiple fatalities, but that does not mean that it has been managing safety well. Sometimes, as in the case of the Glenbrook rail accident, it is only when a serious accident occurs and a public inquiry examines the circumstances, that the nature of the inadequate safety management is revealed.

Any amendments to the Rail Safety Act need to take into account the fact that ongoing research into the causes of accidents has revealed that engineering solutions do not, in all cases, prevent accidents.

Research and learning on safety management in the early 1990's has recognised the importance of human factors in safety management. The human factors model took the existing engineering model and added to it the recognition that human beings were fallible and hence steps needed to be taken to mitigate against the risks introduced to a system by its human operators. A key element of the human factors model was that it recognised that previously relied upon techniques for managing the human element of operations, namely training, operational procedures and supervision, could not be relied upon to control human error. Consequently, this model aimed at identifying the types of errors that personnel could be expected to make during normal operations and implementing measures to control the consequences of such errors.

The evolution of the human factors model of risk management introduced completely new dimensions to the engineering model. Factors such as fatigue, workplace design, perception, the interaction between people and machines, the effective development of operational procedures so that they were simple and easy to understand, as well as appropriate for the end purpose, and the selection, training and assessment of the competence of personnel were some of the matters which the human factors model of safety management addressed.

Research and learning on safety management since 1993 has further evolved beyond the human factors model to an organisational model of safety management. This is the level that has been attained in safety management at this point in time. It should be, therefore, the model which is used for designing and implementing improvements to the safety of rail operations. It is necessary for the New South Wales rail industry to avail itself of the learning and experience that other railways and industries have gained to bring safety management to an equivalent level and thereafter to continue to keep abreast with proven developments in safety management as they occur.

The organisational model recognises that it is not only operational personnel who contribute to accidents but that many persons within the organisation, who are not operational staff, can create latent conditions which increase the probability that an accident or incident may occur. The staff that determine the dwell time allowed at railway stations, the accountants and business managers who decide the resources that should be allocated to safety issues, and the chief executive officers who are under pressure to ensure on time running or to produce a financial return to the government, all significantly influence the latent circumstances which might give rise to a serious accident although the influence they might have may not be obvious.

The realisation that organisational factors can have such an affect has led to attention being concentrated on the development of a safety culture as a means of further reducing the risk of accidents. The issue of a safety culture as an organisational protection against accidents is a matter of such significance that I shall deal with it in a separate chapter. I regard the creation and existence of a safety culture in the rail industry as fundamental to achieving an optimum level of safety.

In considering what was been done at the time of disaggregation in 1996, I have found it instructive to compare the New South Wales approach with what occurred in other places. I have summarised the process that took place in the United Kingdom and it is apparent that a careful analysis took place in relation to the safety responsibilities of the existing organisations and then, through a process of disposition statements and safety validation, a rigorous system was put in place to ensure that all potential safety risks were being properly managed.

In Queensland, a similar process was undertaken and continues, in part, to be part of the way in which safety is managed in that State. Where any change occurs the person responsible for the change must analyse what effect the change will have on the operation of the Queensland railway system, must specify the co-ordination plan to identify the responsibilities that each organisation involved has for the management of safety after that plan, and each organisation involved or division thereof must prepare a safety case. The Queensland regime which is set out in the form of a safety validation standard requires a hand over certificate to be signed by the person in charge of the change, certifying that the change is safe for the stated purpose or use. The relevant Queensland standard is Annexure F to this final report.

In New South Wales, not only were the rigorous United Kingdom and Queensland systems not followed, but nothing at all appears to have been done. Importantly, there was no transitional period and no proper analysis as to how safety was to be managed at the time of disaggregation. A number of witnesses gave evidence that, in their opinion, the general level of safety in rail operations deteriorated after 1996.

This was inevitable. The cohesion provided by a large government owned integrated rail organisation was destroyed by disaggregation. With it went the safety culture which had developed through working relationships that had been established over a long period of time. In addition, expertise in safety management was dissipated among four new and separate organisations. The four independent organisations then established and developed their own safety management systems independently of each other. This was done in pursuit of the dual objectives of obtaining accreditation from the Department of Transport under the Rail Safety Act 1993 and in furtherance of their different organisational objectives. This was done with little communication between them and no co-ordination of the way in which overall safety of the network needed to be managed.

It seems to have been assumed that since each new organisation would obtain accreditation from the Department of Transport, any problems that might exist in the management of safety within and between the organisations would be adequately dealt with as part of the accreditation process. However, as previously demonstrated, the accreditation process was incapable of achieving that outcome. The deficiencies in safety management that existed appeared to be recognised at the earliest in 1998.

The destruction of the earlier safety culture which previously existed and the fragmentation of expertise, together with the different organisational objectives of the four organisations, inevitably produced the other eight accidents, the reports of which have been referred to me.

I have described in this chapter the way in which the management of rail safety has developed and observed that the New South Wales rail industry has not availed itself of those developments. This is all the more disappointing since the 1924 report of the Fay-Raven Royal Commission into the Railway and Tramway Services in New South Wales recommended both that a graduated scheme of railway training be introduced and that a program of officers' visits to foreign railways be established. The body of the report expressed reasons for these recommendations as follows:

> For many years a reproach lay at the doors of railway management throughout the world that, while no expense was grudged in the purchase of improved machinery or new appliances, the human element responsible for the manipulation of the business for which such expensive machinery had been provided was left without facilities or even encouragement, if they cost money, to advance in knowledge or add to experience beyond immediate local surroundings. Progressive administrations have latterly recognised that a man is at any rate equal to the machine as a desirable object in which to invest money with a view to the reduction of cost or greater efficiency of transport. Thus travelling as well as educational facilities, aided by reward where value could be shown, have taken the place of former indifference.
>
> The Railway and Tramway Institute training, including competent instructors travelling with demonstration cars for teaching the Operating and Locomotive Staff, is excellent up to a point, but in order to give those who are anxious to advance in the railway service every opportunity and at the same time make certain that the good material which is evident in New South Wales is made of the greatest use to the State, we think that the scheme of practical education should be carried further by selection of those who specially

> qualify themselves in theory to be given work for a short time in each branch of the railway service, and later on be induced to study the railway systems of America, Great Britain and the Continent of Europe, or alternatively, a tour in South Africa and the Argentine, countries which are developing their railways rapidly and have many problems in common with New South Wales. We understand that some of the officers are given opportunities to study railway methods in other countries. It would be of advantage if all of them were in turn selected to visit the countries mentioned above.

During the overseas investigations Counsel Assisting and I met in Paris and in Oslo with the Chairman of a safety related committee of the Union Internationale des Chemins des Fer (hereafter UIC). The UIC was founded on 20 October 1922 by 51 members from 29 countries in Europe and Asia. It currently has 61 active members, 53 associated members and 32 affiliated members. Its areas of safety related work include the collection of information in relation to safety management systems, risk assessment and control, accident investigation and notification and the communication of safety related information. The only Australian railway which is a member of the UIC is Queensland Rail.

When Counsel Assisting and I visited the United Kingdom we learned that in January and February 2000 a six man railway industry group from the United Kingdom visited Japan. Its purpose was to investigate safety practice on Japanese railways and to understand how the United Kingdom could best benefit from these. The report of the group stated:

> All of the managers we met from the various railway companies were very helpful and seemed generally keen to talk to us. Their dedication and enthusiasm on safety issues was very apparent. It is not hard to see why. A collision between two commuter trains carrying 4,000 people each could easily lead to deaths and injuries in the thousands. Yet they describe incidents we would describe relatively minor as major safety failings, and justify some of their actions by reference to accidents as long as ago to 1949. Cost/benefit analysis is not used but there is a clear pragmatism on what is affordable with a "campaign"-based safety improvement culture.
>
> What we saw was very impressive and, whilst, it was a tough week with a punishing schedule, well worthwhile. We learnt a great deal and believe the Boards of almost any UK Rail Company would find a week's visit to Tokyo just to see how things are done there a worthwhile investment.

In my opinion rail organisations in New South Wales should avail themselves of the wealth of overseas information and expertise in respect of rail safety management and consider its application to the improvement of rail safety in New South Wales.

Attempts have been made to improve rail safety in New South Wales in recent years and I shall review these in chapter 5 of this final report. However, the improvements have not been undertaken with the use of the wealth of overseas safety management information and experience which the overseas investigations identified.

In my opinion, good safety management requires obtaining all relevant information about implementing the optimum safety management system for each rail organisation, a proper

system of government regulation of safety and the cohesion provided by a safety culture. The creation and maintenance of a safety culture is an essential component of a safe rail system and is a matter of considerable importance.

4. Safety Culture

The previous chapter described the significant developments which have occurred during the past 20 years in the management of rail safety here and overseas. There has been a general failure in New South Wales organisations to embrace advances that have been made in the management of rail safety internationally and in other industries.

In the previous chapter, I referred to the different organisational objectives of the three government rail organisations directly involved in the Glenbrook accident. RAC, or as it has now become since the enactment of the Transport Administration Amendment (Rail Management) Act 2000, Rail Infrastructure Corporation, has a statutory obligation to operate along commercial lines and a duty to make money for the government. The State Rail Authority has as its primary function the provision of commuter services to the travelling public. The tension between what are in truth a state owned corporation and a public utility has contributed to the lack of co-operation which made it necessary to create the Office of the Rail Regulator to deal with the performance of the infrastructure owner and the provider of commuter services.

Rail safety is the object achieved by ensuring that strategies and measures are put in place to ensure that each rail organisation is maintaining the optimum level of safety, notwithstanding its organisational objectives or the different organisational objectives that it may have compared with other rail organisations. This object is achieved by a combination of an adequate safety management system underpinned by a safety culture.

In the previous chapter I referred to the safety culture that existed prior to disaggregation and the fact that disaggregation caused a destruction of that culture. Mr Nick Lewocki, Secretary of the RBTU, stated:

> We think that the break up of the safeworking culture that developed over a long period of time in the SRA was broken up when the agencies broke up and instead of having a central safeworking section, each of the business agencies had their own because they were required to do that, and some of that intellectual knowledge was scattered right across the agency and we were concerned there were decisions being made which weren't co-ordinated.

Mr Lewocki, in a later stage of the hearings, stated:

> I think if you look at the changes in the industry over the last 20 years, in spite of government policy, in spite of the calibre of management, we have kept the system going, or our members have. They are very proud.
>
> If you look at the Olympic period you could almost see our members chests swell up with pride in the wraps they were getting about delivering a public transport system when everyone was predicting it to be in chaos. Our members are very proud of the work they do and very skilled at it.

None of the evidence given by Mr Lewocki on these matters was challenged. Other evidence, including the evidence of Dr Leivesley, corroborated Mr Lewocki's evidence about the workforce being highly motivated. She stated:

> Most major corporations would pay huge amounts of money to have a workforce that is as dedicated as this workforce, and I think within a highly committed workforce, such as these workers, there is a wish to do their job well.

The performance of the rail employees during the 2000 Olympic Games demonstrates that there is a solid foundation upon which a strong safety culture can be developed. This will take time and effort. In the words of Mr Lewocki:

> The morale is that people just don't feel comfortable in their job any more. They see government policies being changed. They see CEOs or Commissioners come and go. They always feel no sooner we co-operate in developing some reform than a new regime comes along and it changes, and people in a lot of cases don't feel like, I suppose, the old rail industry where they said "it is great to come to work, you will love the industry.
>
> A lot of people today tell me they roll with the punches. Their morale is low. They are frustrated with the system and have no confidence in the system and worry about their job security. I think bringing people to work with that sort of attitude, we have spoken to senior management about how to improve that. We have tried that from time to time. It is successful for a while and it seems to drop off again.

Before dealing with the way in which a safety culture can be re-established, it is necessary to explain why a safety management system without the underpinning of a safety culture will produce a less than optimum level of safety within the railway.

It is necessary to identify some problems of nomenclature. There was a great deal of jargon used during the inquiry regarding risk management. There is a danger that expressions such as "risk management" and "safety management" may become meaningless jargon, like "best practice" which seems to mean no more than the practice that each rail organisation claims it engages in.

There is also a danger that methodology might be seen as an end in itself. Reliance on safeworking units is a good example. Management of safety simply became an exercise in determining whether the individuals involved in an incident or accident complied with the safeworking unit and, if they did, whether the safeworking unit adequately dealt with the particular circumstance. If it did not, then the response was to amend the safeworking unit. What was required was that the safeworking units should have been seen as part of a system of rail safety management which had many other components and not as an end in itself.

Risk management is a tool which assists in making informed decisions. It is not a matter of mechanically identifying hazards and establishing controls which are then applied without thought. What is needed is clear thinking and the application of appropriate responses in the particular circumstances of the hazard that exists. The hazard list, including controls, is not intended to be used in the same way that safeworking units have been used. The tool of risk management is not a mechanical process. It requires thought and adaptability to the particular circumstances that exist at a particular time. Nor is risk management the only tool that should be used in safety management because the

identification of hazards and the establishment of controls does little to promote a good safety culture.

The belief that all hazards can be identified and controlled is capable of producing the opposite of a culture of safety in that it promotes a perception that safety matters have been addressed. Good safety management involves instilling in the workforce behavioural attitudes which emphasise and promote safety by making employees aware that risk can be unpredictable and constant vigilance is needed to ensure safety.

An organisation may have a good risk management system but the attitudes of the staff may prevent it from having optimal effect. The evidence suggested that RSA was working towards an adequate risk management system and was two years ahead of the other rail organisations in that program at the time of its merger with RAC. Neither RAC nor the SRA had made any significant progress towards establishing an adequate risk management system. RSA had started to establish a safety culture to underpin the risk management system that it was putting in place but the SRA has not progressed very far in the direction of re-establishing a safety culture appropriate to a disaggregated railway industry. RAC was beginning to understand what was necessary to establish a safety culture. It will be a difficult task for the new RIC to give safety management the priority that it should receive over its commercial objectives. The two are not inconsistent but much effort will be required. This is because one of the most difficult cultural challenges for any organisation is unifying the values, beliefs and practices of employees from merging companies.

RIC and SRA are responsible for the transportation of hundreds and thousands of commuters on a daily basis and for the welfare at work of thousands of employees. To achieve the level of safety management that these responsibilities require, a culture which gives priority to safety is essential.

For an organisation to have an optimum level of safety performance there must be a safety culture. A safety culture does not consist of a group of individuals proclaiming that safety is their first priority or disseminating safeworking units or safety guidelines. A safety culture consists of the individuals participating as part of a group and being guided in their behaviour by jointly held beliefs about the importance of safety and by their knowledge that the importance of safety is a matter which every member of the organisation believes in and is prepared to support other members of the organisation in trying to achieve the result that there will be no incidents and no accidents. The combination of the individual belief and the sharing of that belief then influences behaviour producing co-operation which in turn ensures that the safety management system works either by application of particular specified procedures or by their appropriate modification to ensure a safe outcome.

Professor Reason, in his book *Managing the Risks of Organisational Accidents*, stated that it is undeniable that a bad organisational accident can achieve some concessions to safety but he also states that such concessions are often short lived. A safety culture emerges, he says, from practical and down to earth measures and it is a process of collective learning. He has defined culture as "shared value (what is important) and beliefs (how things work) that interact with the organisational structures and control systems to produce behavioural norms (the way we do things around here)". In Professor Reason's opinion the essential element of a safety culture is one in which all levels of the

organisation share the same goals and values. It is a situation where people way down the line know what they are supposed to do in most situations because the handful of guiding values is crystal clear.

Despite the claims of a number of witnesses in managerial areas I am not convinced that a safety culture exists in the rail organisations in New South Wales. Each person separately determines his actions according to what he believes is a proper interpretation of the relevant safeworking rules. This is not the fault of the operational employees because that is the way they are taught when inducted and the way they are expected to carry out their duties. It is clear that each employee acts within the framework of the safeworking rules that he believes applies to his actions without any analytical regard to the particular circumstances of the activity in which he may engage.

Furthermore, the culture that pervades the SRA at the present time is not a culture of safety, it is a culture of on time running. Dr Leivesley stated that when she visited the Sydney control room she observed that a list of incidents was recorded, but the significance of the incidents was defined in accordance with their effect upon on time running. This is understandable because the travelling public and the media appear to judge the SRA principally on whether or not its trains are running on time. It is understandable that the public regards it as important that the trains run on time. Every day over the radio the daily performance of the rail network in regards to the punctuality of trains is frequently broadcast.

The evidence in relation to the Glenbrook rail accident demonstrated that the dominant culture in the rail industry in New South Wales is a culture of on time running. The actions of the train controller, Mr Browne, at West control and of the signaller Mr Mulholland in Penrith signal box clearly indicate that their behaviour was motivated by the desire to maintain the highest level of punctuality and they failed to appreciate the safety issues that were involved in managing the passage of trains through an automatic section of track after a signal failure had occurred.

There are many other examples of the influence of the culture of on time running. At the time of the Glenbrook rail accident Network Operations Superintendents attended signal boxes in their capacity as supervisors. However they were only present during the morning and evening peak periods but the only matter that they supervised was on time running. It transpired that, with the possible exception of Mr Doug Anthony, they did not know how to operate the signal box so that they could not have supervised anything else in any event. Mr Anthony stated “Earlier in my career I did signal boxes, but they were only of a small scale.”

As with all organisations, railway employees do not live isolated from the society of which they are a part. Consequently, they are influenced by any public scrutiny of their actions and their employer. There is little doubt that the continuing criticism of the SRA for failing to ensure trains ran on time, had a filter down effect through the ranks of the SRA. Consequently, individual employees, no matter their function, had a significantly heightened awareness of the importance of maintaining on time running. Under normal circumstances, this is exactly the focus that should exist within a passenger railway as its principal role is to provide efficient and effective services that are predictable to commuters. However this objective had become so entrenched in the attitudes of railway operational personnel that they could no longer objectively assess anomalous situations.

They had developed an attitude that could not be varied under any circumstances – trains had to run on time despite the consequences.

Thus another primary goal for railway personnel, namely that operations should be safe, was overridden. The principal purpose of any public transport system is not only to ensure that people arrive at their destination in a timely fashion, but also to ensure that they arrive there safely. To separate these two functions, or to give one more priority than the other, is to undermine the real purpose of public transport. For this reason, action needs to be taken to ensure that the balance between the goals of on time running and safety are reinstated within the New South Wales railways. Also, where there is any conflict, or potential conflict, between these two goals, safety must be paramount.

Furthermore, maintaining the level of performance of the rail network at a high standard has safety ramifications because the risk of incidents or accidents increases when the system is not operating as intended. Many accidents occur during what is described as a degraded mode of operation, that is, when normal operations are disrupted for one reason or another, such as an infrastructure or rolling stock failure. It is at such times, as the Glenbrook rail accident itself demonstrated, that the risk of accidents is increased if the procedures or training are inadequate or if there is a lack of an appropriate safety culture.

Employees have not been encouraged to take what has been described as a negative safe view. If Mr Mulholland had taken such a view when he was considering authorising Mr Sinnett's inter urban train to proceed past signal 41.6 in the stop position, he would have said to himself: "What if I am wrong in my assumption that the Indian Pacific is well clear?" The behavioural response that a risk aware signaller would then have undertaken would have been to go through various procedures, including contacting trains travelling in the other direction, trying to contact the driver of the Indian Pacific by two-way radio, as he did after the accident, or simply telling Mr Sinnett that he did not know for a fact where the Indian Pacific was located and that Mr Sinnett should drive very cautiously.

Although it is obvious that a number of factors conspired, as so often occurs, to produce the Glenbrook rail accident if there had been a culture of safety underpinning the behaviour of the frontline operators, that would have operated as an additional factor influencing their behaviour in such a way as to have avoided this tragic accident.

The problem with the emphasis upon on time running is that it causes the level of safety to be compromised. Mr Charles Jarvis, a train driver, gave examples of many incidents where it was apparent that the culture of on time running existed in the SRA. His evidence was uncontested by the SRA. He described a culture in the SRA that, if accepted, is far removed from a safety culture. He gave evidence of drivers being forced to operate trains with non-functioning radios, with drivers having pressure brought to bear on them to take trains out with defective brakes and other matters which would make them unsafe in the system. Mr Jarvis named the persons involved in these incidents. In the absence of any challenge to his evidence or any submission being put that I should not accept it, the matters that he referred to must be regarded as having been conceded. Other evidence about radios playing in signal boxes, contrary to the safeworking rules, the disputes over the audit of network control operations and the failure to insist on strict compliance with the communications protocols contained in the safeworking rules and complaints made by other operators all demonstrate the lack of a safety culture.

One of the best illustrations of the lack of a safety culture may be found from the way in which the government rail organisations conducted themselves during the first stage of the hearings. There was very little cross-examination by counsel for the rail organisations. Mr West QC, who appeared for RAC, summarised his client's submissions about the causes of the Glenbrook rail accident as follows:

> The fundamental cause, the real cause of the accident, involved two elements: firstly, a train was wrongly permitted to pass an automatic signal at stop. The second circumstance was that that train, given that permission, was driven too fast in the circumstances. They, in our respectful submission, are the causes of the accident.

The approach taken by the New South Wales rail organisations contrasts with that taken by British Rail in the inquiry into the Clapham Junction rail accident which led to many safety reforms in the United Kingdom. The Clapham Junction accident was caused by a wrong side failure, that is a signal displaying a proceed indication when it should have displayed a stop indication. This occurred because wires were crossed as a result of the way in which some infrastructure maintenance work had been carried out. The report of Sir Anthony Hidden QC records that when Mr Roger Henderson QC for British Rail commenced to cross-examine the tradesman who carried out that work, he said this:

> Mr Hemingway, before I ask you any questions, can I just make one or two things absolutely plain so that people understand what British Rail's stance is. You have said it was not your practice to shorten wires nor that it was your practice to cut off eyes. You said it was your practice to re-use insulating tape. You have described your method of doing it. You said it was not your practice to secure the wires back in the sense of tying them back, but instead to push them aside and that you have used the word "flick". I make it quite plain to you that in relation to all those matters we recognise that those are not satisfactory and indeed bad practices but that the blame for that does not lie with you, it lies with British Rail. Either it should never have been allowed in the first place or once it had happened and the practice had become your practice and indeed was common place, it should have been stopped because the matter should have been monitored. So, there is no criticism of you for those failings which we recognise are our failings and not yours.

The public was entitled to expect during the first stage of the hearings that the government rail organisations would acknowledge at least the deficiencies which obviously existed in the communications system, in the safeworking units, and in the training and supervision of employees, rather than adopting a passive approach in the hope that the deficiencies would not be obvious. These are public bodies responsible for the safety of the public and it is their duty in each case to be open and forthright. There can be no such thing as a different or conflicting interest when there is only a single common interest, public safety.

Although there was some evidence that there is a no blame culture in relation to employees in the rail industry, the opposite is in fact the case. Mr John Dawes, the Manager of Train Crewing of the SRA, when questioned about the Waverton accident, was quick to attribute blame to the unsuitability of the driver who, it was said, under the present conditions of entry would not have passed the present psychological testing of

applicants for the position of driver. He made no mention of the fact that the particular driver was an inexperienced driver who had never been taken over the route he was driving for the first time. Nor did he mention any organisational fault. Mr Dawes was asked to identify the deficiency in the selection and training of the driver involved in that accident and said:

> My own personal view is that, if that particular person was subjected to the new selection process, he would not pass. That's just a personal view though…
>
> I think he actually passed the safeworking components of the training very well, but I think, in the application of his knowledge, there was a deficiency there and I think that would have been picked up with the psychological testing.

This propensity to lay blame was demonstrated continually by witnesses from each of the rail entities, including some who held key safety positions. Frequently this attitude was expressed by witnesses seeking to blame another organisation, rather than an individual, for the accident. What I would expect from organisations which had a proper approach to safety management is a willingness to recognise their own failings, as well as their collective failings, along with a desire, both individually and collectively, to address those weaknesses.

Professor Reason has explained that there cannot be an entirely blame free approach to incidents. He rightly states that it is neither feasible nor desirable because there may be acts which are so egregious that sanctions should be applied. Examples are reckless disobedience of a signal at stop or driving a train under the influence of alcohol or a drug. He states that what is needed is a just culture where, in an atmosphere of trust, people are encouraged and rewarded for providing essential safety related information. He emphasises, however, that a line must nevertheless be drawn between acceptable and unacceptable behaviour.

He also refers to the necessity of having a flexible culture where control is transferred from the normal chain of command to experts on the spot when an incident occurs. There must be respect for the skills and experience and ability of the workforce particularly he says the operational supervisors who must be well trained in safety aspects. According to him, to have a safety culture it is necessary to have a just culture, a flexible culture and a learning culture.

Professor Reason says that a proper system of reporting of safety matters is important. He says that it is difficult to establish that system because people do not like admitting their own mistakes. I also apprehend that people will not like to report on the errors of fellow employees. However, to encourage this to be done, employees have to be convinced that management is likely to act on the reports, that the reports will not cause trouble for them or their fellow employees and that remedial action will be taken. There must not be a lack of trust and there must not be a fear of reprisal.

I am not satisfied that there is such a reporting culture in the New South Wales rail industry. Mr Jarvis, a train driver, gave evidence of what I consider to be the true position in the SRA. He gave an example of a driver reporting a defective signal and

when it was inspected by a signal electrician nothing was found to be wrong with the signal, whereupon the driver was charged with making a mischievous report. He also referred to an occasion when he intervened on behalf of a driver who was being forced by his supervisors to take out a train which he believed had faulty brakes. Mr Jarvis also gave evidence of an occasion where water was dripping onto the dashboard of the train, near live wiring, and he reported the circumstance to the supervisor at Mortdale. He described what happened after that in the following terms:

> He came over, and while Jim Charlesworth watched, he wiped up the water, turned to Jim and said "There is no sign of water ever having entered this cab. The train is right to run". I dug in and said, "No, not under section 211 or 212 of the Crimes Act or the OH & S Act. I am not taking it." I finally had enough and I went home. I rang the next day to get my shift for the following day. I said, "Five o'clock in the evening?" They said, "No, twelve o'clock at headquarters, Xerox House, making a statement regarding refuse duty." In order to defuse that situation I had to wheel my personal solicitor in at a cost to me of, ultimately, $3,000. The pressure is immense. I can't over emphasise that.

Mr Jarvis' evidence was not challenged, notwithstanding the fact that the precise occasions and the names of the individuals involved were identified by this witness in his evidence. That a driver could be subjected to disciplinary action for failing to drive an unsafe train demonstrates the relative priority of on time running over safety.

Whilst there are mechanisms for anonymous reporting, these need to be improved. There must also be a method for informing employees by the weekly notices or otherwise that action has been taken in relation to matters reported. For a just culture to exist, employees must believe that justice will be dispensed. I do not believe that rail employees in New South Wales have such a belief when considering whether to report an incident in which they or other employees have been involved.

In my opinion, it will take at least three to five years to change the existing attitudes within the rail organisations in New South Wales to achieve an appropriate safety culture. This need not be done at the expense of on time running. The two things can go hand in hand. With a proper safety culture fewer incidents will occur, therefore fewer disruptions will occur with the result that on time running will be improved.

The most telling aspect of the lack of a safety culture is the absence of a collective effort in respect of safety by operational employees. This is not the fault of the employees concerned because they had never been taught that safety must be a collective effort. What they have been taught is to operate only on the authority of the safeworking units which they believe apply to the circumstances. This is exemplified by the response that is sometimes made when an accident occurs, that it is the driver's fault because he is in charge of the train. Important information concerning possible hazardous or unusual conditions is not reported to train drivers. There is a prevailing attitude that train drivers should act in accordance with signal indications and receive no other assistance. That attitude does not show a collective approach which is so necessary for a safety culture.

An illustration of this phenomenon is the Hornsby accident on 9 July 1999. This involved a signaller being directed by an area controller to warn the driver of an unusual

change to the route that he was to follow. The direction was not complied with by the signaller.

A further illustration is the Bell accident where there was a failure by the signaller at Mount Victoria to warn the driver of the train that there was a work party on the track. The failure of the signaller at Mount Victoria to give this warning was justified by the statement that the safeworking unit only required the train driver to be warned if he was travelling on the actual track on which the work was being carried out. It was contended that there was no necessity that he be informed that employees were working adjacent to the track on which he would be travelling. I have no doubt that if the train driver had been so warned he would have kept a proper lookout and the accident would, in all probability, not have occurred. Furthermore, the supervisor only considered what the safeworking unit required rather than adopting a proper approach to the safety hazards presented by workmen working on the line near Bell.

Ms Fiona Love, the Manager of Australian Rail Training, made a number of attempts to try and instil in employees this collective approach to safety. When she first wanted to introduce group learning where drivers, guards, signallers and train controllers underwent training together, this proposal was initially opposed by the relevant trade union, an organisation whose duty it was to ensure the safety at work of its members. The trade union later gave approval, but said this was not to be treated as a precedent.

The senior executives on a state and national level of the trade unions which covered almost all of the operational staff on the railways gave evidence that they would support safety recommendations emanating from this Special Commission of Inquiry. Ms Love stated that the trade unions had now accepted her approach that drivers, guards, signallers and train controllers should be taught as a group to enable them to learn to work better together and understand the demands on each other's positions. Issues such as demarcation disputes must take second place behind safety improvements. Overseas experience indicates that to achieve a safety culture within an organisation the employees as individuals and members of a group, need to have a commitment to the way in which they and others work.

Professor Reason has pointed out that the importance of a safety culture in organisations such as railways is that it encourages employees not to forget to be afraid when conducting complex and often dangerous operations and that there are many circumstances where the defences that exist to prevent accidents can be penetrated or breached.

In an unsafe culture employees are led to believe that some accidents are inevitable or that the risk does not exist and is being controlled. Dr Leivesley gave the example, in this regard, of the Chernobyl nuclear accident where the employees actually turned off the safety equipment because they were convinced that they were able to control the processes that were going on.

Commitment to safety must come from the highest levels within the organisation. Otherwise employees are entitled to take the view that if the chief executive officer does not, or does not appear to, regard safety as the first priority then why should they.

Mr Terrence Ogg, the Chief Executive Officer of the former RSA, made it clear in writing that he regarded safety as all important. This is the type of leadership that is necessary to establish the safety culture, particularly if his action and that of his senior management confirm what he has said to the staff in writing.

Senior management leading by example is one of the most effective ways of establishing a safety culture. Another is the willingness of operational staff to work together as a team to achieve a particular objective. A prime example of this is the 2000 Olympic Games. While senior management received most of the public acclaim for the success of the rail system in transporting spectators to the Olympic Games, I am of the view that it was the cohesive and determined attitude of rail staff which ensured the network ran with minimal disruption during this time. Undoubtedly, the impetus for this temporary culture shift came from the railway employees' awareness that they were subject to international scrutiny and their determination to prove that the rail system could successfully provide the necessary rail services with minimum disruption.

This temporary culture change for the 2000 Olympic Games warrants further examination. The railway workforce can and, on occasions does, generate exactly the right type of organisational culture to ensure safe and efficient operations. However, this appears to happen only when there is some unusual external influence which serves to overcome the normal cultural rifts and unite the railway workforce toward achieving a common and unified goal.

A safety culture should be an inherent part of the way in which each rail organisation operates and should not depend upon any particular event to motivate the employees. The same outcome in efficiency and safety can be achieved by strong and effective leadership by management particularly when there is a motivated and dedicated workforce. The corollary is that without the external influence and with poor leadership by management, inefficiency and a deterioration in the overall level of performance is inevitable. If the operational staff lack confidence in the management then the safe and efficient operation of the rail network will entirely depend upon their capacity to work well collectively. A particular event, such as the 2000 Olympic Games, may provide the necessary focus for this collective effort. However, in the absence of a particular event of that nature, the impetus must come from good and effective management. If the operational staff are cynical about management's commitment to safety they will not themselves have any such commitment.

Helmreich and Merritt in their book *Culture at Work in Aviation and Medicine* identify six distinct strategies for building a healthy, safety oriented organisational culture. The starting point is a commitment by management, and in particular senior management, to safety as the first priority in the operation of the rail network. This commitment must be genuine and sincere and backed up by the day to day action of management.

When in London, Counsel Assisting and I met with Mr Richard Clarke, Managing Director, and Mr James Catmur, Director, of Arthur D Little Limited, an internationally renowned rail safety consultancy, which had been retained to advise, among others, Railtrack PLC, Austrian Federal Railways, Italian Railways, Spanish National Railways, Swedish National Rail Administration and the Mass Transit Rapid railway in Hong Kong.

They provided me with a summary of the principles that they espouse in relation to managerial commitment to rail safety:

> It is hard to change the attitudes and beliefs of adults by direct methods of persuasion, but acting and doing, shaped by organisation controls, can lead to thinking and believing. For this reason management actions and actual day to day behaviour are generally much more important than simply changing written policies and procedures for effecting lasting cultural change. For senior managers, actions speak louder than words. If senior management only changes what it says, rather than what it does, then little progress will be made.

The second strategy identified by Helmreich and Merritt is to ensure that frontline supervisors, trainers and line managers provide effective role models for staff. These people need to understand and to actively implement the safety as a first priority value in a practical way. Again, Helmreich and Merritt emphasise that the sincerity of these role models is fundamentally important.

In practice, this means that Network Operations Superintendents should not simply monitor signallers' activities in keeping trains running to timetable, but actively encourage signallers to consider the safety implications of their decisions. The Network Operations Superintendents should be correcting poor communications protocols, thereby demonstrating their commitment to safety. Similarly, rather than distributing safety information only in written form, face to face briefings should be held where operational supervisors explain safety matters to employees. Supervisors need to demonstrate by example their own commitment to safety and communicate the message that safety is a team effort where risk taking will not be tolerated. They also need to communicate the message that this is something which benefits the travelling public which will include friends and relatives of rail employees, the employees themselves and their work mates.

Whenever the occasion presents itself in the workplace, in training or briefing sessions, employees should be encouraged to be risk aware. The attitude that some accidents are inevitable should not be permitted. The individuals, as with the organisation, should be striving for no accidents and no incidents.

The third strategy that Helmreich and Merritt identify is through recruitment and the induction of new employees, or employees who have transferred to other positions. New employees, in particular, should be mentored by a senior person who demonstrates the proper commitment to safety. The mentor can explain the organisation's history, its values, why something is done in a particular way and, in doing so, introduce the new employee to the organisation's culture.

Their fourth strategy is the use of company publications and other documents to reinforce and strengthen the safety message. This does not mean that employees should be sent reams of paper containing safeworking units or other safety information, which will do little to ensure they properly focus on the risks they must confront during their normal work day. Rather, it means that all publications and documents, both those circulated to employees and those circulated to wider audiences including the general public, reinforce the safety message. This should also occur in a meaningful way that makes the

commitment to safety clear, not just by incorporating some slogan about safety at the bottom of such documents.

The fifth strategy is to make membership of the safety culture more attractive to employees. This can be achieved by offering rewards for safety performance or safety improvements. But this is not the only technique. As Helmreich and Merritt note:

> It can also be achieved with an early success or the presence of a common enemy. Everyone wants to be on a winning team; it encourages greater striving… The common enemy might be a competitor, or 'hard times' to be survived – something against which the group can strive.

Finally, the open discussion of safety incidents, and a swift remedial response by management, demonstrates a clear commitment to safety. It can also serve to build trust between employees, their immediate managers and those in the hierarchy. With such trust, employees are more likely to participate in safety improvements and provide information and report incidents, which enables poorly controlled risks to be identified and addressed. The reporting of near misses is an obvious area where trust that there will be no adverse repercussions and openness in reporting is likely to reduce the risk of an accident subsequently occurring.

There is every reason to believe that with appropriate leadership and a program of change instituted as described above those employees will appreciate that safety is as important as on time running. This will produce a public benefit both in terms of the more efficient operation of the rail network and a reduction in the number of accidents or incidents.

Another way of influencing individual behaviour in favour of a safety culture is to include references to safety responsibilities in job descriptions. There has been a tendency for some positions in the rail network to be seen as not relevant to safety and for the view to be taken that safety is a matter for frontline staff and their supervisors. This is not so. Persons responsible for preparing budgets within an organisation may have qualifications in accountancy, yet the recommendations or decisions taken by them may have significant safety implications.

Another example might relate to the planning stages of major trackside work. Engineers in a planning section may approach their task upon the basis that since work is required on only one line of a bi-directional section of track that consideration need not be given in the planning phase of the job to the way in which trains should be operating on the other track. The accident at Bell is a very good example of why people involved in planning work of this nature are also critically involved in safety. The first question they should be asking themselves is whether it is reasonably feasible for trains to be stopped entirely while the work is carried out so as to remove the risk of employees being struck by trains.

If it is not feasible to stop trains, a risk assessment should be carried out with appropriate controls put in place to control the hazard. A system of work in which the safeworking unit relied upon, as is still the case, requires the employee to look after himself and if he feels that he cannot then to ask a supervisor, endorses a system of work which is so manifestly unsafe and so likely to produce serious injury or death that it is hard to believe that it has ever been accepted by the workforce, the management or the trade unions.

Nevertheless, the accident at Bell and the accident at Sydenham about which I received some evidence demonstrated that such practices were not uncommon. They should not be permitted to continue.

When performance of employees is reviewed or when employees are considered for promotion it should be clear that the adequacy of their safety performance will be a matter which will be given considerable weight. By this means they will know in advance that they will be held accountable for their own safety behaviour and that of any persons over whom they have a supervisory role.

The final way in which it seems to me that a safety culture can be instilled in the New South Wales rail network is by the safety implications of any communication being specifically identified. If every time an employee sees or reads about any event occurring in his or her working environment, a reference to the safety implications of a particular matter then the message will be reinforced.

One way in which written communication of safety can be conveyed is through a safety policy. The safety policy should be the guiding philosophy of the organisation. In Norway, the Norwegian infrastructure owner Jernbaneverket (hereafter JBV) has adopted the policy that rail transport must not result in accidents which may entail the loss of human life or serious injury or damage to people, surrounds or rolling stock. That policy underpins the identification, planning, organisation and implementation of all JBV's activities. The approach is one of zero tolerance for accidents and adopting a zero tolerance approach provides an impetus for continuous improvement of the safety of the operations. As an illustration of the way in which the impetus operates, JBV has a policy that no change may occur on the rail network which it operates which taken by itself, or in context, would reduce the level of safety of rail operations.

An example of the type of document which the senior management of a rail organisation can use to convey the necessary safety message to employees can be found in the 1998 safety policy statement on behalf of Railtrack PLC by the chairman of that company. The statement was as follows:

> Railtrack has prime responsibility for the safety and security of the railway it controls and for the health and safety of those who may be affected by the company's activities. We seek and welcome recommendations for continuous involvement from both our staff and theirs.
>
> We view safety in the widest context – for us, it means protection from risk of death, injury and poor health arising from our activities. It also means the avoidance of damage to property and the environment from whatever cause – accident, fire, explosion or loss of security. We will adopt a robust and cost effective policy in all that we do, recognising that good safety performance is good business, for us and our customers.
>
> We accept that our responsibility extends to all who are involved in any way in our industry – our travellers, our workforce and those contracted to work for us, on our own property, the general public when on our property, and our neighbours.

> Our commitment to safe railway comprises … improving safety through the setting of goals and targets and adherence to defined standards of excellence for all those involved in the provision of rail transport.
>
> I as Chairman, and the Railtrack Board, commit ourselves to uphold these principles in the efficient and effective conduct of our business and will provide adequate resources for this purpose.
>
> Our approach to safety is dynamic and we will revise this policy to take account of any and all improvements to safety. Our policy will be revised at least annually.

The observations that have been made about safety culture are not limited to advances in safety management in the rail industry. Several industries have embraced the establishment of a safety culture as one of the core foundations for a safety management system. In the course of the overseas investigations I became aware of a report which arose out of a serious aircraft accident involving Alaska Airlines. The consultants retained were required to evaluate the existing practice of safety in Alaska Airlines and it is their safety assessment which constitutes the report published on 19 June 2000. The report contains a number of observations with which I agree:

> The safety culture of an organisation is the product of individual and group values, attitudes, competencies, and patterns of behaviour. These characteristics determine the commitment to, and the style and proficiency of, an organisation's health and its safety programs. The safety culture within any organisation is an indicator of the state of respect for safety consciousness, the willingness and determination to comply with the company's policies and procedures and with regulatory requirements, and, on an individual basis, the accountability one has to himself or herself, the accountability to the first level of supervision and finally to his or her employer.
>
> Certain attributes are critical to a strong safety culture. Understanding performance requirements, conformity to policies, procedures and regulatory requirements, quality and ease of communications throughout the organisation, respect for training, respect for peers and supervisors and professional pride are examples of positive attributes that contribute to a health culture.
>
> …Employees should feel free to discuss safety concerns with their supervisors or with other employees without fear of penalty and when concerns are raised, they should be examined and judged on their merit, with the results not only fed back to the initiator, but also shared with the greater workforce to foster safety awareness.
>
> …Encouraging open communications and ensuring that not only is one "transmitting" information in a clear and unambiguous manner, but also that one "receives" information in the sense of understanding what is being said and meant (i.e., listening with positive purpose and intent, to concerns that emanate from all levels in an organisation) are attributes that contribute to

> organisational effectiveness and safety. Valid concerns should be dealt with in a positive and proactive manner by taking appropriate action and informing the workforce of the action and the reasons for doing so. This is critical to achieving a healthy and safe culture. (Original emphasis)

The creation of an adequate safety culture will, I believe, take three to five years. The establishment of an adequate safety culture together with safety management systems within the rail organisations, with external monitoring and supervision by the Rail Safety Inspectorate is, in my opinion, the most effective way by which those organisations and the government can discharge their duties to the travelling public and to those who work on the railways. Regrettably, neither proper safety management nor an adequate safety culture was present at the time of the Glenbrook rail accident and it is to the adequacy, or more accurately the inadequacy, of the risk management procedures applicable to the circumstances of that accident that I shall now turn.

5. The Adequacy of Risk Management at Glenbrook

The second matter in the Letters Patent as varied is the adequacy of the risk management procedures applicable to the circumstances of the Glenbrook railway accident.

On 8 June 2000 I directed each of RAC, RSA and the SRA to deliver a detailed report setting out the risk management procedures in force prior to and at the time of the Glenbrook rail accident and their respective assessments of the adequacy of those risk management procedures. Those directions were made to enable the rail entities primarily responsible to examine critically the circumstances of the accident and whether the risk of one train colliding with the rear of another had been properly managed and controlled.

Although required to deal specifically with those two matters the rail entities were invited to place before me other material relevant to the third matter in the Letters Patent as varied, namely recommendations for safety improvements to rail operations.

I received from the SRA a report which comprised 1,750 pages including annexures, from RAC a report which comprised 290 pages including annexures and from RSA a report which comprised 684 pages including annexures. I also received from the RBTU a report which comprised 1764 pages including annexures as well as an 11 page submission from National Rail Corporation Limited. The RBTU annexures included a copy of a report dated March 2000 prepared by Richard Oliver International entitled *A Review of Rail Safety In New South Wales*, commissioned by the New South Wales Department of Transport and a copy of a report by Booz, Allen and Hamilton dated September 1999 to the Standing Committee on Transport entitled *Independent Review of Rail Safety Arrangements in Australia*.

Counsel Assisting took the view, with which I agreed, that as findings were required to be made about the adequacy of the risk management procedures applicable to the circumstances of the Glenbrook rail accident, the Chief Executive Officers of the government railway organisations at the time of the Glenbrook rail accident should be called to give evidence. These officers had the ultimate responsibility for the safety of the operations of the organisations which they managed and the ultimate responsibility for the reports that were delivered, following my direction, in relation to the adequacy of the risk management procedures applicable to the circumstances of the Glenbrook rail accident. Accordingly, these witnesses were the first to be called except for the former Chief Executive Officer of the SRA whose employment had been terminated shortly before the resumed hearings and who was called later in order to meet his convenience.

Following the calling of these witnesses Counsel Assisting took the view that the officers primarily responsible for safety, training, personnel and accident investigation and management should be called. I heard evidence from witnesses dealing with each of these matters in the relevant organisations.

I shall deal with the material provided by the SRA first. This material contained little about the adequacy of risk management procedures at Glenbrook but a substantial volume of material about the state of safety management at the time Mr Simon Lane became the Chief Executive Officer.

The evidence of Mr Lane about the safety system that he inherited is worth recording. Before I go into the detail it is necessary to observe that while he was Chief Executive Officer significant attempts were made to improve rail safety and he was one of the few people in senior managerial positions who actually had relevant rail safety experience. He was appointed the Chief Executive Officer of the SRA in November 1997 and took up duties on 1 December 1997. He had fifteen years prior experience in the rail industry. He had been a station master in London, a traffic manager in Ipswich and station master at Victoria station in London. He had been an area manager in Swansea and from 1991 to 1994 was the operations manager for ScotRail in the United Kingdom. As such he was responsible for the safety of all train movements that were taking place in the ScotRail area.

He then moved to Australia and was appointed to the position of Area Manager of Met Trains in Melbourne in May 1994 and occupied that position until he was appointed as the Chief Executive Officer of the SRA. He had experienced the changes in safety management in the United Kingdom.

When he took up his position there was very little safety management expertise within the SRA. It was dominated, he said, by the safeworking groups and there was an easy acceptance of past standards and methods. He stated that a lot of people in the railway had a great deal of knowledge and experience and it was thought this was enough to manage such complex activities. He gave three examples of the effect of this. The first was that he was aware of the risks to passengers of fires in underground stations as a result of the 1987 fire in Kings Cross station in London where 30 people died and he sought to ascertain the level of training in fire management and evacuation procedures for staff employed on the CityRail underground stations. He was given verbal assurances that the arrangements were satisfactory but when he conducted an audit of the training of the staff he found out that only 35 per cent of the staff that were working there had been trained properly in fire management and evacuation procedures.

The second example that he gave related to the upgrading of fire systems and associated warning systems. He was aware that Wynyard and Town Hall railway stations should have been treated with the highest priority because the potential risk to the public was much more significant at those stations by reason of the number of people using them and the layout of the stations. He found out, however, that Museum and St James railway stations were completed first and the reason for this was that they were the easiest ones to do. He thought that was a very strange way in which to prioritise the use of capital funds for safety improvements. A third example that he gave was that he personally attended to observe crowd management at Circular Quay railway station on New Year's Eve 1997 and subsequently attended a debriefing by the line managers responsible who informed him that it had gone much better than the previous year. Yet he had personally witnessed a number of occasions during the evening when platforms and concourse areas had become very dangerously overcrowded and there was a very high likelihood of injury to the passengers as a result.

He then looked at what happened when an incident or accident occurred and an investigation was conducted. His view was that most inquiries were concerned with finding somebody who had done something wrong and were regarded as a disciplinary matter rather than a retraining matter or a matter where engineering design issues needed to be considered. His expectation when he became the Chief Executive Officer of the

SRA was that all his senior managers would have had a program of meetings reviewing all of the safety critical indicators so that they were not just reacting to incidents but were looking for trends that were developing. He found there was no system in place to identify trends and he instituted a system of monitoring. His observation was that managers thought that safety was a matter to be dealt with by people who had safety in their job title rather than something for which every person, including supervisors and line managers, was responsible. He stated that a lot of the line managers did not think that safety was important. Many of them did not know what the safety policy was when a member of the staff had been injured. Investigation of accidents was seen as an administrative process rather than one of searching to identify weaknesses and prevent recurrences. The activities of line managers were driven by performance related issues such as on time running.

Mr Lane did not only rely on his own observations but sought to use some statistical means for determining the overall safety performance of the SRA. One statistical measure he used was LTIFR which is an acronym for lost time injury frequency rate. He thought that was an excellent barometer by which to measure the safety of an organisation. By the reforms that he put in place he succeeded in reducing the amount of time lost as a result of injury. Dr Leivesley expressed the view that, as with other statistics, LTIFR was not an indication of whether an organisation had a sound risk management system. Although it may not provide much information about the system of safety management, an improvement in LTIFR is an indication that the steps that have been taken have produced safety benefits. This would seem to be axiomatic in relation to the measures undertaken by Mr Lane prior to the termination of his employment.

Mr Lane's observations were entirely consistent with the view that I formed that the inquiries concentrated on which safeworking units applied in the circumstances and whether the employees had been neglectful in choosing the correct one and properly applying it.

Since Mr Lane had not been associated in any way with the SRA prior to his appointment, it was necessary for me to examine the evidence about the way in which safety was managed during the years prior to his appointment, including during the period immediately after the disaggregation that occurred in 1996.

During that time the Manager, Safeworking of the SRA was Mr Barry Camage. He gave evidence about his background prior to his appointment to the position of Manager, Safeworking and some general observations about what happened to the management of safety after the disaggregation in 1996. Mr Camage had joined the New South Wales railways in 1958 as a station assistant, then became a station master, then acting inspector, then deputy operations superintendent, then superintendent of train control in Sydney. From that position he was promoted in 1990 to Manager, Operations Safety and Audit, when that position was first created. His duties required him to audit signal boxes and train crewing centres to ascertain compliance with various procedures and safety requirements. From 1991 to 1994 he was the General Manager, Safeworking of the SRA and then from 1994 to 1996 the General Manager for Metropolitan Freight and then he was appointed to the position of Manager, Safeworking. He held that position until 1997 when he was appointed to the position of Train Operations Manager of the SRA.

He was asked to indicate in general terms how safety was managed when the SRA was one large organisation before it was broken up in 1996. He answered:

> Prior to 1996 I would say there was more discipline in safeworking at that particular time. The General Manager, Safeworking, was a new position created because of concerns about safety and Tony Boland, whom I reported to at that particular time, used to hold an Executive Safety Development Committee meeting, and that was held once monthly. All major incidents were tabled at that meeting and all general managers attended the meeting and the CEO at that particular time also attended the meeting. So there was very strict compliance to safety.

He was asked what was done in relation to major incidents and he said that there were inquiries or joint inquiries and he used to personally liaise with the Department of Transport in arranging the terms of reference and what was to happen in relation to conducting joint inquiries. He said that he set the terms of reference of investigations and then later the Department of Transport took over that particular role but he had very close liaison, on a daily basis, with Bill Casley who was the Executive Director of the Transport Safety Bureau at the time.

He stated that recommendations were made as a result of the investigations and that their respective general managers had an obligation to implement the recommendations. The recommendations were also tabled at the Executive Safety and Development Committee meeting and remained on the agenda until they were dealt with. The questioning then continued:

> You mentioned a few moments ago in general terms your observations about the way in which safety was managed. It was a disciplined system of management?
>
> That's correct.
>
> You mean by that there were safety rules, namely, the safeworking units, and that if an incident occurred then the investigation would focus on whether or not people had been complying as they should have been complying with the safeworking units?
>
> That's correct.
>
> From your knowledge of the rail industry, had that always been the way in which these matters were approached?
>
> Yes.
>
> That was an historical way of dealing with them?
>
> Yes, correct.

He agreed with the proposition that the system for managing safety was a disciplined system built around the safeworking units. Mr Camage thought that the safeworking

units were the best way to manage safety. Mr Camage was of the view that that system for managing safety worked reasonably well up until the time of disaggregation but that the level of safety appeared to have deteriorated in the rail industry after the disaggregation in 1996. He was asked the reasons why he thought that occurred and he said:

> There were problems in various organisations wanting to do their own thing, so to speak. Their perception was that they were answerable to themselves and it was also the responsibility, during that time, where there was a need for more influence by the Department of Transport to ensure the accreditation of that particular organisation complied with the safety requirements, and they were told that if they did not comply with these, that they would not be able to operate. So, it was a case of having to insist that organisations comply with the regulations.

He said of the new organisations created following disaggregation that "they were answerable basically to themselves."

Prior to 1996 when there was one large government owned and integrated railway. He said that promotion depended on people having to "better themselves, and had to study and pass the examinations". He stated that there was a greater appreciation of the need for people to be conscious of safety matters. He gave the example of his own father who he said was 26 years of age before he got a signaller's job. He said that these days advertisements are placed outside the organisation for recruits for signal positions and that the experience "isn't there like in the old days".

It is clear from the evidence of Mr Camage that the management of safety within the New South Wales railway industry prior to 1996 depended upon the acquisition of knowledge of safeworking principles over a long period of time, a training in the safeworking rules tested by examination and reinforced by a system of discipline used against employees who were found to have been involved in an incident or an accident which occurred because of a failure to comply with an applicable safeworking rule. If the safeworking rule did not properly deal with the situation then the practice was to amend it.

With the reduction in the number of employees and the breakdown of that discipline which accompanied the disaggregation in 1996, the discipline which had formed the cornerstone of the safety system was substantially weakened and the expertise that existed within the one large government owned and integrated railway was fragmented into four.

The safety implications of disaggregation in 1996 do not appear to have been given any proper consideration and it appears that it was assumed that nothing in particular needed to be done. I have previously dealt with the role played after 1993 by the Department of Transport in the process of accreditation. In some respects this did more harm than good because it led to the attitude identified by Mr Camage, namely that each organisation would "do their own thing".

When comparison is made between developments in safety management which were occurring overseas and the system of safety management described by Mr Camage, it is not surprising that Mr Lane regarded it as being necessary to establish a corporate plan.

One of the reasons he established a corporate plan was because he perceived there to be a lack of an adequate safety culture. He stated:

> I think there was a view that safety really was something that was the responsibility of people who had safety in their job title, rather than embracing acceptance that every person in an operational grade, every supervisor, every line manager responsible for those areas actually had a responsibility and that the safety people were there in a sense to assist line managers in being effective.
>
> It wasn't a question if you had [the word] safety [in the title of your job], then you were the only people who had to deal with safety, and in visits to a number of work sites, particularly in that first four, five months I saw a lot of evidence that line managers did not consider safety, occupational health and safety particularly as something that was important, and I assessed that by their lack of knowing where the safety policy was, what it said, when their staff had been injured, what the results of investigations were, things which I would expect to find with a progressive, preventative management.

Mr Lane said that he reorganised the structure of the SRA by establishing divisions that had separate emphases, namely an operations division, a passenger fleet maintenance division, a CountryLink division, and a CityRail stations division. He also established the position of General Manager, Organisational Development, which was the position where senior safety expertise in the organisation would reside. The function of that role was the development of initiatives and systems that were in line with modern safety management thinking. This was to be an area where the expertise in safety management would be developed. It was an area where initiatives would be developed and implemented and assistance would be provided to line managers in the discharge of their responsibilities. It was also intended to be the single point of contact for safety management arrangements with other agencies such as RAC, the Department of Transport, RSA, National Rail Corporation and FreightCorp.

Mr Klaus Clemens was appointed to that position in 1998. He found to his disquiet that there were no safety professionals in the SRA. He determined that it was necessary to recruit and train the right personnel in safety and, in doing so, wanted to develop a proactive safety organisation which would define authorities and responsibilities, identify and manage risks, ensure customer and employee safety and collect data through audits and interviews.

In December 1998 Mr Clemens formed a Safety Task Force consisting of representatives of the managers of each business group to review safety management. There is no evidence to suggest that the persons seconded to the task force were safety oriented or understood safety management. They were there to address interface problems and assign tasks to various individuals. In December 1998 the task force issued its first report and in March 1999 it issued its final report which comprised two volumes. Extensive recommendations were made relating to a new comprehensive safety management system for the SRA and for the development of a framework representing alleged "best practice" in Australia and overseas. The approach was to have an active system for identifying hazards and a system for management of the risks that were identified.

That report was endorsed by the Chief Executive Officer, Mr Lane, and the Board of the SRA and Mr Clemens was directed to commence its implementation. A more detailed plan was prepared by reference to Australian standards 4292 (Rail Safety) and 4360 (Risk Management) and the Rail Safety Act. This was endorsed by general managers of business groups in the SRA.

Thereafter the Safety Task Force worked with the general managers to develop a special safety plan for each business unit to comply with Australian safety standard 4292. In May 1999 the Safety Management Group was created from the task force members, with the addition of safety professionals to lead the program.

By December 1999, Mr Clemens had finalised the risk management plan which had been endorsed by the Chief Executive Officer and the Board and a safety management plan for each business unit was drawn up at about that time in final draft form.

The Department of Transport carried out a safety audit in October 1999 and concluded that there was an effective system in place within the SRA for managing rail safety at all levels, including allocation of safety responsibilities and accountabilities.

In November 1999 briefings of managers and supervisors commenced so as to bring about awareness of safety issues and these were conducted by an international organisation, Richard Oliver International. The material included a rail safety vision statement. This was designed to assist managers and supervisors to build a superior safety culture in the SRA, by indicating how that could be done, particularly by managers in safety inspections. One hundred managers and supervisors went through this course.

While RAC had assumed responsibility for the safeworking units from the time of disaggregation in 1996, the safeworking section which comprised the employees responsible for managing the safeworking units, including amending them and giving interpretations of their meaning, had remained with the SRA. It was not until 7 December 1999, five days after the Glenbrook rail accident, that the safeworking section of SRA was transferred to RAC. At the time of this transfer of the safeworking section of the SRA, the Safety Management Group of the SRA was divided into the Safety Improvement Group and the Safety Process Group.

The next development was the appointment of Manager, Corporate Safety of the SRA to manage the safety groups within the SRA and the safety management processes. That position was filled by Mr Warren Jolly on 14 February 2000. Mr Jolly stated that when he took up his position the matters that he found that required the most attention were communication to management of precisely what their responsibilities were in regards to safety and the establishment of a lot of the policies and standards and processes that form the basis of a safety management system. He stated that he needed to promulgate throughout the organisation what the elements of a safety management system were and to get people to understand how they participate in it.

He stated that he submitted to the Executive Safety Committee a proposal to restructure his organisation in May 2000 and since that was approved he has been building the organisation and staffing it. He also stated that his role was a high level co-ordination and planning role and that the group for which he is responsible provides specialist

advice in health and safety across the organisation and provides specific safety improvement projects which are then monitored.

His group has also developed a seven step guide to risk assessment in the work place in which employees are being trained, and at the time he gave evidence on 27 November 2000 he was intending to publish in pocket book size a guide which examined the risks within the work place and how they should be managed.

He stated that his duties also required him to look at the incidents that occur and incorporate the results of those incidents into the training which is now conducted on a 16 week rotation basis for SRA employees by Australian Rail Training.

There is evidence of a large number of other safety initiatives that were being developed by the SRA. The impression that I have been left with is that the approach by that organisation to improving safety has largely been bureaucratic in nature. It has involved the appointment of a large number of people with titles relating to safety in various areas and the creation of several committees to deal with the matter. This is a far cry from the pre-1996 system that was described by Mr Camage, which consisted of one committee which met regularly and whose function it was to review incidents, order investigations, then either discipline employees found to have been working otherwise than in accordance with the relevant safeworking rules or amend the safeworking rules if they did not adequately deal with the incident, thereby producing the proliferation of safeworking rules that now exists.

I am not convinced that the bureaucratic approach to the management of rail safety has any more to commend it than the disciplinary approach which it appears to have replaced. The safety management system that has been put in place by the SRA is still evolving and I have few means available to determine whether it has produced any increase in the level of safety. The evidence from experienced drivers was that whatever the safety management committees have been doing, the information has not filtered down to the operational staff. Evidence of trains being sent out to operate without a working train radio or effective brakes, and the circumstances of the more recent of the eight other accidents leave me with no confidence that the safety management system that is being put in place by the SRA is achieving or will achieve its objective. The only way that this can be determined and that steps can be taken to ensure that it is effective is by the ongoing monitoring of the safety arrangements by an independent Rail Safety Inspectorate.

RSA had approached safety management entirely differently from SRA. The evidence about safety management procedures and changes to them since 1996 was contained in the risk management report submitted by RSA and explained by Mr Terrence Ogg, the then Chief Executive Officer of that state owned corporation. RSA received the impetus to improve its safety management as a result of a number of tragic accidents in 1998 including those at Bell and Kerrabee.

Mr Ogg, who was appointed in 1996, had no rail background. He held the degree of Bachelor of Commerce and was a fellow of the Australian Institute of Company Directors. He started his working career as a journalist and worked in that occupation from 1972 until 1980. He then worked for Morgan Grenfell Limited in their funds management division analysing equities in Canada, Australia and South Africa. He

became an associate director in the Corporate Finance Group and then executive director in the Corporate Finance Group. From 1988 to 1990 he was a director and head of research for First State Securities Limited as he described it "sourcing and delivering corporate finance transactions but also researching and building a research team of people analysing companies listed on the Australian Stock Exchange". From 1990 to 1993 he was the director for client services for Cigna International Investment Advisers Australia Limited managing the funds of Cigna Corporation which was a major international life and general insurer. From 1993 to 1996 he was the director of KPMG Corporate Finance Pty Limited and described his activities as "a raft of corporate assignments of a consulting nature and the corporate finance nature, and also work with the partners internally, seeking to develop the synergies from three parts of their practice, the old liquidations practice, now corporate recovery, the consulting practice and the corporate advisory practice".

From that position he was asked, while a director of KPMG Corporate Finance, as a consulting assignment, to establish the business that was to become RAC and then asked to extend his assignment to set up RSA which was then the Railway Services Authority. Later in 1996 he was asked if he would accept the position of full time Chief Executive Officer and he did so. He remained in that position at the time he gave evidence.

Mr Ogg had not undertaken any course of study to obtain knowledge in relation to the operation of railways and railway systems, although he stated that he had read reasonably extensively in connection with risk management and had done some reading in connection with safety management because "risk is part and parcel of the financial services sector and safety is a feature of risk management and a number of my clients had safety management parts to their activities".

RAC was set up as a commercial enterprise to sell access to the track and RSA was established as a separate corporation to provide services to RAC and to engage in contractual work for other rail operators in Australia and overseas. Mr Ogg stated that "to be a profitable business was certainly a goal requested of us by Government". The company had not done work in Tasmania or the Northern Territory. It had a joint venture with Thiess Contractors Pty Limited to maintain half the metropolitan network in Victoria for Bayside Trains, it was contracted by National Express Group to supply infrastructure works and services to Swanson Trams, which operates half the tram network in Melbourne. In South Australia it was contracted to Australian Rail Track Corporation to maintain the signalling across the standard gauge track from Melbourne through to Perth up to Tarcoola on the South Australian border. In Western Australia it had a joint venture with John Holland to re-sleeper and re-rail a section of the standard gauge track from Kalgoorlie to Koolyanabing.

He stated that outside Australia, RSA had a joint venture in Hong Kong with Leighton Asia and had a substantial rail fit out contract for the Kowloon Canton Railway, one of the two railway companies in Hong Kong.

Although the RSA risk management report stated that RSA had a risk management safety system since its inception in 1996, I do not accept that there was a proper or adequate system in place then. The material relating to the system that was supposed to be in place reads as an excessively complicated system described with the use of considerable jargon. On the evidence that I heard the reality was that there was no adequate safety

management system in place and it was for this reason that RSA engaged the Du Pont organisation to advise it on what was necessary to be done to properly manage safety within the organisation.

In March 1999 Du Pont started the evaluation by examining the capabilities of the safety management personnel within RSA, by analysing safety incidents. It developed a set of recommendations with priorities to strengthen the safeworking behaviour of employees and provided a step by step plan to guide managers in the implementation of those safety strategies. The Du Pont report was submitted to the Board of RSA and management was instructed to implement the recommendations and to obtain from Du Pont further assistance in carrying out these objectives.

The first step in this process was the training of senior managers. This commenced in May 1999 and continued to September 1999 by which time some 365 managers had been trained in safety behaviour and observation. The next step was training supervisors in safety management systems and that commenced in September 1999 and continued to November 1999. During that period 374 supervisors were trained. Those two steps were intended to set the ground work for a cultural change in relation to the safety of operations. In October 1999 the Du Pont representative reviewed the progress of the recommendations. There has been no independent review of the effectiveness of this training process. Assessing the effectiveness of such programs should be a function of the Rail Safety Inspectorate.

The Du Pont process by which safety is improved involved a change in the emphasis that previously existed within RSA which involved an emphasis upon orders being complied with to an emphasis upon ownership and responsibility for the system of work by the employees engaged in it. The Du Pont system of safety management emphasises managers and supervisors praising good work and encouraging personnel to come forward with any safety improvements. Supervisors are required to be open with employees, and rather than ordering them, to explain what is required so that the employees understand their roles.

The Du Pont system also involves observation of the activities being carried out and stipulates that supervisors must perform at least two safety observations per month and report the results of those observations to the resources centre officer. The object of the observations is to see whether there are any unsafe practices and then ensure that steps are taken to eliminate the risk and to follow up to ensure that the steps have been followed. The supervisors conducting the observations are required to fill in a safety observation form and report. Data from such observations is analysed by a safety management committee.

Part of the process that was undertaken by RSA included a safety day conducted in May 1999 for all personnel and as a result of that four issues were identified. These were the management of contractors, communication, work site protection, staff skills and availability of sufficient numbers of qualified staff. Working groups including a senior manager were then set up to assess each of these areas. At the time of the hearing the process of assessment was ongoing, at least in relation to some of these areas.

On 1 June 1999 a zero injuries and zero incidents policy was introduced. Employees were provided with information through the internal magazine sent on a monthly basis to

the home address of each employee. In addition slogans were placed on work sites, laminated copies were distributed to all offices supported by posters with excerpts from the policy to enable staff to familiarise themselves with the policy concepts. Internal audits were introduced with the role of examining and evaluating whether the organisational structure, programs, functions and internal control systems were appropriate and operating effectively. Eight personnel, headed by an internal audit manager engaged in this work reported to the board and the chief executive officer.

RSA established a safety unit which conducted audits of work site protection processes including protection plans and briefings. When the results were unacceptable the relevant personnel were retrained and a follow up audit was then conducted.

In addition a data base was set up to compile and implement any recommendations from past reports, accidents or inquiries. This in turn was reviewed in 1999 and problems were identified in relation to the implementation of the recommendations in the field and additional training was carried out and a second review found that that training had overcome the defects.

Safety management committees are a key component of the RSA safety improvement program. It is said these committees provide a visible demonstration of management's commitment to continuous improvement of safety procedures and behaviour in RSA. There are six such committees and I have the same reservations as to their effectiveness as I have about the committees established by the SRA. Mr Edward Oliver, an expert retained by the Department of Transport, expressed the view that committees are often a substitute for action, not a means for action. However, if the focus of the committees is to identify and communicate ways of achieving the safety policies then they may have an effective role to play. RSA has also introduced monthly meetings for supervisors and pre-work briefings prior to the commencement of work every day with discussion of the work management plan and the work site protection plan. Records are kept of those briefing sessions.

The organisation also has an incident investigation unit which works closely with the safety unit to investigate major accidents and recommend changes if necessary.

A safety manual that is currently in use was introduced in 1999 when employees were trained in the way in which it should be used. The training sessions were designed to ensure that the procedures in the manual were easily understood and to demonstrate to the personnel where they fit into the risk management system and how safety cascades down to them. Safety videos are produced and they are used at the beginning of all safety sessions. Communication of safety messages is considered important and a number of means is used to communicate those systems to the workforce. Initially, deficiencies were found because it could not be guaranteed that all personnel were receiving the messages and steps have been taken to overcome those deficiencies. The Rail Services Australia report stated that the company was still looking at ways to improve communication of safety messages to its personnel and has designed a briefing tree which is the process of distribution of information. It is claimed by RSA that as a result of these developments which I have briefly summarised the safety of the activities that it conducts has been improved since 1998 and the improvement is demonstrated by a reduction in the number of safety incidents that have occurred.

This summary of the evidence of the attempts to improve the management of safety within RSA indicates they are more likely to produce improvement than the largely bureaucratic approach that has been undertaken by the SRA. I appreciate that the nature of the safety issues that RSA deal with largely involve track side workers and that there are differences, but the organisation appears to have made efforts to ensure that the provision of safety information and the implementation of safe practices emanates from the top of the organisation, goes down through the various layers and is reinforced to people in the operational areas by such exercises as the pre-work briefings. Whether these processes have been effective is a matter which the Rail Safety Inspectorate can determine.

This summary of the safety management systems that RSA has been attempting to establish confirms, as previously observed, that RSA is two years ahead of the SRA in beginning to establish an adequate system of safety management and an adequate safety culture. However weaknesses remain. The most obvious of these is that although they have made genuine attempts to improve workplace safety, there is no evidence that the same degree of attention has been given to those aspects of their activities which affect public safety or the safety of other rail organisations and their employees. One of the functions of the Rail Safety Inspectorate will be to require the new body RIC to continue the work previously undertaken by RSA in relation to workplace safety and to establish an adequate system of safety management by RIC for its employees, the employees of other rail organisations and the travelling public.

The third organisation whose safety management systems, during the period after disaggregation in 1996, that I need to consider is RAC. The evidence in this regard was given by Mr John Cowling, its Chief Executive Officer. Mr Cowling's background for the thirty years prior to his appointment was that between 1969 and 1979 he had worked as a chartered accountant with Coopers & Lybrand. Thereafter he was an executive director of Burns Philip from 1979 until 1997. He joined the board of RAC in 1996 and became acting Chief Executive Officer in July 1999 and Chief Executive Officer in October 1999. Prior to his appointment to the Board he had no previous experience in rail operations. He stated that "in the middle of part of 1999 there seemed to be a number of accidents and criticisms of safety, and the company changed its structure on 1 July 1999 to set up a special safety division to specifically focus on safety and safety projects."

At the time of the disaggregation of the rail industry in 1996, "there was no mention of safety" and Mr Cowling's observations when he became Chief Executive Officer were that:

> There was insufficient clarity if we were responsible for risk coming onto the network by an operator, we ought to have the ability to check whether the operator was operating in accordance with the standards, but there was no way in the legislation we could do that, and when we approached operators and said to operators, 'Can we please audit your trains to make sure the wheels and brakes are OK?', they said, 'No, that's not your job. Your job is to provide access. DOT has to give us accreditation and if we have accreditation we can come onto the system.' And yet I felt we had a responsibility if it was our system.

Mr Cowling also had concerns about trackside workers. He said, "One of the issues that I found very early on in my job was that there were a number of trackside workers' injuries and fatalities, and that the safeworking rules were insufficient to protect them."

He was asked to describe what was done to address the deficiencies that he perceived and he said:

> The restructure as I recall took place from 1 July 1999, and with the establishment of a specialised safety division the safety division was charged with the auditing of complaints across the network with standards and looking to see whether safety standards are being correctly controlled. He was charged with looking at incidents and keeping a database of incidents to see if he could identify what types of incidents were on the rise and what we needed to do to eliminate those incidents. We also kept a record of the most hazardous types of situations, for example, passing a signal at red, and we kept a permanent record each month of the number of incidents so that we could see what sort of programs we needed to put in place to minimise those particular risks and then to develop, with the asset managers, programs to actually fix the problem.

The person that Mr Cowling referred to is Mr Owen Henry, General Manager, Safety of RAC. He was appointed to that position in July 1999. Prior to that he was General Manager, Operations. His background was that of a civil engineer.

The safety management system that RAC had in place was reviewed by an international consultant in safety, Det Norske Veritas in January 1999. The report of that review was in evidence. It commenced by comparing the safety performance of RAC with railways elsewhere in the world. The consultants expressed the view that "RAC scored well below average in the majority of the elements." Mr Henry stated that part of the reason that RAC scored so badly on a number of the tests was not that its safety management systems were as deficient as the scores would suggest, but that they had inadequate documentation for the safety systems in place.

The outcome of the report was the establishment of three separate safety groups. There was a group concerned with accreditation of the safety plans, safety data and statistics, a group concerned with auditing and investigating of safety related matters, and a group concerned with particular projects.

The particular projects that RAC was directing its attention to were those to do with SPADs, worksite protection, and level crossings. Mr Henry said that the projects were identified on the basis of the top ten hazards. In the projects area there were four employees, the accreditation group was a team of three and the audit investigation group was a team of twelve persons. He later described the way in which the projects area operated. He gave the example of the SPAD group identifying from the data available the signals which had been passed at danger on more than four occasions. He said these were called multi-SPAD signals and that there were twelve such signals on the rail network and that an analysis was conducted of each of those twelve signals to determine how to reduce the incidence of them being passed at danger or stop. He said that the mechanisms that were available were to move the signal, put an extra signal in or change the sighting of it. This was done in conjunction with drivers from the SRA.

The second approach was to identify with the assistance of the drivers the areas on the rail network where there was a potential for ambiguity in the signals, particularly in locations where turnouts were involved. Those signals were identified and rated in priority and work was progressing in relation either to moving the signal or putting a turnout indicator in, or putting in an extra train stop to deal with that problem.

Another project in which RAC became involved related to the protection of track side workers. The reports relating to the deaths of track side workers at Kerrabee and Bell were referred to me. In addition Mr Henry gave evidence about the death of a track side worker named Wayne Hook at Sydenham in August 1999.

> Wayne was working for a group which was going to do a major track recanting on the weekend and as part of their preparation for that work they were required to erect, ironically, some safety fences in the area, to give them the separation between tracks to help them manage on the weekend to have a safe place.
>
> Sydenham area where they were working was four tracks. They chose to go down to that area and erect or start to prepare for the erection of that fence. I think they were there in the morning between 10 am and 11 am, and for some reason, although they were working in pairs, Wayne became separated from his partner, who was looking out for him and became disorientated and stepped into the path of a train and was killed.

It transpired that the safety system in place was described as "look out only protection" which meant that "they were working in pairs and looked out for each other". The response to this and other deaths of track side workers was the issuing by RAC of safeworking circular 470. This circular identified three principles which were ultimately incorporated into the safeworking unit 910. They were that there should always be a safe place for a worker to go, that there was a principle which Mr Henry called "one track separation" which meant that "the track immediately adjacent to the worker should not allowed to run trains at normal speed" and the third was that in multiple track areas be steps should be taken to limit the activities that workers can carry out in those areas while trains are running.

Mr Henry stated that the safeworking rules will be further modified under the safeworking rules review project to provide for the workers a safer environment by giving them the chance to do their work in a safe area. Mr Henry also referred to a concept of "white periods of time" which he said meant that the timetable which is normally set for trains should be written to also provide for the workers on a regular basis to do track work when trains would not be running. The redrafted safeworking rules designed to deal with circumstances which caused the deaths to which I have referred had not been prepared when Mr Henry gave evidence on 23 November 2000. I cannot understand why it would take over two years after the Kerrabee and Bell accidents and a year after the death of Mr Hook for the drafting process for the new rules to be finalised. The principles contained in circular 470 amount to little more than common sense. It should have been possible to introduce immediately such a straightforward amendment to the rules following the Kerrabee and Bell accidents. This may have avoided the death of Mr Hook and others. One can only wonder why it would take the deaths of several track side workers to produce that response. I would envisage that the Rail Safety Inspectorate

would not tolerate procrastination if a serious safety risk to the lives of employees existed.

The accident in which Mr Hook died occurred after RSA had introduced the comprehensive review of its safety management systems, to which I have already referred, which was supposed to have the effect of preventing accidents such as this. I should also add in relation to the Bell accident in 1998, that its features and those of the accident in which Mr Hook was killed are similar. Mr Hook was supposed to be protected from being struck by a train by his co-worker keeping a look out for him while the co-worker was engaged in other responsibilities. In the Bell accident the worker that was killed was working with a system of work site protection in which he was supposed to be keeping a look out for himself.

In the course of his evidence Mr Henry was taken through the assessment that had been done by Det Norske Veritas assessment of each of the elements of RAC's safety management system. In the area of leadership and administration RAC scored 25.5 per cent. It would have obtained 35.2 per cent if the documentation in relation to its leadership and administration had been in order. In the area of planned inspection and maintenance, which was one of the key functions of RAC as infrastructure owner, it scored 9.9 per cent and in the area of risk assessment it scored 12.1 per cent. These scores rated against the performance of other railway organisations do not demonstrate an adequate system of rail safety management.

One of the functions of the Rail Safety Inspectorate should be to examine the safety management systems of the new RIC to ensure that the review of safeworking units is being expeditiously and competently performed and that the merger of RSA and RAC has or will result in the best elements of the respective safety management systems of the two organisations prior to their merger being used in the new safety management system of RIC.

Lest it be thought that I have overlooked the hazard list prepared in 1989 by the SRA and subsequently adopted by the other rail organisations, it is necessary to observe that this approach typifies the criticism that I had earlier made that the reliance upon hazard lists with associated controls can be as inadequate a method of properly managing rail safety as the safeworking units have become.

The hazard list sought to analyse and list hazards into three distinct categories being mode, cause and reason. The mode describes the outcome which would actually occur or may occur as a result of the hazard. While there are ten different modes listed, there are in fact only five different outcomes, namely, collision, derailment, fall, strike and fire/explosion. The ten modes consist of each of these categories listed as actual then potential events.

The cause category provides a broad based category of the type of causal factor involved in the incident. Examples of cause categories are rolling stock irregularity, track obstruction and safeworking irregularity. There are 33 cause categories in the hazard list.

The reason category qualifies the broad base cause by focussing on the nature of the causal factor for the incident. For example, a collision caused by a rolling stock

irregularity might have as its reason faulty brakes, while a derailment caused by a track irregularity might have as its reason a broken rail. There are 141 discrete reason codes.

When the hazard list is closely examined, there are 486 identified hazards listed. Of these 333 have technical reasons and 153 have human reasons. In other words, 68.5 per cent of the hazards which have been identified have technical causes, while 31.5 per cent have human causes. Additionally, of the human reason codes which are identified, 15 relate to persons not involved in rail operations, such as vandalism and trespassing, while nine relate to rail employees. The hazard list repeats cause and reason codes in different modes. When one examines the discrete reason codes only, this reveals that there are 117 technical reasons and 24 human reasons, that is 83 per cent being technical reasons and 17 per cent being human reasons.

When the reasons relating to human activity are further examined, nine relate to railway employees and 15 relate to non-railway employees, the latter being members of the public. Consequently only 6.4 per cent of the reasons relate to failures by railway personnel.

Both common sense and an examination of the circumstances of the Glenbrook rail accident and the other eight accidents the reports of which I am required to consider, demonstrate that the hazard list has little relationship to what occurs in practice when incidents or accidents occur. Most incidents or accidents occur because of mistakes made by employees which in turn have their explanations in a variety of reasons including training, supervision, misunderstanding of operational rules, failure to keep a proper lookout, lack of concentration and the myriad of other frailties which human beings exhibit.

Indeed, RAC's risk management report stated:

> The majority of safety incidents on the network involve human error. Wherever possible systems and equipment that are automated, highly reliable and/or provide a barrier or second chance for recovery from operator mistake should be used. Ongoing safety and reliability considerations will be paramount in selection of new equipment, design, standards and systems.

This statement makes it clear that the model adopted by RAC is an engineering model. It is an attempt to engineer human frailties out of the operation of the system. Such an approach to risk management can never be successful when train movements are being carried out by drivers, guards, signallers, controllers and other operational staff. The lack of appreciation of the way in which human factors contribute to accidents is the first and perhaps most obvious criticism of the risk management approach based upon this hazard list. In *Red for Danger* by L.T.C. Rolt, the author makes the following observation, with which I agree:

> No matter how many ingenious safety devices are introduced in the last analysis, our safety on the rail depends largely, as it has always done, upon the skill and vigilance of the railwayman.

Mr Cowling's attention was specifically drawn by Counsel Assisting to the lack of appreciation of the way in which human factors contribute to accidents by:

> Do you have a person within the organisation who is a specialist in analysis of human factors when accidents occur, to try and identify what underlying causes there might have been including, for example, things such as training, supervision, instruction of those sorts of matters?
>
> No we don't.
>
> Why not?
>
> That is a good point. I agree we should.

The second deficiency in the hazard list being used as a risk management procedure is that each hazard was to have a particular control. As Mr Cowling put it:

> Each of those contributing factors needs to have a control in place and if there is a control over each contributing factor and that control is operating, then the hazard will not occur. It is when you get four or five contributing factors without a control being on, that you get an accident occurring.

Mr Cowling then expressed the wish that the railways proceed in a very methodical way to look at all the hazards and all the contributing factors and prescribe responsibility for the controls over the contributing factors to relevant rail entities and for those entities to ensure that they have in place a system so that they may satisfy themselves that that control is in fact operating. According to Mr Cowling that was what was needed to be built into the risk management system.

The deficiency in this approach is that it is the combination of causes and contributing factors that gives rise to accidents, not the existence of several independent circumstances. The approach of first identifying a hazard then putting in place a control or controls does not address the dynamic way in which events unfold so as to cause an accident. The first interim report demonstrated the way in which events unfolded following the hazard created by the failure of an automatic signal.

A joint submission by the Chief Executives of the SRA, RAC and RSA attached a risk framework methodology. This incorporated not only the active hazard list but a list of 419 contributing factors to incidents. Of them, 49 relate to rail employees. However, the history of accidents in hazardous industries demonstrates that the proportions where some element of human error is involved are not in the order of 10 per cent but closer to 80 per cent.

The contributing factors list also provided a sample of a hazard which in turn identified various factors which could contribute to this hazard and the control mechanisms which were designed to mitigate the hazard. A hazard such as the collision of two trains at Glenbrook was regarded as a collision, safeworking irregularity and violate block.

The factors which are identified by the contributing factors list as contributors to the hazard of a collision which falls into the classification safeworking irregularity, violate block are safeworking officer performance, train crew performance, signal worker performance and equipment fault. A number of controls for these factors is listed. Apart from the technical ones which relate to equipment faults the controls for safeworking

officer performance, train crew performance and signal worker performance are identical and they are training, staff supervision and the safeworking procedures. For each of these main controls, a further series of sub-controls has been identified as necessary. In the case of the safeworking officer performance, train crew performance and signal worker performance, the sub-controls are also identical. Rather than examine each of these sub-controls in turn, I intend to examine whether all readily identifiable risks have been listed and addressed for this hazard.

Examining the issue of performance of operational employees in relation to this hazard, a number of risks are readily identifiable over and above the three factors outlined. These relate to communications, fatigue, error and motivating imperatives such as on time running. None of these has been identified as a matter requiring attention and there are no controls to manage them.

Even if the identified controls are examined, whether they work or not is dependent upon other factors. Take the area of training. Whether there were sufficient resources made available to properly train the staff is a matter which will determine the effectiveness of that control. If resources are too limited then class sizes may be so large as not to be manageable. Alternatively, the quality of materials or teaching aids, such as simulators, may be inadequate to impart the necessary knowledge. Similarly, the duration of the courses may be too short for all of the students to gain sufficient knowledge of what is required in particular circumstances.

The most glaring omission from the controls is failure to recognise that individual operators do make mistakes. Mr Mulholland was clearly of the belief that the Indian Pacific was well clear when he implicitly communicated that belief by the authorisation that he gave to Mr Sinnett to proceed into the section of track which was in fact occupied by the Indian Pacific.

The third deficiency in the hazard list approach is that for each identified control it is not difficult to identify the type of weakness which will render the control useless. Mr Oliver when asked questions about RAC's hazard list stated:

> It seems to me this is where risk management on the railway system has not been effective, that that upper level of risk management or hazard identification has been applied but this second level of risk management, of identifying all the sub-categories in which things can go wrong has not been adequately applied.

That point may be demonstrated by taking as an example the area of training. The hazard of collision might be thought to be controlled by training the employees. That is only the beginning of the inquiry. It is then necessary to consider whether the curriculum adequately deals with the subject matter and this will, in turn, depend upon the expertise of the people who develop the curriculum which in turn will influence the content of the curriculum. The Glenbrook rail accident again provides an illustration of this. Mr Sinnett attended a training course in the July before the Glenbrook accident but was trained in accordance with a safeworking procedure which was not the one in current use and which had not been authorised by the Department of Transport. Neither the safeworking procedure in which he was trained, nor the one which was in fact the authorised and applicable safeworking procedure, satisfactorily dealt with the

circumstances which occurred at Glenbrook, as was demonstrated in the first interim report. Accordingly, it is no answer to say that the hazard of collision has been controlled because there is a system for training employees.

A better illustration of the weakness of the controls identified in respect of this hazard is to examine the controls entitled safeworking procedures, violate block. There are no less than 84 safeworking units which are identified as being involved in the control of this particular hazard. For that control to be effective the employees must know not only the content of all the 84 safeworking units but also be able to identify accurately which one should be applied in particular circumstances, then interpret it correctly and then apply it correctly. As I have previously observed interpretations of safeworking units can vary from person to person, even within the safeworking section.

This hazard control mechanism, like the safeworking units themselves, suggests an engineering approach to the management of safety by pointing to the existence of controls as if that were the end of the matter. To make matters worse the hazard list was developed in 1989 and did not undergo any re-evaluation in 1996 at the time of disaggregation. Mr Lane, the Chief Executive Officer of SRA from 1997 to 2000 said:

> It is my view there was an assumption made in the disaggregation of the industry here in 1996 that the safety arrangements essentially would remain unaltered, and I believe that was a flaw.

Notwithstanding the Glenbrook rail accident, and the eight other accidents the reports of which I am required to consider when Mr Cowling, the Chief Executive Officer of RAC, gave evidence he agreed that no examination of the hazard list had taken place to determine what additional risks might arise from disaggregation and although he was not aware of any attempt to do so, he said that he had asked for this to happen "at this time" that is towards the end of the year 2000.

There is no evidence regarding the purpose for which the hazard list was developed in 1989, nor the manner in which it was used and applied at that time. However, the overseas investigations and other research reveal that it is consistent with the type of risk management process that was being applied at the time. Nevertheless, I have the clear impression that over time this hazard list has not been used as a risk management process to manage safety, but rather as a means to deflect any criticism from the rail organisation concerned when an accident or incident occurred. This is emphasised by the fact that on the evidence there has been no review of the list or controls since its development.

Even without this level of sophistication, by conducting only the most superficial examination of the controls that were supposed to be in place, it is clear that neither RAC nor SRA had adequate risk management procedures in place at the time of the Glenbrook rail accident or subsequently.

The Rail Access Corporation was responsible for the safeworking units which were the primary means whereby the hazard of collision when a signal failure occurred was to be managed. The first interim report demonstrated the inadequacy of safeworking unit 245 to deal with the circumstances that presented themselves at Glenbrook. The evidence is that the safeworking units are being redrafted. I am not confident that that project is

likely to produce any significant improvement in the quality of the safeworking units. I have dealt with this in further detail in a later chapter dealing with the safeworking units.

The State Rail Authority which employed the driver of the inter urban train, the signaller and the train controller involved in the Glenbrook rail accident had the relevant safeworking unit and the training of its employees as the primary controls against the risk of collision. There were numerous deficiencies in that control mechanism. They included:

i. none of the train controller, signaller or train driver properly understood the safeworking unit;

ii. the train driver was taught in accordance with a different and unauthorised safeworking unit from the one which was in force;

iii. the signaller did not use the other options that he had available to identify the whereabouts of the Indian Pacific before authorising the inter urban train to proceed; and

iv. none of the employees was risk aware, namely none had been trained to consider that his actions may lead to a collision if in fact there was another train on the track ahead. Nor was there any adequate safety culture. The employees did not believe that there would be any adverse consequence arising from them pursuing the course of authorising the inter urban train to pass the failed signal or doing so.

The fact that the accident happened itself demonstrates the inadequacy of the risk management procedures in place. However, when the elements of the inadequacy are identified it is clear that both the SRA and RAC failed in their duties to adequately manage the risk of collision at Glenbrook on 2 December 1999. So much was conceded by those organisations. In relation to RSA, its involvement in the management of the risk of an accident was less direct but nevertheless contributed to the Glenbrook rail accident.

There was considerable evidence of the risk management procedures that were developed by RSA following the fatal accidents at Kerrabee and Bell. Dr Leivesley regarded that organisation as being two years ahead of the SRA in the development of adequate risk management procedures. I agree with that observation so far as it relates to employees. However, on the evidence concerning RSA, there does not appear to be any equivalent advance in the management of risks which affect persons other than its employees or contractors, namely other users of the railway.

The first interim report demonstrated how the alteration to the signal post telephone at signal 40.8 led the driver of the Indian Pacific, Mr Willoughby, to believe that the telephone was not working and for that reason he did not persevere in his attempts to contact the signaller at Penrith. Had he persevered and contacted the signaller at Penrith then the signaller might have had time to communicate with the driver of the inter urban train for him to stop his train before the collision occurred.

Although RSA did carry out work on the signal post telephone so as to change it in such a way that it appeared to the driver of the Indian Pacific not to be working, no steps were taken to communicate that information to National Rail Corporation Limited whose

locomotive was pulling the Indian Pacific. Having observed Mr David Edwards, the National Manager Safety of National Rail Corporation Limited, I have little doubt that if he had been informed by RSA that the signal post telephone had the press to ring button removed he would have informed the drivers that its absence did not affect the operation of the signal post telephone.

The same may be said about RSA in relation to the locking of signal post telephone 41.6. Valuable time was lost because Mr Willoughby had to return to the Indian Pacific to get the key to unlock it. This was the first time that Mr Willoughby had come across a signal post telephone that had been locked. That loss of time also illustrates the dynamic nature of the way in which accidents or incidents occur.

At the time of the Glenbrook rail accident the Indian Pacific had commenced to move off from signal 40.8. It was travelling at six kilometres per hour at the time that the inter urban train came around the curve and collided with its rear. If Mr Willoughby had not taken the extra time to go back to the Indian Pacific to obtain the key to open signal post telephone 41.6, the Indian Pacific would have been further down the track. The rear wagon would not have been located near the apex of the curve but in the subsequent straight stretch of track and may have enabled Mr Sinnett to stop the inter urban train prior to colliding with the rear of that train.

The inadequacy of the risk management procedures of RSA to communicate the changes it made to the infrastructure to train operators is also illustrated by the rail accident at Redfern on 6 April 2000 which is discussed in some detail later in this final report. It is clear from the report in relation to that accident that no proper assessment was made of the risks associated with changes in the points from one directional operation to bi-directional operation. This accident occurred after Du Pont had provided its recommendations to RSA about the way in which risk management procedures could and should be implemented.

Although RSA has improved its risk management in relation to its employees, in my opinion it has much work to do in improving the adequacy of its risk management procedures in so far as they affect other rail organisations.

Although its involvement in the Glenbrook rail accident was minor, it had inadequate risk management procedures in place for ensuring that its activities in relation to the infrastructure could not create an increased risk of accidents occurring because of the effect of those changes on the employees of train operators.

The final matter with which I wish to deal in this chapter relates to the adequacy of the risk management procedures of the rail entities involved in terms of the way in which they dealt with each other. It was apparent from the evidence given by Mr Ogg, the Chief Executive Officer of RSA, that he did not regard his organisation as being causally involved in the Glenbrook accident. However its activities indirectly contributed to the cause of that accident. In the case of RAC, evidence in the first stage of the hearings given by witnesses employed by it was to the effect that safeworking unit 245 was adequate for the circumstances and the accident was caused by the failure of the SRA employees involved to follow the procedures laid down in that safeworking unit.

The inadequacies in the risk management procedures relate not only to the way in which the individual organisations managed the risks which it was their duty to control, but also the way in which they related to, and communicated with, each other. The notion that an accident is the fault of another organisation is only one step removed from seeking to blame the driver or attributing the cause to human error when there are underlying or latent conditions which enable the human error to occur. Where dynamic events involve the symbiosis of infrastructure owner and train operator, risk management procedures are inadequate where, as in the case of the Glenbrook rail accident, the individual organisations concerned did not examine the way in which their separate activities would affect others on the rail network.

The evidence is clear that no proper consideration was given to safety management in New South Wales when the 1996 disaggregation occurred. The process appears to have been driven by an ideological commitment to the separation of train operations from infrastructure ownership and to the economic benefits which were perceived to be available from the creation of RAC with a duty to collect access fees on behalf of the government. The lack of any proper planning of the safety implications of the disaggregation led directly to the deficiencies in safety management which each of the three organisations attempted to deal with in their own way from 1996 onwards.

One measure of the lack of safety management resources is the recourse to outside consultants to investigate and report upon what needed to be done. I have referred to the use by RSA of the Dupont organisation and to the use by RAC of Det Norske Veritas. These are not the only consultants who have been retained to advise in the area of safety management. As the use of Du Pont as a consultant to improve the safety management of RSA demonstrates there is a role for external consultants. There is little point in retaining them if use is not made of their advice and recommendations.

In August 1998 Mr Terry Worrall, then the Director, Rail Operations and Safety, Halcrow, Transmark, London (and now General Manager and a Director of Thames Trains Limited), who gave evidence before me, was retained by the New South Wales government to undertake an examination of safety issues and responsibilities in consultation with RAC, the SRA, the Transport Safety Bureau within the Department of Transport, RSA, FreightCorp, National Rail Corporation Limited and various companies engaged in infrastructure maintenance. The purpose of that review, conducted two years after disaggregation, was an attempt to ensure that all safety responsibilities were clearly specified for each rail entity. He advised on a number of improvements to safety management systems and prepared improved statements of accountabilities and responsibilities for RAC, the SRA, RSA, FreightCorp and the Transport Safety Bureau within the Department of Transport.

In October 1998 the government commissioned an inquiry into the overall safety management of RSA in regard to the safety of employees and contractors. Mr Peter Medlock of Fellows Medlock and Associates, a consultancy firm with extensive experience in occupational health and safety was appointed to conduct this inquiry. Mr Medlock's inquiry involved a full analysis of relevant documentation, in depth consultations with RSA staff and independent audits of worksites and procedures. As a consequence of the Worrall and Medlock reports, a Rail Safety Committee, chaired by the Director General of the Department of Transport and comprising the Chief Executive Officers of the major rail entities in New South Wales was established. The committee's

function was to oversee the implementation of the recommendations of each of the above reports.

On 29 December 1999, after Letters Patent had been issued requiring me to inquire into and report to the Governor on matters which included the adequacy of the risk management procedures applicable to the Glenbrook rail accident and safety improvements to rail operations which were considered necessary, Richard Oliver International was commissioned by the Minister for Transport to prepare a safety audit of the New South Wales rail entities. That report was delivered to the Minister in March 2000 and its recommendations included a clearer delineation of responsibilities for rail safety and more effective communication training and signal operations. The report dealt with, among other things, safety interfaces, regulation, enforcement and safety performance. These are things that could have been dealt with by an independent Rail Safety Inspectorate.

Finally, shortly after he was appointed as the Co-ordinator General of Rail in June 2000, Mr Christie commissioned Mr Kevin Band, the Executive General Manager, Safety of Queensland Rail to undertake a quick evaluation of safety within the rail industry. No doubt that was done because of the public concern about the state of safety in the rail industry leading up to the 2000 Olympics and because this inquiry was not going to be able to be completed before that time. These too are things that could have been dealt with by an independent Rail Safety Inspectorate.

The plethora of outside consultants retained by the rail entities and by the government demonstrates the lack of competence within the organisations and the lack of strategic direction that existed, and still exists, in safety management for the whole rail system. In addition to the six separate consultants who have conducted investigations since 1998 and provided reports on safety management, each of the rail entities has appointed people to positions in safety management on many occasions during that period.

The 1996 disaggregation occurred without any analysis of the safety implications, let alone the rigorous and careful process that was followed in the United Kingdom to ensure that public safety was given necessary and proper priority in the restructuring of the rail industry in that country. It was then a further two years before any attempt was made to properly manage safety within the rail entities. This was driven by the need to obtain accreditation. But the accreditation process was bureaucratic in character and the response by the SRA was to establish a safety management system with corresponding bureaucratic layers.

The uncontested evidence from several SRA employees leads me to conclude that although this formal structure of committees was in place, little had in fact changed in the attitude to safety or the effective management of safety which was being managed with the same rule orientated approach, except that the discipline of the system had been diminished by the fragmentation of the integrated railway into three separate organisations.

The Rail Services Australia approach appears to have been much more practical and much less bureaucratic. This may have been because of a genuine desire to avoid tragic deaths of the kind which occurred at Kerrabee and Bell, but the death of Mr Hook at Sydenham would lead to some reservations about its effectiveness.

The effectiveness of RAC's safety management system can be measured by the marks that it received in the Det Norske Veritas assessment of its safety performance against international standards in a number of areas.

Although it must be acknowledged that some genuine efforts have been made to improve the management of safety, the overall level of safety management in the New South Wales rail industry at the time of the hearing was much lower than that which the public is entitled to expect of the rail organisations in which it places its trust when using the public transport system.

Before dealing with the specific safety matters which require attention and the regulatory means by which safety management on the New South Wales rail system needs to be structured, I shall deal with the other eight accidents.

6. The Eight Other Accidents

The Letters Patent as varied require me to inquire into and report upon any safety improvements to rail operations as a result of my findings in relation to the causes of the Glenbrook rail accident and the adequacy of the risk management procedures applicable to the circumstances of that accident and as a result of the consideration of the reports of the rail safety investigations and any coronial report into eight further rail accidents. The reports in evidence fell into three categories. First, reports of investigations ordered by the Minister for Transport and undertaken by the Department of Transport. Secondly, reports by the rail organisations involved in the respective accidents as required by the Rail Safety Act 1993. Thirdly, a coronial report in respect of the accident at Kerrabee. There were Department of Transport reports in respect of the Redfern, the two Hornsby, Waverton, Kerrabee and Bell accidents. Finally, there were railway investigation reports in respect of the two Olympic Park accidents.

The Letters Patent as varied limit the evidence to the contents of these reports. I have therefore accepted the facts recorded in the reports as correct. I have neither seen nor heard any of the witnesses to those accidents, nor have I examined any of the documents upon which the reports are based, except those which are attached to and form part of the reports. Accordingly, where conflicts of evidence have arisen in the reports I have been unable to resolve them and determine where the truth lies.

I have also assumed the accuracy of the technical information contained in the reports since I am not permitted by the Letters Patent as varied to consider any other evidence.

I am able to consider, for the purpose of making recommendations, the facts stated in the various reports as found by others and the circumstances of each accident insofar as they reveal safety deficiencies which need to be addressed. I shall deal with each of the accidents in turn and in chronological order.

Fatal Accident at Kerrabee on 18 August 1998

At approximately 7:02 am on 18 August 1998 an empty coal train, designation G209, collided with a RSA (hereinafter RSA) road vehicle which was traversing a cutting on the Sandy Hollow to Kerrabee section of the Ulan line about 349 kilometres from Sydney central terminus. The collision occurred in conditions of restricted visibility owing to the curvature of the cutting. It occurred on a single line section of track with light freight train use. It was exclusively used by freight trains. As a result of the collision the two RSA employees who were in the vehicle were killed.

Two reports were prepared in relation to this accident. The first was a report of the NSW Department of Transport following a direction by the Minister for Transport that there be an independent inquiry into the accident. The second was the report following the coronial inquest conducted by Mr John Abernethy, then the Senior Deputy State Coroner. The facts as stated in those reports were that prior to August 1998 heavy rain had blanketed much of the Hunter region. Rail operations were affected and work groups from RSA were required to undertake line repairs in a number of places where water logged soil had given way resulting in land slips which had threatened the stability of rail tracks.

Figure 1 Kerrabee Accident Location

A number of small land slips had occurred along the section of track from Sandy Hollow to Kerrabee and some work had already been undertaken in that area. Work was required to be done 354 kilometres from Sydney central terminus. The two men that were killed were part of a work group that was sent to undertake this work.

The work group consisted of a convoy of three vehicles. The convoy left the rail maintenance depot at Sandy Hollow at 6:00 am with the intention of meeting up with contractors driving two other vehicles to the gates of a private property which had to be passed to gain access to the railway line. The convoy of three vehicles arrived outside the gates by which time two heavy dump trucks were waiting. The first and second sets of gates were unlocked and all five vehicles passed through the property and waited on the dirt access road. In all there were nine men, four from RSA and five who worked for independent earth moving contractors.

There was a tenth man who had not arrived. His absence was unexplained and the foreman of the group, or ganger, modified his normal approach in accessing the work site and made new arrangements for traversing the cutting that took into account train running times.

It was known to the ganger that trains travelled ahead or behind their scheduled running times in this area and for that reason normal practice required that no person would be on the tracks ten minutes before a train was due or after a train had passed. The ganger was responsible not only for the safety of RSA employees but also for ensuring the safety of the employees of the independent contractors who were less familiar with rail operations and more likely to be at risk as a result.

The work site to which the group was going was located 354 kilometres from Sydney central terminus. To obtain access to that work site it was necessary for the convoy of vehicles to drive along an access road beside the railway line for a substantial part of the journey but to cross the line at three locations. Two of those locations had good visibility in both directions. However, at the crossing located approximately 349 kilometres from Sydney central terminus, the vehicles would have to travel through a cutting and were forced to straddle the railway line for about 100 metres until they cleared the cutting. It was not possible to move off the railway line because of a steep 15 metre drop to the flooded Goulburn River on one side and the vertical rock and cement cutting on the other. The visibility of approaching trains on the down line was minimal inside the cutting owing to its curve and the sound of any approaching train was masked by the topography.

The ganger's normal practice was to check train times before allowing anyone in the work group to go near the track. Prior to 25 July 1998 the ganger would have been able to obtain information about train times by telephoning the signaller at Muswellbrook signal box by using telephones at the entrance to the cutting. However, the signal box had been closed down and the track side telephone system was diverted to Broadmeadow Train Control Centre. There is no evidence to indicate that the ganger, or anyone else in the work group, had been advised of the change. Poor radio reception in the area precluded the use of a vehicle mounted radio.

In order to obtain the most accurate information about train running times the ganger sent an RSA employee to the Kerrabee staff hut where the employee would be able to obtain the train running times directly from the train controller using the communications equipment in the hut. Once the employee had obtained these times, he was to advise the ganger by two-way radio of that information.

By 6:20 am the contractor for whom the group had been waiting had still failed to arrive and the ganger decided to split the convoy into two groups. He stayed at the 340 kilometre gate with the RSA employee and two employees of the earthmoving contractor. He sent the other employees to the entrance of the cutting under the supervision of an RSA employee. He issued hand held radios, one per vehicle and he sent the utility truck and the two dump trucks to the cutting where they were instructed to wait for his arrival. He also sent another vehicle back to Sandy Hollow to attempt to find out what had happened to the contractor who had not attended for work. The ganger then drove to the crossing site.

The employee who had been sent to the Kerrabee staff hut did not know how to adjust the frequency on the radio system that was operated from that staff hut. At approximately 6:40 am he contacted the ganger on the normal frequency and received instructions as to how to change the frequency to enable him to communicate with the train controller at Broadmeadow. The ganger had told the employee to hurry up as a train had left Sandy Hollow ten minutes earlier.

The employee at the Kerrabee hut then contacted the train controller at Broadmeadow between 6:45am and 6:48 am. He identified himself as a RSA employee and indicated that the work group would be working around the emergency slip area at 354 kilometres from Sydney. He requested train running times. The train controller then asked what type of work was being done and at what location. He was told that drainage work and cleaning up work was to be done at location 354 kilometres from Sydney. The train

controller asked whether the group would be working at the site all day and the RSA employee informed him that they would be. The train controller then proceeded to read out the times of trains that were to enter the section in the up and down directions up until midday. The train controller told the employee that train G209 had left Sandy Hollow at 6:40 am, UL213 was due to leave Sandy Hollow at 8:55 am, 4861 was due to leave Sandy Hollow at 10:35 am and UL276 was due to leave Kerrabee at 9:45 am.

The Rail Services Australia employee repeated all the train running times except the time of the 6:40 am train. This is clear because the conversation was recorded and the record demonstrated that the RSA employee did not repeat to the train controller the running time of the first train, although he repeated each of the others. The Rail Services Australia employee claimed that he wrote the train running times down on a piece of paper. Although he said he transferred those times to his diary and had searched to find the scrap of paper on which he had originally noted the train times, that scrap of paper has never been found.

However, the material in the reports does demonstrate that the ganger was conscious of the need to obtain accurate information about train running times and used the only method which appeared to him to enable him do so. Once he had obtained accurate information about train running times he could safely use the cutting as a means of access. He did not obtain accurate information and he and another employee were killed as a result. Included in the diary of the employee at the Kerrabee hut were the details of the train that left Sandy Hollow at 6:40 am which the controller told the RSA employee was in the section when he had the conversation with him. It is not possible for me to determine for myself whether the RSA employee did in fact write the details of the train in his diary before or after the accident, but it is unlikely that he did so given that he did not repeat it to the train controller at Broadmeadow.

The Rail Services Australia employee then contacted the ganger using the GRN radio. As there is no recording of this conversation, it is impossible to determine what was actually said. Based on witness statements, however, it appears that conversation proceeded along the following lines. The Rail Services Australia employee at Kerrabee identified himself and told the ganger that there was a train in the section. He did not identify this train as being the one that had left Sandy Hollow at 6:40 am. The ganger replied that he was aware of the train in the section. The employee at Kerrabee then gave the running time of the second train and of the other trains, and the ganger repeated the running times of each of the trains except the first train. In addition to repeating the running times, the ganger made a note of those times as they were given to him and the note on the notepad that he used recorded each running time except for that of the train G209. The train in the section which the ganger said he was aware of was a train designated UL262 which had briefly been sighted by the work group while it was waiting at the gate located 340 kilometres from Sydney. That train was travelling in the direction of Sandy Hollow and was well clear of the cutting.

There appear to be only two explanations for the failure of the ganger's notepad to record the presence of train G209. The first is that he was not told about that train by the employee calling on the GRN radio from the Kerrabee hut or, he was told, but assumed that the train that the employee was referring to was UL262 which he had previously seen and which he knew was well clear of the cutting. It is obvious however, that he did not know of the approach of G209. When he advised the convoy of trucks that they could

proceed into the cutting he stated words to the effect that the next train was not due until 8:40 am. This is corroborated by the fact that after the accident one of the members of the work group stated that the next train was not supposed to arrive until 8:40 am. Since the only source of that information would have been the ganger, this tends to confirm that the ganger believed it was safe to enter the cutting.

When the empty coal train G209 entered the cutting travelling at a speed of approximately 70 kilometres per hour and saw the work vehicle on the track ahead of it, there was nothing that could be done to avoid a collision. The ganger and another employee were killed when the train struck the work vehicle in which they were travelling.

Although the ganger had tried to assess the risk that existed and had attempted to manage that risk by trying to ascertain which trains might be in the section his management of the risk was impeded by deficiencies in the systems of communication and generally in the systems of protection for trackside workers. These were:

i. That the employees did not know the means by which the trackside telephone could be used to contact the signaller at Broadmeadow thereby necessitating the three-way method of communication which created the inherent risk that important information would not be communicated.

ii. The Broadmeadow train controller either failed to notice or neglected to confirm that the employee at the Kerrabee hut had in fact received the information about G209 when this train number was not repeated back to the **t**rain **c**ontroller. There is little point in repeating information if mistakes or omissions in what is repeated are not corrected.

iii. The failure to use a formal protocol to relay and receive information increased the risk that important information would not be communicated and that the person providing the information would not correct the recipient if the latter omitted or misstated relevant information.

Safeworking unit 135 contained a radio protocol which, notwithstanding its inadequacies, would have reduced the risk that the ganger would not be provided with the critical information. Failure to institute and maintain a system of using the protocol contained in safeworking unit 135 is a serious deficiency in the safety management of rail operations. I will not repeat what I have said about the Glenbrook accident in this regard other than to note that Dr Leivesley who had listened to taped controllers' communications in the nuclear industry, the chemical industry, the Metropolitan Police, Queensland Rail control room and in the Channel Tunnel control room, said of the tape recorded conversations leading up to the Glenbrook accident "I have not had an experience before of that type of language in a control room". She said that the individuals were not using "an operational procedural type of language in the way they are addressing each other." Mr Franklin Hussey described the frustration that he experienced in trying to get the SRA to follow a communications protocol and that even though he was assured in 1997 that this matter would receive attention, it has not occurred. That result also demonstrates why, in the public interest, it is intolerable to leave safety regulation to the particular organisations. There must be an independent Rail Safety Inspectorate to monitor and ensure compliance with essential safety protections.

There was no proper system for recording safety critical information. Notes on scraps of paper which have since been lost should not be the means by which such information is recorded. There should be appropriate forms used by each person relaying and receiving that information and each should be required to read back what each has written so that each has his own accurate record of the safety critical information.

The technology that was used for communications at the time of this accident was inadequate. A proper system of communications would have enabled the ganger to radio or telephone the train controller directly and remove the inherent risk of not relaying accurate information that this use created.

There are two matters of concern in the Department of Transport report in respect of this accident. The first is the analysis in the Department of Transport report of the content of several safeworking units, notably the 900 series, and particular sections within those operating rules. There was no specific rule that dealt with the situation and it was only by an examination of the combined effect of SWU 903a, SWU 910a and SWU 912b that it was possible to identify several safeworking procedures which might be said to govern the situation. This need to analyse the safeworking units in depth to determine which was applicable, and the fact that more than one procedure may have been applicable, mirror the concerns expressed previously in relation to safeworking unit 245. The Department of Transport report, however, does not sufficiently emphasise the need for the weaknesses in the safeworking units to be rectified. Nor does it endeavour to assess whether it is just these units which are inadequate or whether the problem is more systemic. Associated with this is the failure of the report to identify and stress the importance of individual work groups being properly trained and supported in the application of risk assessment and management techniques when establishing work sites. This is fundamental to the safety of work groups as each individual site is different and has unique risks which need to be managed and controlled to ensure the safety of workers.

The other concern in the Department of Transport report is the statement in the report that the primary cause of the accident was the work group's failure to apply protection procedures specified in the safeworking units. Although I cannot make my own findings of fact it is clear that the primary cause of this accident was not the work group's failure to apply protection procedures specified in the safeworking unit. In my opinion, the cause of the accident was the failure of the employee at the Kerrabee hut to communicate to the ganger the presence of the train G209. The reasons for that failure largely depended, in my opinion, upon lack of training, lack of a suitable protocol for the passing and recording of relevant information and lack of suitable equipment to enable communications to take place without the intervention of a third party.

There is, however, one comment in the report with which I do agree. The author of the Department of Transport report states:

> The difficult circumstances faced by the managements of the various railways with a break up of the former State Rail monopoly are appreciated. What is apparent, however, is a reduction in the margin of safety. The systems related to worksite protection and communications were developed for a rail monopoly that, in the main, directly employed its own workforce. However, the restructured industry is more and more relying on external organisations

and contractors. Consequently, there is a need to ensure that worksite protection and communications systems are refined and developed so as to effectively protect workers who may have minimal or no experience of railway working conditions.

This latter observation demonstrates the need for a Rail Safety Inspectorate. The failure of the Department of Transport report to identify the real issues in this accident demonstrates the need, in my opinion, for an independent Rail Accident Investigation Board with some members who are not affiliated directly or indirectly with the railway industry so that any assumption or mind set which limits the quality of the investigation and the quality of the reports and recommendations can be avoided.

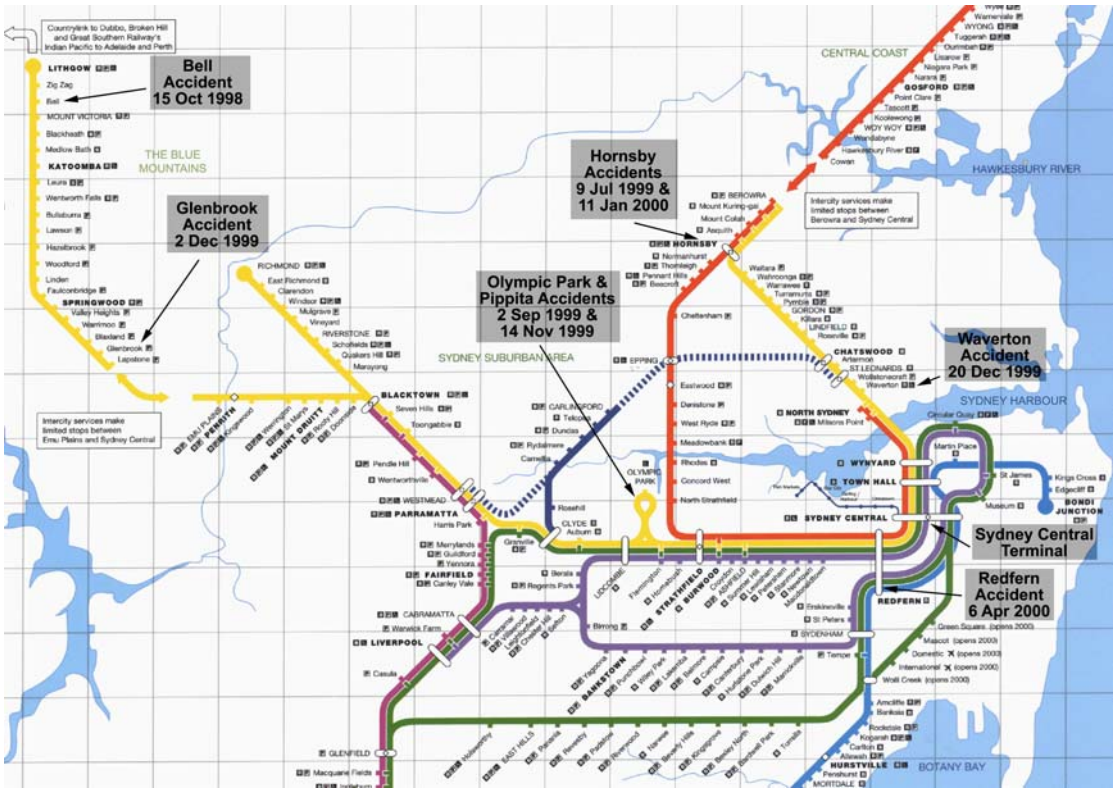


Figure 2 Locations of Other Accidents

Fatal Accident near Bell on 15 October 1998

On 15 October 1998 two work groups employed by RSA were sent to carry out work on the up main line at two work sites located at 134.940 kilometres and 134.731 kilometres respectively from Sydney central terminus. The two work sites were just out of sight of each other due to the curvature of the line. The up main line is the description given to the line which proceeds towards Sydney. The other line, travelling away from Sydney is called the down main line.

At the site of the accident, located at 134.731 kilometres from Sydney central terminus, the work group consisted of five men including the deceased. The work that needed to be carried out involved welding and a large and cumbersome piece of equipment was used for cutting welding residue from the rails. This piece of equipment is called a power shear which has a petrol motor and is started by pulling a zip cord.

The work group arrived at between 8:00 and 8:30 am and the supervisor informed the men of the work to be done then drove to the signal box at Mount Victoria and advised the signaller of the proposed work locations and obtained a copy of the train running times for the up main line. A hand signaller was placed on the up main line at a position approximately 135.500 kilometres from Sydney central terminus and another hand signaller was placed on the up main line at a position approximately 136.710 kilometres from Sydney central terminus. Radio communication was established between the two work sites. The signallers at Mount Victoria and other signal boxes in the area were advised that the work groups were in position and work commenced.

Welding activity had been carried out by the work group which included the deceased and the work had reached a stage where it was necessary to use the power shears to remove excess weld from the track. Two of the men were working close to the up main line knocking the residual slag off the weld that had been completed, a third was packing equipment into the work truck while the deceased and another employee were in the area between the up and down lines known as the "six foot" a reference to the approximate distance between the two lines in order to operate the power shears.

At 8:22 am a four carriage double decker inter urban V set train designation number W529 left Sydney Central railway station bound for Lithgow. It arrived at Mount Victoria two minutes ahead of time. The driver of that train was not told that there were men engaged in work on the track near Bell or the precise position where the workmen were located, even though this was known to the signaller at Mount Victoria. The inter urban train left Mount Victoria railway station at 10:32 am. It arrived in the vicinity of the work site at 10:35 am. The driver of the train had a visibility of 380 metres down the track. The train was travelling at 70 kilometres per hour.

The width of the train meant that it extended beyond the rails on both sides. That is the train's body encroached on the space that is called the six foot. Before the train approached the power shears had been placed in the six foot near to where the welding activity was being carried out so that they could be started adjacent to where they would be used. The deceased was bent over in the area between the two tracks engaged in starting the power shears when he was struck by the front right hand side of the train then travelling at approximately 70 kilometres per hour.

The driver of the train did not see the deceased in the six foot. Nor was he aware that his train had struck the deceased. He only became aware of this after the accident when the guard on the back of his train noticed a pile of clothing in the six foot and people running towards it and immediately applied the emergency brake. This brought the train to a stand approximately 332 metres from the point of impact. This braking distance is consistent with an impact speed of 70 kilometres per hour.

The driver claimed that he had sounded his whistle and that one of the workmen raised his hand in response. I have no means of determining, on the evidence before me, whether either of those events in fact occurred. If he did sound his whistle the deceased and his co-worker did not hear it.

It is however, beyond doubt that there was no protection for the deceased from trains travelling on the down main line. There was no lookout stationed on the down main line. There was no flag man positioned on the down main line to control the movement of

trains when workmen were working in the area between the up main line and the down main line. The driver of the train was not told prior to leaving Mount Victoria railway station, or at all, that there were workmen working in that vicinity. This is notwithstanding the fact that he arrived at Mount Victoria railway station two minutes ahead of schedule and apparently had a conversation with the station master during that time. It was apparently not the practice to tell train drivers as a matter of course that there were workmen on the track in the section of track ahead of them.

On 16 October 1998 the Minister for Transport directed the Department of Transport to conduct an independent **i**nquiry under section 58(4) of the Rail Safety Act 1993 into the circumstances of this accident. The report once again analyses the safeworking units at length. The analysis again reveals that the safeworking units were inadequate in that they did not properly deal with the situation where equipment was placed in the six foot or where multiple worksites were established in close proximity. While this again emphasises the fundamental weaknesses in the safeworking units, the way the Department of Transport report analyses them is consistent with the entrenched attitude that alleviation of the causes of accidents can be brought about by amendments to the safeworking units to address areas which are not dealt with. This final report has already dealt with the deficiencies of this approach.

The reason why no protection was provided for the deceased appears to have been that he was required to undertake work on the up main line. Since that was his work site the down main line was left unprotected with trains travelling at the relatively high speed of 70 kilometres per hour past the area. Thus nothing was done to protect the deceased from the only danger which was likely to kill him, namely being hit by a train coming in the opposite direction to trains on the line on which he was working. He could not be hit by a train on the line on which he was working because rail traffic on that line had been stopped.

What appears to have happened in this accident is that it was thought that the work site did not include the area between the up main line and the down main line and therefore there was no need to put any protection in place for workers in that area. Common sense would have demonstrated to anyone that this was not sensible because of the probability, if not the likelihood, that men and equipment would be between the up main and down main lines thus bringing them into danger of being hit by trains travelling on the down main line.

What this accident once again demonstrates is the undesirability of slavish adherence to safeworking units to be the primary mechanism for preventing injury or accident. The safeworking units which are said to have been applicable to the circumstances of the accident are SWU 900, SWU 910, SWU 912, SWU 914, SWU 920 and SWU 922. Copies of each of these are Annexure G to this final report. A reading of them demonstrates that they are very complicated. It is not difficult to see how supervisors of work sites could be distracted by the complexity of these safeworking units from considering in a common sense way the obvious danger to employees of being hit by a train and putting in place precautions to prevent this occurring.

What the inquiry report should have concentrated upon in my opinion is the need for each and every worksite to be assessed carefully in terms of the unique risks it poses to employees. The safeworking units are not an end in themselves. They are part of the

means to an end. The end is the protection of track side workers from injury or death. The starting point for such protection is to identify the risk. This should be obvious. It is then necessary to put protection in place. The safeworking units may provide a guide as to how this should be done, but they may or may not be adequate to protect against the risk. If they are not adequate additional measures must be taken. Safeworking units cannot accommodate every situation. This is why clear thinking and common sense is needed.

It is the common law duty of every employer to foresee the possibility of injury occurring and to take reasonable measures to prevent the risk from becoming a reality. The more serious the consequences of the event occurring, the greater the steps that the common law requires an employer to take. Preventing track side workers from being killed by passing trains should be given the highest priority when planning and executing track work.

In Queensland, according to the evidence of Mr Band, the view was taken that wherever possible, train timetables and work on tracks should be organised in such a way that workmen are not on or near the tracks while trains are running. This is the highest level of protection of track side workers. If there are no trains running the employees cannot be hit by a train.

It may be impractical to institute that arrangement in some circumstances although it should be seriously considered on every occasion where track work is to be carried out to see whether it can be achieved. If it cannot, the obvious means of controlling the risk is not to have trains moving up and down in circumstances where track side workers are on or near the line, or if they are, to have them moving at such a slow pace through the area that the risk of injury or death is eliminated or at least minimised. This means using hand signallers, lookouts and warning procedures. Evidence was given of available technology for track side workers to be warned of the approach of trains. These do not seem to me to be very expensive and are sound and desirable methods of protection.

On a less direct level it seems to me that it should have been mandatory for train drivers approaching an area where workmen are working for them to be told precisely where the workmen are, what work they are doing and to proceed at such a speed and in such a way as to minimise the risk of running any of the workmen down. I do not understand why there was not a rule which required the driver to be told before leaving Mount Victoria railway station where the workmen were and what they were doing. No harm could come from such a requirement and it is obviously a means by which train drivers could be made more aware of the presence of track side workers thereby minimising the risk of an accident occurring. This tragic accident further demonstrates the undesirability of placing primary reliance upon safeworking units as a means of safety management. They are lengthy, complicated, ambiguous and difficult to interpret as Annexure G demonstrates.

One of the problems with safeworking units is that there are many areas where the safeworking units do not take into account human factors such as fatigue, perception and understanding. It is not possible to write safeworking units which by themselves protect against such human failures. This is why a safety culture which requires consideration of safety implications separately and apart from whatever safeworking units might be thought to apply in a particular case is also necessary.

A good example of the need to consider overall safety rather than particular units is the existing 900 series of the safeworking units which are Annexure G to this final report. Mr Oliver, an expert retained by the Department of Transport, gave the example that where work is being carried out within 200 metres of the signal, the safeworking units required two signals to be used to protect the workers but not if the work was being carried out more than 200 metres from the signal, where only one signal is sufficient. There is no risk analysis apparent in such an approach. Common sense and safety would dictate that categorical rules like that will not provide a safe system. It is necessary on each occasion to assess the situation and institute appropriate protection. Mr Oliver gave another illustration of the way in which the safeworking units do not adequately ensure the safety of the employees. He said that one of the rules upon which reliance was placed was a rule which required employees to watch out for their own safety if likely to come within 2.5 metres of a line which is being used. When working on one line track side workers are virtually always within 2.5 metres of the other line but they do not perceive themselves to be in that position. Mr Oliver's view was that a culture has developed which did not involve protection from the other line and once that became the usual system of work employees continued to conduct themselves that way even though, had they considered the risks, the dangers would have been obvious. It may be that the practice developed because the rule applied in circumstances where the track side workers were "likely" to come within 2.5 metres of the other line. As Mr Oliver observes "likely is a wonderful word isn't it, you can interpret it however you want."

This accident also demonstrates the lack of a safety culture in the New South Wales rail industry. There was no appreciation of the fact that co-operation was necessary between the signaller and the driver to ensure that the driver knew that there would be track side workers at a particular location. Reliance upon interpretations of safeworking units falls far below a proper standard of safety management to protect track side workers. This is particularly so when the interpretation was incorrect. A measurement of the distance between the two lines would demonstrate that the kinematic envelope of a train travelling on the up main line included the area between the up main line and the down main line. Not only was the safeworking unit deficient, the system was inherently unsafe because a misinterpretation of the definition of the words "work site", combined with a slavish adherence to what was thought to be required by the safeworking unit, precluded proper consideration being given to the protection of workers from the only serious risk which did exist, namely being hit by a train travelling on the line upon which work was not being conducted.

There is a further statement in the Department of Transport report with which I wholly agree:

> It is reasonable to assume that workers engaged on or about the rail line have the capacity to make rational decisions concerning their own safety and have a commitment, for the most part, to work conscientiously within the framework set by management. The onus is, therefore, on management to ensure that safety systems are well designed and effectively implemented.

The report into this accident demonstrates the lack of a safety culture and the failure to operate as a team. It also demonstrates the importance of an independent and external Rail Accident Investigation Board which is not influenced by the same mind set that affects the rail organisations themselves, and which can examine the circumstances of the

accident in an objective and common sense way with a view to making recommendations which might prevent a tragic recurrence.

Derailment at Hornsby on 9 July 1999

On 9 July 1999 at 6:12 pm an eight car electric passenger train designated run number 81D carrying 99 passengers ran off the end of a loop line, a small section of track running parallel to the main line which can be used to enable one train to overtake another and is either connected to or disconnected from the main line at a set of points. The loop line formed part of infrastructure work which was being carried out. An examination of the wheels of the train after the accident demonstrated that the wheels were still turning in the dirt at the time that it ran off the loop line thus demonstrating that the driver of the train was unaware until his train left the track that he was on the loop line and not the down main line.

The rolling stock was extensively damaged and there was severe damage to the overhead electric power lines and supporting structures. Although the potential for injury or death was alarming, fortunately no serious injury to the driver or any of the passengers occurred. The cost of repair to the train alone was $523,597.57. This did not include the cost of the repair to infrastructure.

The circumstances in which this accident occurred raise a number of disturbing features. The events giving rise to the derailment started with disruption to services on the North Shore line caused by fallen overhead wire at 1:55 pm that day. At about 2:50 pm the driver of train 81D commenced his shift at Central railway station and the train was then running about 25 minutes behind its timetable.

At 4:41 pm the driver of the train attempted to log into his Metronet train radio. He was unsuccessful in doing so with the result that he did not have a Metronet radio in working order on his train. I should digress to observe that according to the evidence before me, which was uncontested, many trains were sent out or permitted to operate without the Metronet radio in working order. This is an undesirable state of affairs and should not occur since it is an essential safety feature which enables quick and efficient communication between drivers and signallers and other employees. For reasons to which I shall shortly come, one of the main causes of this accident was the absence of any communication to the driver of the change of route for his train.

At approximately 6:05 pm train 81D arrived at platform 2 at Hornsby railway station. At that time it was running approximately four minutes late. Platform 2 is a platform for trains that have travelled to Hornsby on the North Shore railway line. There are four platforms at Hornsby railway station. Platforms 1 and 2 cater for the North Shore railway line, platforms 3 and 4 cater for the main Northern line from Hornsby. Train 81D was bound for Berowra and its route usually required it to cross the up main line to travel on the down main line to Berowra. At about the same time an inter urban train, being run designation number N275, also heading in a northerly direction, arrived at platform 4 at Hornsby railway station.

The inter city train N275 was a limited stops train and, if it had followed train 81D, its progress would have been further impeded by having to wait as 81D stopped at each station on the way to Berowra. Train 81D was due to depart before inter city train N275

but the area controller had decided to permit N275 to go first to minimise disruptions to services. However there was a further problem with the inter city train, namely some disturbance amongst the passengers which required the police to be called and this added further delay.

At 6:09 pm the area controller decided that, to minimise delays to other trains on the North Shore line, the best course was to move train 81D out of the railway station and into the down loop siding while waiting for train N275 to depart. It was thought that this would minimise delays to other trains on the North Shore railway line. No complaint could be made about this decision. However, what then occurred demonstrates to me a serious failure to safely manage train 81D.

The area controller directed the signaller to inform the driver of train 81D of the intended alteration to his route. Up until that point of time the driver was entitled to believe, and obviously did believe, that his train, being late, would be permitted to proceed on its journey north. The signaller was unable to contact the driver because the train radio had not been logged in although he could have put a general call over the radio which would have been picked up by all trains including the driver of train 81D. Instead, he took no further action to carry out the instruction that he had been given by the area controller. In a properly managed railway the signaller should have used the two-way radio or whatever other means were necessary to ensure that the driver was provided with this safety critical information. To simply ignore the direction from his superior, because he could not make contact on the Metronet radio, to me demonstrates a want of proper discipline in the administration of the signalling area at that time. It also demonstrates a lack of a culture which gives priority to safety in the management of train movements and the vitally necessary co-operation between operational staff.

This was not the only breach of discipline at the time. The area controller also advised the station assistants to inform the train guard to tell the driver of the changed running arrangements. There was a disputed question of fact as to whether or not the guard was told, but if he was told he also did not carry out the instruction to inform the driver. These were additional safety precautions to guard against the risk that the driver would misunderstand the signallers because of his expectation that the track north would be cleared for the movement of his train. These safety precautions were then ignored or for some other reason not carried out.

Following the derailment there was an exchange of correspondence between trade union officials and the network operations superintendent in which the trade union claimed that signallers were being directed to carry out duties “that we cannot fathom”. These duties, which were to inform drivers of a change of route, were alleged to be in substitution of the responsibility of drivers in relation to signal recognition. The letter went on to say that the drivers were trained in the responsibilities and duties of train drivers including signal recognition and that they also were required to receive road knowledge training. It was said that signallers would be performing someone else’s duties if they were held to be responsible for the shortcomings of the SRA in failing to properly train drivers in signal recognition and road knowledge.

The letter exemplifies the opposite attitude towards safety to that which should exist. It is the responsibility of all employees working on the rail network to take appropriate measures to ensure that accidents do not occur. It is inappropriate for any of them to

assume that safety matters are someone else's responsibility and that they need only concern themselves with their own narrow and specific tasks and not think about the safety implications of events that are occurring on the rail network. Each employee forms part of an overall operation. If there are safety precautions which will minimise the risk of an accident occurring because of an oversight or some other mistake by someone else, the precaution should be taken. Industrial issues should never impede safety issues. It is the duty of the trade unions to ensure that the safety of their members has the highest priority. It should be a priority above demarcation disputes.

From a safety management point of view it is inherently unsafe for the management of a train, whose movement had been altered from its scheduled operation, to depend upon the observation of the driver in relation to the signalling. If he made a mistake, as appears to have occurred in this case, there was no back up control. The obvious means to ensure that he was aware of the change in the routing of his train would have been to inform him, over the two-way radio or in person, that such a change had been made, rather than leaving him in a state of ignorance in the expectation or hope that he would observe the change from the altered signal indication. No harm could come from providing him with verbal information about that change. Great harm could occur from not doing so, as the circumstances of this accident demonstrated.

As previously stated, the driver of the train was unaware of the change of route. However, lack of communication was not the only cause of the accident. The main signal for trains on platform 2 was located in a position where the driver could not see it. The movement of his train was controlled by a shunt signal or indicator signal. This displayed the letters "DL" which stand for down loop and the driver either did not notice that signal or he misunderstood it. If the signal had indicated for him to go on the down main line it would have displayed the letters "DM".

Ahead on the track were two other signals adjacent to each other. One was signal 5 and the other was signal 133. Signal 5 was the signal for the down main line and it was green. The driver moved off and crossed onto the down loop line and proceeded north on what he thought was the down main line. It appears that he responded to the proceed signal shown on signal 5 and he passed signal 133 at stop. This signal was not fitted with a train stop nor was there an intermediate train stop preceding it. In the result, the driver drove the train off the end of the loop line into the dirt and it proceeded for a further 80 metres through the dirt bringing down electrical wiring. There was a number of matters which in my opinion caused this accident. Each of them demonstrate significant deficiencies in the management of safety. These matters were as follows.

The train radio was not working. As previously stated, according to one witness who gave evidence before me trains were, and are, sent into service and continued in service where the train radio is not working notwithstanding dissatisfaction expressed by drivers about that circumstance. From the uncontested evidence it appears that considerable pressure is put on drivers to take trains which do not have a working train radio into service by suggesting to them that they will be inconveniencing large numbers of passengers if they do not do so. Others are threatened with disciplinary action. I regard it as unsafe and undesirable for trains to be operating on the network unless they are fitted with a Metronet radio which is in good working order. It is obvious, in the circumstances of the present accident, that if train 81D had a radio in good working order this accident

would not have occurred because the signaller could and would have carried out the instruction to communicate with the driver about the change of route.

The signal siting appears to have been deceptive. The layout of the signal for platform 2 required the train to be past the position of the main signal. In addition, the signal that was controlling the down loop line, signal 133, was located next to the signal which was controlling the main line, signal 5. It appears to me that the driver of this train followed what he thought was a proceed signal indication on the main line as being the one relevant to him. This is understandable because he thought he was on the down main line. Poor signal siting contributed to this accident in my opinion.

There was no train stop on signal 133. This apparently was because it was not the practice to put train stops on signals on loop lines. When the driver went past the signal on the down loop, signal 133, the absence of a train stop meant that the air was not automatically released from the train's braking system causing the train to stop and this explains why the wheels were still turning after it left the tracks.

Human error contributed to this accident in a number of ways, each of which was reasonably predictable in the circumstances. The driver obeyed the wrong signal. This mistake was contributed to by the signal siting to which I have referred. In addition, the driver was not informed of the change of route. Since his train had been running late and there was, as previously stated a culture of on time running, his expectation was that he would be proceeding on the down main line so as not to cause any further delay or disruption to services. He did not have an expectation that he would be shunted off onto the down loop. His expectation may have been strong and the emphasis upon on time running such an influence on his behaviour, that he simply did not register the indications on the signals. Research in the area of human factors studies has demonstrated that if a person's expectation that certain events are going to occur is sufficiently strong, the person concerned will fail to register obvious objective information to the contrary. In the safe management of a rail system these types of human error, since they occur not infrequently, need to be taken into account so the safety of particular rail operations does not simply depend upon one man correctly observing the indication of a poorly located signal as was the case here.

There was a lack of discipline in the SRA management. If an area controller gives an instruction which is critical to the safe operation of trains there is no excuse for the instruction not being carried out. If employees do not carry out safety critical instructions given to them by their superiors the safety of the public is jeopardised. In my opinion, appropriate disciplinary action should follow if employees simply refuse or decline to do what they are told by their supervisors in circumstances where the safety of the travelling public is involved.

The driver apparently did not know of the change to the loop line which involved upgrading the condition of that line to the extent that it created the same appearance as the down main line. This contributed to the human error in turn proceeding along that line in the belief that he was on the down main line. If the driver had been informed of the redesign of the area north of Hornsby railway station and the upgrading of the down loop line he may not have made that mistake. This lack of route knowledge and the lack of knowledge of the signals which controlled the train movements demonstrates deficiencies in the training and assessment of this particular driver.

As stated, there was no train stop for signal 133. Apparently this was because this signal was on a loop line. A program has been under way to fit train stops to all signals in the metropolitan area. This seems to me to be not only desirable but essential for the purposes of minimising SPADs, a significant cause of multiple fatalities in rail accidents in the United Kingdom. In my opinion train stops should be fitted to all signals, including those on loop lines. When one considers the financial cost of this accident involving, as it did, in excess of $500,000 in expenditure to repair the train without taking into account damage to the track, electrical wiring and other infrastructure, the cost of fitting train stops would not seem to be an unreasonable expense. It is possible to identify the cost of not being safe. Unfortunately, it is never possible to identify the cost saved from operating safely because accidents are prevented.

The absence of a procedure which required a driver to be informed of any significant change to the running of his train was probably the greatest safety defect. This, combined with the fact that the driver was not told, meant that he proceeded in ignorance of the true circumstances, thereby creating the risk that if he made a mistake in relation to the signal indication there was no other method in place for preventing a significant accident.

There was a lack of general safety awareness or, as it is sometimes called, safety culture. Various employees thought that their function was simply to perform their particular job and that they had no general obligations in relation to the overall management of safety on the railway. This is the exact opposite to the culture that should prevail. Employees should, of course, perform their own tasks competently and diligently. They should also be encouraged to think and anticipate circumstances which might give rise to an accident and ensure by the flow of information to each other that each is aware of any change of circumstances. The disruption of the timetable and the fact that trains are running late is just the type of circumstance which should encourage employees to consider that drivers might be trying to catch up lost time or might be making assumptions about what is to happen with their train. In anticipation of the possibility of mistakes in reading signals that might arise as a result of those assumptions or expectations they should ensure as a precaution that the drivers are aware of any changes.

Another factor highlighted by this accident, which may not have had any direct effect but which is relevant, is the discouragement of drivers from challenging signals. Apparently, as a means of better ensuring on time running, drivers are discouraged from communicating with signallers to clarify the train movements that they are required to undertake. In my opinion clarification and confirmation are essential in the safe operation of trains and if a driver has any doubt about what he is expected to do then he should, particularly with the aid of the modern Metronet radio, shortly and concisely communicate with the signaller to ensure that he is not about to make a mistake which could have significant consequences.

The final matter relates to the quality of investigation and reporting of the accident. The conclusion of the report states, in part:

> Taken overall it is not believed this incident (a completely missed signal passed at danger) should have been anticipated. The incident itself was quite unusual and it required a number of missed communication measures to occur simultaneously for it to happen.

> The investigation has shown that there is a lack of clear understanding of the responsibilities and duties under the various instruments that govern the actions of the organisations involved, namely, SRA, RAC and RSA …[I]n this context the ability to review total operations and assess the risk is difficult if not impossible.

I do not agree with the first paragraph in the above quotation. It seems to me that an accident of this kind was foreseeable and should have been anticipated. Train 81D was running behind schedule. There was a mind set in favour of on time running. The driver had an expectation that he would be cleared to continue on his journey north and an expectation that he would do what he could to reduce the delay that already had occurred. The location of the signals, the upgrading of the down loop line so that it looked like a main line and the driver's lack of route knowledge were all matters that were either known or should have been known. In any situation of degraded operation, such as this was, the risk of an accident is increased and therefore it is necessary to anticipate and to ensure that proper procedures are in place for communicating all relevant information.

I agree with the second paragraph in the above quotation. This demonstrates again the need for a separate and independent Rail Safety Inspectorate to ensure that no safety measure is overlooked by the different rail entities and that there is a proper system in place for the management of the overlapping responsibilities and accountabilities in safety matters between the rail entities.

The conclusion expressed in the report again demonstrates to me that the investigation was conducted by a person who examined the circumstances from a rail perspective which involves too narrow an approach. An objective examination by an outside person or body such as a Special Commission of Inquiry leads to a different conclusion as to what has occurred. My own assessment of the circumstances of the accident raises safety issues beyond those identified in the official report. Although I have no particular expertise in railway matters it does seem to me that the investigation of this accident yet again reveals the necessity for an entirely independent Rail Accident Investigation Board.

Derailment at Olympic Park on 2 September 1999

In preparation for the 2000 Olympic Games which were held at Homebush Bay a number of major infrastructure transportation projects were undertaken in the years leading up to the Olympic year. One of them was an Olympic rail project designed to connect Homebush Bay precinct to the existing rail network within the Sydney metropolitan area. This rail project was commissioned on 27 November 1997 and, once completed, was frequently used thereafter to transport passengers to events including sporting fixtures and the Royal Easter Show which is a major agricultural show held annually in Sydney. Several organisations were involved in the project. The project was funded by the Olympic Co-ordination Authority and the Department of Transport.

The report into the accident does not describe the way in which the design of the rail project was undertaken, but it discloses that the line was a single track design which divided into an outer platform road and inner platform road at a turnout at a location known as 870 points. The main line radius in the area leads into the location of the derailment at a radius of 212 metres and a turnout radius of 180 metres. The 212 metre radius curve is on a falling grade of 1 in 33 and just prior to the derailment site there is a

vertical easing of the grade so that it rises to a grade of 1 in 45. The derailment occurred on the turnout road of 870 points which leads to the inner platform track. The track speed through the turnout and its approach is 50 kilometres per hour and the superelevation is 99 millimetres in the approach track and through the turnout itself. The track geometry design was near the maximum limit for curvature and what is known as cant deficiency. Cant deficiency is a technical term which relates to a compromise made when designing the track so that a set maximum speed can be achieved by different types of rolling stock using the track, such as freight and passenger locomotives. The design led to the creation of high lateral forces on train wheels as they went through the turnout.

The abrasive nature of the contact between the wheel flange and the rails was appreciated by the designers of the new work and they specified that lubricators be fitted to the rails to reduce the wheel wear. This was not done because the Olympic Co-ordination Authority would not authorise installation of lubricators on environmental grounds. The line was therefore put into use without the specified lubricators or other forms of lubrication. Predictably enough it became apparent that rapid wheel wear was being experienced. In 1998, during the Royal Easter Show, large numbers of persons were carried over that area of track and the rapid wheel wear that was observed became the subject of an investigation by a project manager.

Although the new section of rail was put into service without the specified lubricators, and the problem of excessive and rapid wheel wear was identified in 1998, no steps were taken to deal with the risk of derailment that this created. The report discloses that the only apparent reason for this was an assumption that the Olympic Co-ordination Authority would not authorise any kind of lubricators to be utilised.

The risk of an accident was increased by the type of trains that was being used and the fact that, as it was a shuttle service, the same trains would cross over the area of track frequently. The trains that were used, and the one involved in the accident were known as an L set. It was an older style train which imposed high lateral forces on the wheels. This was because the bogies on L set trains have a relatively high rotational stiffness compared, for example, with the newer Tangara trains.

RSA undertook the pre-commissioning inspections and was satisfied that the line was suitable for use. The State Rail Authority operated the L set trains on the line and RAC managed the infrastructure on behalf of the Olympic Co-ordination Authority.

On 2 September 1999 at approximately 2:15 pm a two car electric train designated number 99ED derailed the trailing car at the location of the 870 points while proceeding in the down direction. An investigation conducted into the accident established that wheel number 4, the leading left hand wheel of the trailing bogie, climbed the down switch rail and rode along the switch rail until it dropped off the rail. This in turn precipitated wheel number 2, the trailing left hand wheel of the trailing bogie, also to derail. The train was engaged in the operation of a regular shuttle service between Olympic Park and Lidcombe railway stations. Although it was carrying passengers at the time of the accident, fortunately no one was injured.

The investigation report examined the mechanical and technical reasons for the accident. It found that the worn wheel and switch rail profiles were such as to reduce the height of the wheel flange and thereby enable the wheel to climb up the switch rail. The report

further found that there was a wheel load imbalance between the wheels arising from a difference in wheel diameters and from a levelling adjustment of the air bags in the suspension. The report also found that the track geometry design was near the maximum limit for curvature and cant deficiency and that this produced high lateral forces and that there were additional lateral forces arising from the different wheel diameters on the same axle. The report also noted that the train was possibly exceeding the designed speed, but by no more than 10 kilometres per hour.

The mechanical causes of the accident were not difficult to determine. The wheels on the train had simply been worn away by the curved rail surface. This enabled the wheel to ride over the top of the rail causing the derailment.

What the report does not examine are the organisational factors which resulted in the derailment occurring. This is particularly surprising since the report notes that following the derailment, a lubricant which was not thought to be environmentally harmful was found and utilised thereby obviating the risk of a further accident. The report does not discuss why this could not have been done earlier, and in particular, following identification of the wheel wear problem after the 1998 Royal Easter Show.

On the facts as stated in the report, I do not agree with its conclusions in respect of the causes of the accident. In my opinion, the causes of the accident were:

i. The failure to recognise the consequence of a departure from the specifications in not using lubricators;

ii. The failure to co-ordinate the arrangements between the Olympic Co-ordination Authority, RAC, RSA and the SRA to find a lubricator which was acceptable, as was done after the accident; and

iii. The failure of any overall safety regulation when the problem was detected at the time of the Royal Easter Show in 1998 and nothing was done to remedy it.

The accident demonstrates:

i. The need for an independent safety organisation such as the Rail Safety Inspectorate to ensure that safety issues do not fall between the cracks when several rail organisations are involved.

ii. The need for an independent Rail Safety Inspectorate to check the specifications and the engineering implications to ensure that when a rail line is being commissioned it is to be used in the way that it was designed to be used and not with essential safety features omitted, such as the use of lubricators in this case.

iii. The need to co-ordinate between the different rail organisations involved if issues such as the environmental impact of lubrication become a problem rather than ignoring the problem and using the line in a way which it was not designed to work.

In addition, the accident again demonstrates the need to have an independent Rail Accident Investigation Board. The investigation of this accident confined itself to technical issues as to how and why the train became derailed. Although expressed in

highly technical terms, the mechanical issues causing the derailment are not difficult. What the investigation report did not deal with were the safety management issues which were obviously raised by this accident, including:

i. How could a new line be commissioned and within a few years of its commencing operations a derailment occur because of the design and use of the track, particularly when it was built for a major public event such as the 2000 Olympic Games?

ii. Why was nothing done about the problem of excessive wheel wear and the risk that that created for derailment once the problem was identified during Easter 1998?

iii. How could the inspections that were carried out not have revealed the risk of derailment before it occurred?

iv. Who was responsible and accountable for the fact that the derailment occurred largely because a safety design specification, namely lubricators, was excluded from the operations?

The members of the Rail Accident Investigation Board would not necessarily conduct an investigation themselves. They may call upon others to do so. However, what they would most certainly do, in my opinion, is check that the draft report of the investigator or investigators properly deals with all issues related to safety management that have arisen in the course of the investigation. If the draft report did not do so, as was the case here, the Board members would necessarily reject the draft report and require it to be redrafted.

Derailment at Olympic Park Loop on 14 November 1999

On 14 November 1999 at 3:40 pm an eight car Tangara train, designation number 1702F travelling from Blacktown to Sydney via the Olympic Park loop passed signal ST809 in the stop position on the down Homebush west fork line at Pippita on the Olympic Park loop. Although the train driver claimed he had a proceed indication, subsequent tests demonstrated that the signal was functioning normally. The signal was fitted with a train stop being an arm raised next to the track which caught a trip valve on the train causing the air to be released from the brakes on the train.

If it were a proceed signal the train stop would not have been operative. The braking system on the train is designed in such a way that air pressure keeps the brakes in the off position and releasing air from the system brings the brake discs into contact with the wheels thereby arresting the progress of the train. The function of the train stop and the trip valve is to cause this to occur automatically when a driver passes a signal at stop.

In addition to the train stop the section of track was fitted with catch points. The purpose of catch points is to deliberately derail a train that has passed a signal at stop so as to prevent it from going onto an adjacent track and colliding with another train with possible catastrophic consequences. The catch points, which were known as 861 catch points, were located approximately ten metres from the train stop. When the train passed the signal at stop the arm on the train stop connected with the trip valve, applying the brakes,

but the momentum of the train was such that it continued to travel until it reached the catch points which were set in such a way as to cause the train to derail.

It is obviously the lesser of two evils if a train passes a signal at stop for the train to be derailed rather than for it to collide with another train. The latter event could cause many deaths and dozens of injuries depending upon the extent of the collision and the number of passengers involved. However the location of the catch points in these circumstances caused the train to derail but directed the train towards a stanchion which supported the electrical overhead wiring, and in the direction of an embankment.

Fortunately, the train was not travelling at a very high speed at the time and the front of the train hit the signal pit which diverted it away from the stanchion. Had the train been travelling in excess of 35 kilometres per hour it could well have hit the overhead stanchion and then plunged down an embankment with the obvious severe risk of death or injury to the driver and passengers on the train. This circumstance was due entirely to the catch points being located in such a position as to change the direction of a derailing train towards the stanchion and the embankment.

This is the first feature of this accident which is of concern. It demonstrates a failure to consider adequately, or analyse, the safety risks of locating catch points in that position. The evidence was that as a result of this derailment RAC commenced a program to examine the position of catch points elsewhere on the rail network with a view to eliminating those catch points which created a risk of danger to a derailing train. Mr Cowling stated that of the 85 catch points in the metropolitan area, thirteen were identified as being in need of repair and all have been rectified.

The second feature of this accident which is significant is the fact that it happened at all. The report indicates that a number of factors contributed to the driver passing the signal at stop. The route knowledge of the driver raises questions about the adequacy of driver training and in turn the means whereby his competency as a driver was assessed. The report also identified the possibility that he was affected by an illegal substance or substances at the time of the accident.

The driver had completed his training in October 1997. There was no indication in the records of his assessment for the initial three month training period that suggested that the problems identified had been successfully rectified. Interviews with driver trainers confirmed that the previous assessments were not passed on when the trainee driver was moved from one driver trainer to the next. This is a defect in the training process.

Additionally, only one competency assessment had been performed since the driver completed his training thirteen months previously. That competency assessment took 53 minutes and involved the ticking of various boxes on the assessment forms. However, boxes had been ticked which were not relevant to the route or type of train the driver was driving at the time of the assessment. The evidence in relation to this suggests that the assessment was of a perfunctory nature.

The third matter raised as relevant to the cause of this accident, namely the possibility of the driver having been affected by an illegal substance or substances was not the subject of proper investigation. This was partly due, in my opinion, to the limited powers available to compel answers to questions and to the inadequate procedures for the testing

of drivers suspected of being adversely effected by drugs. The driver in question was tested for alcohol and no alcohol was found to be present. However, the report into this accident contains a quotation from a statement by Mr Ken McClure, Operations Division, Train Crewing of the SRA dated 15 November 1999 (the day after the accident) as follows:

> I asked driver M. what signal indication did he have, and driver M. replied that he had green lights. I then said, "Are you sure M" and he replied "Yes". Whilst sitting and talking with driver M. he appeared to be very nervous and he appeared to be sweating. While driver M. and I were talking I noticed that he could not keep still and again I asked if he was OK and again driver M. replied "Yes I am all right".

It transpired that the driver had agreed to undergo a blood and urine test. However, while waiting for the Sister at the hospital, who had left the room to make a telephone call to Flemington police station requesting a blood and urine kit the driver left the hospital without informing anyone that he intended to do so.

The other records in relation to this incident showed that the driver in question had previously been arrested on drug related matters and a court hearing was pending. I am not in a position to make a finding in relation to whether the driver in question had used any illegal substance which affected his ability to manage the train. The incident demonstrates, however, the desirability of random drug testing of drivers in circumstances where a serious incident has occurred and the provision of the necessary kits in an accessible way for that testing to be done.

The final feature of the accident which is significant is that all other evidence indicated that the driver had passed a signal at stop. There was no material to support the contention, advanced by him, at the interview the day after the accident that the signal had a proceed, and not a stop, aspect. Although I cannot resolve that question of fact it is necessary to observe that when investigations are conducted into serious accidents under the present legislation, there is no sanction for a witness providing misleading or deceptive information. This is undesirable. If information is misleading or deceptive it can frustrate or hinder an examination of the circumstances of an accident and prevent important safety matters from being identified. It can also produce a large wastage of resources, for example in checking and re-checking whether the signalling system worked correctly, if a false answer is provided.

Derailment at Waverton on 20 December 1999

On Monday, 20 December 1999 at 8:20 am a driver, who had four weeks previously been certified as competent to drive, was taking a terminating train from number 2 platform at North Sydney railway station to be stabled in the North Sydney car sidings at Lavender Bay. The driver had commenced duties at 4:31 am and the train that he was driving departed Emu Plains at 7:10 am and terminated at North Sydney railway station. The manoeuvre that was then to be undertaken required the driver to proceed through North Sydney railway station tunnel to the end of number 2 platform, then over the track connecting the number 3 platform track onto the down line to the North Shore and then off onto a track called the Waverton shunting neck. When fully on the shunting neck the train was to be reversed and moved into the North Sydney car sidings.

A number of signals was involved in this particular incident. There were two signals at driver height, there was a dwarf signal and there was an overhead gantry signal. The train proceeded along the number 2 platform track passing signal NS317 which was displaying a green over yellow indication. It then passed signal NS311, which was in the North Sydney tunnel, displaying a green over red indication. Those two signals were located at the usual height at about driver level. The train then passed out of the tunnel and the next signal was a dwarf signal NS341. It was displaying a yellow indication. The driver thought that this was the signal which controlled his movements and he passed that signal towards signal NS305 which is a gantry signal. At the time that signal NS305 was displaying red over red. It was located 70 metres beyond the dwarf signal NS341 which the driver thought was the signal that he should follow.

The driver passed signal NS305, the gantry signal, in the stop position. The reason why the signal was in the stop position was because the signals had been set for a train which was proceeding from the number 4 platform at North Sydney railway station down the North Shore railway line and it was intended that this train proceed on its journey before train 96B was manoeuvred into the sidings. Fortunately, the driver of the other train observed that train 96B had derailed and was fouling the down main line and brought his train to a stop. Had that not occurred a collision would have occurred between that train and train 96B. Although train 96B had terminated and was empty, the other train was carrying passengers up the North Shore railway line. The accident had serious potential consequences. An accident was averted because the driver of the other train saw what was occurring and because the track upon which train 96B was proceeding was fitted with catch points which were designed to, and did in fact, automatically derail the train once it had gone through the signal at stop. The catch points were positioned in that area so as to prevent conflicting movements of other trains on the main North Shore railway line. The driver of train 96B thought that the signal that applied to him was the dwarf signal NS341 and he did not believe that the overhead gantry signal NS305 related to him.

This accident, which occurred 18 days after the Glenbrook rail accident, raised serious safety issues. The first and most obvious was how a driver who had been certified to operate trains on his own four weeks previously could have made the mistake that he did in determining which signal applied to the manoeuvre that he was undertaking. The explanation is in the Department of Transport report. This driver had never accompanied an experienced driver while the manoeuvre was undertaken. Nor had he ever undertaken this manoeuvre himself while supervised by another experienced driver or an inspector. It is obvious that he did not have adequate route knowledge and in particular that he did not know which signals were the ones that affected his manoeuvre. The driver involved had been one of the first to come out of a new competency based training program which he had successfully completed. To regard him as having successfully completed the program he could only have been thought to have had adequate route knowledge to undertake this somewhat complicated manoeuvre with unusual signalling on the basis that he had walked over the section of track in a different direction on one occasion.

It appeared that the driver did have some knowledge of the location of the accident in that he had walked over the route from a different direction. This is a completely unsatisfactory way of ensuring that drivers know the route and what signals affect their movements as this accident demonstrates. They should travel in a train with an experienced driver or, more importantly, undertake the manoeuvre themselves under

supervision as part of their training. The inexperience of this driver was, obviously, the immediate cause of this accident. The accident also demonstrated significant deficiencies in the training that the driver received and, in particular, the training in relation to route knowledge.

Another issue this accident raises relates to the location of the signal. In the case of an eight car train the distance between the dwarf signal NS341 and the overhead gantry signal NS305 is less than half the length of the eight car train. It is usual for greater spacing between signals to exist and this could have been a cause of the driver thinking that the dwarf signal was the one which controlled his movements. The two previous signals were at driver height, the dwarf signal was below his height on the track in front of him yet signal NS305 was on an overhead gantry.

The train had gone from a tunnel into daylight and the position of the morning sun may have made the stop indication on signal NS305 less apparent. In addition, the location of the gantry signal may have made it difficult for an inexperienced driver to determine the track to which it referred.

The positioning of signals on overhead gantries has been a matter of discussion in other Inquiries. As previously stated, Counsel Assisting and I met with Lord Cullen who is the Chairman of the Ladbroke Grove Rail Inquiry. Although his inquiry is continuing, there does not appear to be any dispute that in the Paddington accident the signal that was showing a stop indication and was passed in such a way as to enable the train to proceed into a head on collision with a train travelling in the opposite direction was also a gantry signal. The Waverton accident and the Paddington accident would require special consideration to be given to the location of overhead gantry signals because of the additional problems of signal recognition that they may present compared with signals which are on a vertical pole located at the same height as the driver of a train.

I have identified the training, certification and infrastructure issues which this accident raises. However, as with other Department of Transport reports, the report in relation to this accident also raises issues in relation to investigations into and reports on rail accidents. In the Department of Transport's report the author of the report said:

> There was a passivity in the level of co-operation by the organisations involved. It was slow obtaining documents (sic) and some documents remain outstanding. Some people interviewed would not answer questions asked. This occurred despite the seemingly clear (but legally untested) requirements of the Rail Safety Act 1993 in relation to obtaining documents and requiring persons to answer questions.

It is unsatisfactory to say the least, when a rail accident occurs which could have resulted in a collision between an empty train and a passenger train conveying commuters at 8:20 am on a Monday morning, that the investigation of the accident is frustrated by inadequate powers of investigation. The report into this accident further demonstrates the necessity for adequate investigatory powers to be given to persons conducting interviews, with appropriate sanctions for non-co-operation.

The report also recorded that the driver was travelling at about 25 kilometres per hour and that this was contrary to a local rule contained in a local appendix which said that when

engaged in a manoeuvre of this kind that the speed of the train should not exceed 10 kilometres per hour. This was in a local appendix in a section headed "Stabling of trains in number 2 and 3 tunnels". It transpired that although a speed in excess of 10 kilometres per hour did not comply with the local appendix there was no way in which the content of that local appendix was routinely brought to drivers' attention and it seems quite clear that this driver of four weeks experience did not know about it. According to Mr Oliver, there was no requirement on anybody to have copies of the local appendices or to read them. He said:

> They are just out there and somehow it is expected that operators will inculcate their contents to the staff without the staff necessarily having direct access to them. At least the staff would have to go and get access to them by some conscious effort on their part. Then when they do go and get access to them they find they are full of mistakes anyway, so that irrespective of whether a local appendix system should work, I certainly believe that the current system doesn't.

There is little point in having local rules in relation to the movement of trains unless the contents of those rules are communicated to drivers and steps are taken to ensure that they know what those requirements are and that they manage their trains in accordance with them. Again, the overall supervision of safety by a Rail Safety Inspectorate which could follow up on these issues would significantly improve rail safety.

The final observation that I wish to make about this accident is that it revealed matters requiring attention relating to training, assessment and certification of drivers and in relation to infrastructure issues such as the sighting of signals. I was assured during the course of the hearing that steps had been taken to remedy the deficiencies in relation to the training of drivers, but I have no way of independently satisfying myself that this has occurred. This was a potentially serious accident and it is essential that there be a Rail Safety Inspectorate responsible for following up any deficiencies which are revealed to ensure that in fact they have been corrected and that the same deficiencies cannot lead to another accident with the potential that it has for multiple loss of life in future. Since the incident involved not only matters of training but also infrastructure, it is necessary that when an incident like this occurs there is a proper examination of the infrastructure issues. This involves co-operation between the infrastructure owner and maintainer and the organisation responsible for the training, instruction and supervision of train drivers. It is in these overlap areas that there is at present a significant gap in the management of rail safety in New South Wales. It is this gap which the Rail Safety Inspectorate will fill.

Derailment at Hornsby on 11 January 2000

At approximately 6:04 pm on 11 January 2000 the leading bogie of an eight car passenger service to Berowra went through signal HY 57 in the stop position, activated the train stop on that signal and then was derailed by points number 522. Signal HY 57 is located at the northern end of platform 2 at Hornsby railway station. The train had travelled, according to its timetable, until it reached the Hornsby area. Between Waitara and Hornsby the train arrived at signal HY 31, which was in the stop position at approximately 6:01 pm. Signal HY 31 is the admitting signal into the Hornsby controlled interlocking. The train was held there until 6:02 pm and was then given a caution signal, green over red, to proceed to signal HY 35 which was displaying a low speed indication.

The low speed indication required a train to travel at 25 kilometres per hour or less. The train then proceeded around the corner and onto platform 2 and having failed to stop at the stop signal the catch points operated to derail the train. Fortunately, only the leading bogie of the leading car came off the rails and no person sustained injury.

The driver of the train claimed that the accident was caused by defective brakes. However, this seems inconsistent with other evidence that the train accelerated while it was travelling through the platform and after it passed an intermediate train stop and the subsequent testing of the brakes which found them to be operating satisfactorily. I am not able to resolve that issue of fact and neither could the Department of Transport investigator. The intermediate train stop has as its function the regulation of the speed of trains entering the number 2 platform. If a train is recorded as travelling in excess of a particular speed then the intermediate train stop will operate to activate the trip valve on the train causing the air to be released from the brakes and the train to be stopped. The speed at which the intermediate train stop is set is determined by SWU 100(b) and SWU 127(b). This speed is 25 kilometres per hour. For reasons which are not explained in the Department of Transport report into this accident the intermediate train stop was set at 35 kilometres per hour, some 10 kilometres above the speed at which it is supposed to automatically activate to stop a speeding train.

The existence of an intermediate train stop is obviously a safety measure and the inference that can be drawn from the increase in the speed limit above that contained in the operational rule is that it was thought desirable that trains should be proceeding into the platform at a higher speed than the operational rule required. An apparent desire to increase the speed at which trains pass intermediate train stops seems consistent to me with only one view, namely that safety is compromised for the purposes of increasing the speed at which trains move, an imperative of on time running. Otherwise, the safeworking unit could have been changed if 35 kilometres per hour were a safe speed. From the accident it is obvious that it was not, yet the intermediate train stop had been set to accommodate the higher speed.

This accident has a number of disquieting features. First, there was the unexplained increase in the allowable speed for the passing of the intermediate train stop. A proper investigation of this accident would have required the identification of the persons who made the decision, when the decision was made, why it was made and why it was permitted to remain as an operating procedure in contravention of the existing operational rule. The report does not deal with any of these matters. This defect may be due to the lack of powers of the investigator.

Second, the report identified that the positioning of the signal and train stop at the end of the Hornsby platform leaves little margin for error on the part of drivers. The report notes that the train derailed 14 metres past the signal at stop. It does not take much intelligence to realise that even a train which passes this signal at a relatively low speed will still be unable to stop before derailing. Given that the intermediate train stop is 92 metres from the signal at the end of the platform, and was set to 35 kilometres per hour, it is clear that the design leaves little room for human error. There was no material in the report which indicated that there had been any investigation into the reasons why the signals and the train stops were positioned where they were and whether any consideration had been given in the design to issues relating to drivers navigating the area.

The third feature of this accident that is of concern is that the truth as to how it occurred could not be ascertained because technology was not available to be used to identify the precise way in which the train operated. Had a data logger been fitted to the train then it would have been possible to determine the precise movements of the train and these would have become objective facts which could not be disputed. A data logger would have provided objective information regarding when the brakes were applied and what effect they had on retarding the progress of the train. I am told that there is a program in place for the fitting of data loggers to all trains before December 2001. I commend that project in the earnest hope that it will in fact be completed on, or before, time.

A further feature of this accident which is significant is that the train did not have a speedometer. Apparently the driver needed to operate his train making an estimate of the speed at which the train was travelling. This is clearly an unsatisfactory state of affairs. There are speed indicators along the railway track which state the maximum speed for trains to minimise the risk of accident. The whole purpose of having such speed signs is defeated if the trains are not fitted with speedometers which enable the drivers to check whether they are travelling at a safe or unsafe speed in those particular locations. In my view, trains should not be permitted to go into service unless they are fitted with a working speedometer. I heard evidence that drivers are often subject to pressure to take trains into service where the train radio is not working and it is apparent that the same applies to faulty speedometers. This demonstrates an attitude towards safety which falls far below what the public is entitled to expect in the operation of the rail network.

Derailment at Redfern on 6 April 2000

On 6 April 2000 at approximately 9:58 pm an empty eight carriage CityRail passenger train was crossing from the up main line to the Eveleigh dive near Redfern Station. The area it was crossing is so called because the gradient there changes from the 1 in 100 gradient on the up main line to a gradient of 1 in 30. This is to provide access to the Eveleigh presentation centre and requires the trains to pass under the Lawson Street overbridge.

The points number 266A are located 1.10 kilometres on the up main line from Sydney central terminus and consist of a right hand turnout with a standard configuration consisting of two 53 kilogram switches secured to timber sleepers on ballast with an off set in the turnout stock rail only. The left hand stock rail is part of the down rail to the up main line and does not have an offset for the switch. The points are electro-pneumatically driven.

Following meetings that were held in 1997 a decision was made that the then infrastructure owner, RAC, would undertake a remodelling project of the Sydney yard to increase train paths and operational flexibility in preparation for the 2000 Olympic Games. Prior to the project being undertaken a risk analysis was carried out. The risk analysis essentially focused on train operations, commercial aspects, general equipment supply and drainage issues.

Prior to 13 March 2000 points number 266A were trailing points. After the project commenced a decision was made to change these points from being trailing points to being bi-directional points. No separate risk analysis was done in relation to that decision. Indeed, the only risk analysis that appears to have been done in relation to the

whole of the project did not concentrate on the safety implications of any of the features of the work that were to be undertaken. This demonstrates again that the public is not protected by leaving these matters to the organisations involved and that there is a need for an independent safety body to oversee what is happening to ensure that safety issues are given sufficient attention and not treated in a perfunctory manner or, worse still, ignored.

At the time of this derailment the driver of the train was driving over those points in that direction for the first time. It would appear that the train was travelling at a speed in excess of 20 kilometres per hour, 5 kilometres per hour above the maximum safe speed. There were no speed signs or speed boards facing towards trains travelling in that direction indicating the speed at which the train should be travelling. No definitive answer in relation to the speed of the train can be given because there was no data logger fitted to the train which monitored the speed of the train and could be down loaded so as to determine that fact objectively.

The tip of the switch blade at the points was cracked and when the train passed over it, it fractured. In addition, there were imbalances in the wheel sets on the train. The allowable limit for imbalances between wheel sets is 0.8 tonnes. The average load imbalances across the wheel sets of cars C3603 and C3589 were 1.1 tonnes and 1.4 tonnes respectively, although these results could result from the fact that both cars were weighed with deflated air bags and car C3589 had damage to its spreader beams, traction rod assemblies and levelling valve arrangements. Additionally, the wheel diameters on a wheel set of the trailing bogie of car C3589 were outside the allowable tolerance of 0.8 millimetres. Of more concern is the fact that car T4269 had three wheel sets showing imbalances exceeding the allowable limit of 0.65 tonnes, with one wheel set imbalance being 1.2 tonnes. This is despite the fact that the car had only recently been returned to service after major maintenance work, including the replacement of both bogies.

The most likely scenario was that as the train passed over the cracked switch blade the leading bogie of the fifth car mounted the damaged tip of the left hand switch blade and then followed a path between the up main line and the Eveleigh dive pulling off the trailing bogie of the fourth car as well as the last three cars in the consist. There were heavy impact marks and evidence of abrasion on the shank of the leading auto coupler of car C3589 (the fifth car) leading to the conclusion that this car was instrumental in derailing the rear of car C3603 (the fourth car).

The first three cars, although not derailed, were inaccessible in the tunnel under the Lawson Street overbridge. The fourth car had all wheels on its trailing bogie derailed. In addition, all wheels under the fifth (C3589), sixth (T4260) and seventh (T4250) cars were derailed. The last car (C3600) in the consist had all wheels derailed with the exception of its trailing wheel set. Although the fifth car was tilted nominally to 45 degrees due to the coupler locks, all cars remained upright and coupled as a consist. The derailment resulted in some of the derailed bogies laterally displacing the up main line towards the Eveleigh dive, thereby fracturing both rails of the up main line. In addition, the derailment also caused extensive damage to adjacent track and abutment walls as well as associated signalling and electrical services. By the time the train had come to rest, the train consist had travelled a distance of approximately 170 metres past number 266A points. When car T4250 was removed to the Flemington maintenance centre it was noticed that its number five and six wheels had class 5 scaling probably due to the application of a hand

brake during the journey. It is said this scale build up to a class 5 magnitude has significant potential to derail a train.

Although there were no passengers on the train, and neither the driver nor the guard sustained any injury, the disruption to rail services from this incident was very significant. The derailment effectively blocked both up and down main lines along which most inter urban services in that area operated. Recovery work commenced about midnight but was hampered by the limited access permitted in the dive and the jamming of the fifth carriage between the track and the walls. The lines were only restored to full operation after 58 hours of continuous work. CityRail restored the down main line to limited operations at 5:00 pm on the day after the accident, just prior to the start of the evening peak. Consequently, there was serious disruption to morning peak services with 79 trains being delayed for between 4 and 33 minutes, along with some minor disruption to the evening peak services.

As the above short précis demonstrates there were many causes of this accident. RAC, which was the infrastructure owner, made a decision to change these points to bi-directional movement but there was no proper analysis done of the steps that needed to be undertaken to ensure that no safety risk was involved. RSA undertook the work but, obviously enough, did not replace a switch blade which had a cracked tip which eventually could, and in this case did, contribute to a train derailment. This was the first time that the driver had driven over that set of points. The maximum speed in the up direction is specified in the working timetable as 15 kilometres per hour. A weekly notice was issued on 10 March 2000 stating that bi-directional movement would be permitted in that area. However the weekly notice did not state the speed at which trains should travel. In the result, the driver probably travelled at a speed which exceeded 15 kilometres per hour and the speed contributed to the cause of the derailment. The State Rail Authority was responsible for the training and knowledge of the driver. In addition, the SRA owned the train. For reasons that remain unexplained the train appears to have been driven around with the hand brake on one of the wheels on thereby causing the scaling later identified.

Added to all of this is the fact that there does not appear to have been any attempt to bring the three rail entities concerned together to identify the combination of design, construction, inspection and train operation which needed to be done to ensure that when this new work was commissioned the trains could be safely operated over it.

Again, this incident demonstrates that in these areas of overlap between organisations it is essential to have an impartial, independent and active body engaged in the safety management of new work so as to prevent incidents like this from occurring. A Rail Safety Inspectorate will ensure that proper procedures are in place in relation to the safety of the rolling stock, systems of inspection, systems of training and communication of safety critical information to employees. The fact that each of these was lacking in this case caused this derailment with the very substantial disruption and inconvenience to the travelling public that resulted.

Conclusions

The Glenbrook accident and the eight other accidents have identified areas where improvements to the safety of rail operations must be made. It is possible to represent

diagrammatically the relative significance of the 63 factors identified in the analysis of the Glenbrook accident and the other eight accidents in a table. Figure 3 demonstrates this.

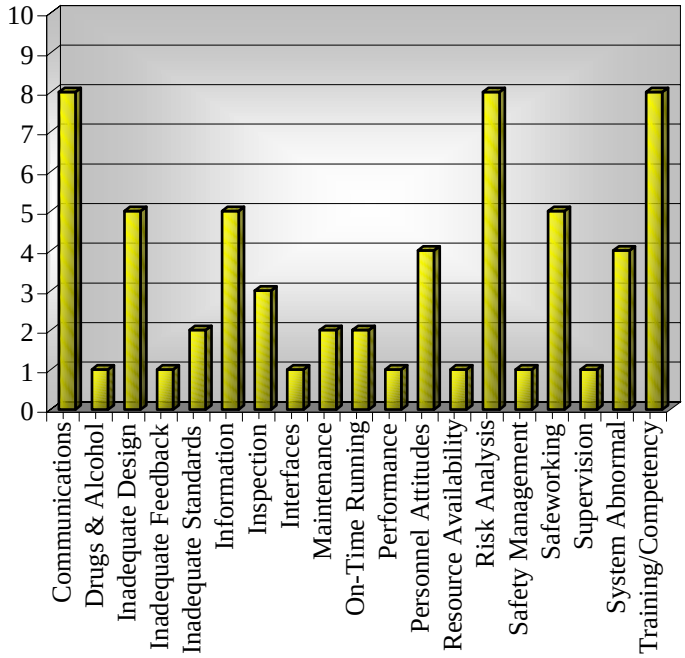


Figure 3 Categories of Contributing Factors

The first and most obvious is in the area of communications. The deficiencies in communications that were evident and that caused the Glenbrook rail accident have already been discussed. The parallels between the non-communication of the relevant information to train drivers and the tragic deaths at Kerrabee and Bell demonstrate the importance of adequate systems and procedures for communications. In the Glenbrook rail accident the driver of the inter city train was not told by the signaller at Penrith that he did not know the location of the Indian Pacific and assumed that the track was clear. The driver of the freight train which struck the two employees using the track at Kerrabee as a means of access did not know that there was a work group on or near the track at that location. The driver of the train that struck and killed the track side worker in the Bell accident was not told that workers were on the track in that location. The driver of the train which derailed at Hornsby on 9 July 1999 was not told that he was being diverted onto a loop line. The provision of such information to train drivers is essential in order for them to know about hazards that exist in the environment in which they are working and in turn are essential to ensure that train operations are safe.

To enable safety critical information to be provided the equipment needs to be available to do so. This means that track side workers must have the equipment necessary for them to communicate directly with train controllers. If that equipment had been provided to the ganger at Kerrabee and he had been able to communicate directly with the train controller at Broadmeadow about the trains that may have been in a location which could hit him if he went onto the track, that accident would have been avoided. The same applies in relation to the Bell accident. In the Hornsby accident the train was not logged in to the Metronet train radio and for that reason the signaller was not able to tell the

driver, via the Metronet train radio, that he was about to be shunted off onto a loop line notwithstanding his obvious expectation that he would be proceeding in the ordinary way on the down main line. That train should not have been in service if the Metronet train radio was not logged in and working. Nor did the signaller use the alternative means of a general broadcast notwithstanding that he had been directed to inform the driver of the change in the route of the train.

The third area in relation to communications which these accidents demonstrate is the need for a communications protocol. I have already discussed the deficiencies in the communications protocol which contributed to the Glenbrook rail accident. Lack of an appropriate communications protocol contributed to the Kerrabee accident. If there is no protocol for clearly stating information, recording and accurately repeating it, then the risk of essential information being omitted is obvious. It seems quite probable that in the Kerrabee accident the ganger was not told about the only train that posed a threat to his and his crew's life. This, in very large measure, was due to the absence of any clear protocol for writing down and reading back accurately the information about the location of that train. I have made the observation that communication should have been direct between the ganger at the track side and the Broadmeadow train controller. However, even if a three way system of communication was being used and each participant was required to write down and read back the precise information in relation to train movements, the risk of the critical information not being communicated would be minimised. The deficiencies in the communications protocol which contributed to the deaths at Kerrabee and Bell in 1998 and at Glenbrook in 1999 were matters about which the SRA was on notice. In 1997 Mr Hussey, who was then the Crew Operations Manager of the National Rail Corporation, had complained to the SRA about the failure to enforce the communications protocol and received an acknowledgment from Mr MacFarlane, the Manager of Safeworking which included the statement:

> Our basic Safeworking Manual SWU 135 and SWU 136 outlines the correct protocols to be used, however, management and staff still neglect to comply.

The accidents resulting in deaths at Kerrabee in 1998 and at Glenbrook in 1999 were contributed to by the continuing neglect of staff to comply with the protocols required and the unconscionable failure of the government rail organisations to do anything about it to ensure compliance with the relevant protocol.

The need for improvement to the safety of rail operations in the areas of communications technology, communications procedure and, in particular, a communications protocol is apparent from the Glenbrook rail accident and the eight other rail accidents. Matters of procedure and protocol involve issues of training.

The final area of poor communications which is apparent from all these accidents relates to dissemination of information about modifications to the system, procedures or otherwise to safety critical staff and others who need to be aware of the changes. In the Kerrabee incident, no notification or explanation had been given to the work group regarding the change to the signal telephone operation, just as the Indian Pacific crew at Glenbrook was unaware of these modifications which had been made to the signal telephone. In the Hornsby derailment, no information had been conveyed to train drivers regarding the changes to the infrastructure and, in particular, how the appearance of the track had changed from a driver's perspective. The Olympic Park derailment on 2

September 1999 revealed that specified lubricators were removed from the project without reference to the designers of the infrastructure. The Redfern incident involved the alteration of a set of points to bi-directional usage without anyone being advised of speed limits for travel across the points. Clearly, had accurate information regarding such safety critical alterations been properly conveyed to the people who needed to be aware of the changes, then there is every likelihood these accidents would not have occurred.

In all of the additional eight rail accidents there were deficiencies in the training of the staff which contributed to each accident. The most obvious was in relation to the Waverton accident. That driver had inadequate route knowledge and did not know which signals governed the movement of the train which he was driving. He had never driven a train over that particular route before. He had only walked over it in a direction different to that in which he drove the train. One can only conclude from this that it was thought that that was sufficient route knowledge and nothing more needed to be done.

In relation to training it is not enough to assume that employees will appreciate the deficiencies that exist in their knowledge of how they should go about their duties. It is necessary for them to be assessed and for proper information to be recorded and passed on in relation to their assessment so that any deficiencies can be identified and corrected.

The Olympic Park accident on 14 November 1999 was not satisfactorily investigated, but one of the issues that it did reveal in relation to the inexperienced driver is that there was no record of his earlier assessments, and the competency assessment that did exist showed that it had taken place over a period of 53 minutes. This was to determine whether or not he was competent to drive a train by himself on that route. If employees are not properly assessed then their competence to perform their tasks cannot be determined. Nor is it possible to identify the areas where their knowledge and experience is lacking. Without that it is not possible to bring them to a level of competence where they are able to operate safely on a complex and complicated rail network. This competency assessment suggests a perfunctory re-certification rather than a real assessment of a driver's abilities.

These eight accidents, as with the Glenbrook rail accident, demonstrate deficiencies both in relation to the content of safeworking units and the emphasis placed upon them. The existence of debate as to which safeworking unit may or may not apply demonstrates the ineffectiveness of safeworking units as a primary means of ensuring safety in rail operations. The risk of track side workers being hit by a train is the obvious risk that needs to be guarded against. It should not be necessary for employees to consider and choose from several different possible safeworking units when it is the outcome that needs to be concentrated upon. The outcome to be achieved is simple, it is to separate trains from track side workers so both are not on the same section of track or in close proximity to each other at the same time. The action taken by the ganger at Kerrabee did involve an assessment of the relevant risk, namely being struck by a train at the time he would be going through the cutting. He believed that on the information he had received he had the ability to control the hazard by determining to enter the cutting when there were no trains in the area. The system of work failed him because of a lack of available technology to enable him to communicate directly with the train controller at Broadmeadow and because of the failure of the protocol involving the reading back and confirmation of the information being conveyed.

A safeworking unit which stated that separation of trains and track site workers should be the first safety principle to be applied would achieve the result that exclusive possession could be given, where necessary, to the track at certain specified times. This should be done by prior arrangement well in advance. However, where work is urgent or workers only need to be on site for a short period of time, then there should be a simple procedure which provides them with a track possession. For example, at Kerrabee, by prior arrangement the work gang could have been given exclusive possession of the area of track in the cutting between certain times and train movements controlled accordingly. Alternatively, with proper communications equipment and procedures the same results could have been achieved. The senior person in charge of the work group would communicate directly with the train controller at Broadmeadow. The train controller would then give the senior person exclusive possession of the track and for a specified period of time, the appropriate written authorities having been completed by each party and read back. This is but an illustration of simple straight forward procedures which can readily be used to avoid tragedies of the kind which occurred at Kerrabee and Bell.

The concerns with safeworking units that one finds in the reports in relation to these accidents is itself related to a wider issue, namely the general lack of safety awareness. Such general lack of safety awareness was apparent in the Glenbrook rail accident. It permeates, in different ways, these eight rail accidents. That trains should be in service without a working train radio demonstrates a lack of awareness of essential safety matters. The train involved in the derailment at Hornsby on 11 January 2000 did not have a working speedometer. In the Hornsby derailment on 9 July 1999 employees were told to communicate safety critical information to the driver that he was to be put on the down loop and would not be proceeding on the down main line as anyone would have known he expected to do. That direction to communicate that information appears to have been ignored. When bi-directional running was to be undertaken at the Eveleigh dive at Redfern no attention was given to putting up signs about speed limits while manoeuvres were to take place. Lubrication of the track to obviate the risk of wheel wear causing a derailment at Olympic Park was dispensed with, although the danger of a derailment became obvious at Easter 1998 when the risk was identified. Yet nothing was done. One could go on and on and identify and highlight other illustrations of a lack of awareness of the need for safety in rail operations. In a railway where an adequate safety culture existed, employees would be co-operating with each other and providing full information to others rather than confining their activity to what they believed were the obligations imposed upon them under some safeworking unit.

These accidents did not occur because the employees were reckless or careless but resulted, in my opinion, from neglect of safety management. The emphasis appears to have been so heavily placed on on time running that safety considerations were not at the forefront of the minds of the employees carrying out their duties. While that position remains there is an ongoing threat to the safety of the travelling public of sufficient magnitude to produce another catastrophe.

The lack of safety awareness needs to be addressed within each of the rail organisations. It also needs to be addressed in areas where the rail entities need to work together. Many of these accidents demonstrate areas where there is an overlap of responsibilities between the rail organisations. The derailment at Hornsby on 9 July 1999 is a good example. RAC owned the infrastructure that was remodelled. RSA did the work. Whether either of them communicated to SRA what had been done and what effect it would have on the

way in which their drivers operated their trains is not known. What is known is that the driver of the particular train did not recognise that he was on a loop line because of the upgrading that had been done. Nor had he been trained in the signals that controlled the movement of his train. The signallers who were employed by SRA but subcontracted out to RAC to provide network control functions did not tell the driver about the change of route. Nor did the signaller follow the direction given by his superior that he should ensure that the driver received that information. RAC and SRA were responsible for the location of the signals which were capable of giving rise to confusion. The potential for confusion could have been removed by adequate route training by the SRA of its driver. Other illustrations can be given. However, these observations sufficiently illustrate the need for ensuring that the entities involved in rail operations work together.

When Mr Oliver was asked about these matters by Senior Counsel Assisting his view was that there appeared to be no overall strategic planning of rail safety and management of rail safety. He stated that whilst he believed that there was an attempt by the Transport Safety Bureau within the Department of Transport to provide that process, its powers to implement it were limited. He believed there has however been a conscious and deliberate effort to try to improve the strategic planning between the rail organisations. The problem, he said however, was that it was very difficult to avoid people going their own way however much they are supposedly being co-ordinated. He went on to say that it was very difficult to avoid territorial disputes and demarcation issues. This of course has been exemplified in the management of network control. He stated that rail authorities tend to believe that they have their own safety management systems and conduct themselves within their own systems rather than taking the broader view. It is one thing to get people to talk to each other and to try to understand a need for collaboration, but it is a different thing again to actually achieve a degree of collaboration that is necessary to obtain the optimal level of rail safety.

Under the present system there is no organisation at an operational level which deals with these issues. It is not difficult to find other areas where an integrated and co-ordinated approach to safety is necessary. The location of the catch points at Olympic Park which could have caused serious loss of life or injury is another example. The catch points involved in that accident were located 10 metres from the signal at stop and had the effect of directing the train towards an over head electrical stanchion or down an embankment. Such a design was inherently defective. If consultation had taken place between train drivers and the infrastructure designers and builders that danger would have become obvious. The signal and the catch points could have been located at different positions so that the danger could have been avoided.

Mr Cowling, the Chief Executive Officer of RAC, made the observation that:

> Co-operation needs to take place between the infrastructure designer and the operator. If you have an infrastructure designer building an infrastructure in isolation of the operator, you can get situations like this that operators or somebody who drives a train for a living says: this is the wrong place to put a catch point. We need to have co-operation between the entities. That is happening now and there is a program now to work with the SRA to identify these types of situations.

One only has the evidence of this witness that such co-operation is now occurring. The level of the co-operation and its effectiveness is not something that one is able to measure. It is, however, something that can be monitored by an independent Rail Safety Inspectorate.

These matters make it plain that it is essential that there be an independent Rail Safety Inspectorate responsible for safety matters. RAC is limited in what it can spend money on. Its priorities, I believe, do not put safety as the first priority in the conduct of its affairs.

The observations that I have made about the Glenbrook rail accident and the other eight accidents show that the SRA has demonstrated that it is incapable of managing its own safety regime by itself. Several innovations have been undertaken by it to improve the safety of its operations but I have no way of determining whether they have been effective other than by the evidence that I have heard. Regrettably, the unchallenged evidence that I heard from a number of witnesses demonstrated that although SRA claims to have put in place safety management systems which should ensure the safe operation of the railway from their perspective, the result had not been achieved by January 2000. Again, this demonstrates the need for an independent Rail Safety Inspectorate to oversee and supervise, in the public interest, the way in which SRA is managing the safety of its operations. The need for such an organisation is however obvious from the circumstances of the Glenbrook rail accident, and these other eight rail accidents, the reports of which I have been asked to consider.

The final matter that I wish to reiterate in relation to the eight accidents is that the reports in relation to them have clearly demonstrated the need for an independent Rail Accident Investigation Board. When one looks at the investigations that form part of the reports I have been asked to consider, a number of deficiencies is apparent. I have already referred to the concentration upon which safeworking units applied. The focus of the reports should have been an examination of the matters which caused or contributed to the accident, not whether a safety rule applied and whether it had been breached. In many cases, and the Glenbrook rail accident is an example, the employees simply did not know the safety rule. The question then becomes why they did not know it, what should be done to ensure that there are adequate safety rules and procedures, and that the employees know how to carry them out. It seems to me, that in many cases the safeworking units may operate as a distraction and an impediment to safety management rather than ensuring the safe operation of the railways.

The reports which I have been asked to consider demonstrate a lack of proper analysis of all the relevant issues in relation to the safety matters that arose in the Olympic Park accident on 2 September 1999. There is no examination of how it came about that the catch points could be positioned in such a way as to create a hazard. The report does not discuss the process by which the specification for the use of lubricators on the track to avoid the risk of derailment of the kind that occurred was dispensed with, by whom or why. There is simply a broad reference to environmental issues. The report later observes that when attention was directed to that issue an alternative method of lubrication was identified and that this was subsequently used after the derailment. No examination took place in the report as to why this could not have been done earlier.

In the examination of the circumstances of the derailment on 11 January 2000 at Hornsby extensive reference was made to the fact that the intermediate train stop was designed to operate when trains travelled in excess of 25 kilometres per hour but that the speed limit had been restricted to 35 kilometres per hour. There was no examination as to why this was done, when it was done or who was responsible for it. Nor was there any examination of the circumstances under which the intermediate train stop was positioned at a location such that trains could pass then accelerate before they reached the stop signal which was designed to be protected by the intermediate train stop.

It is possible to give many more illustrations of the deficiencies in the quality of the reports in relation to the eight other rail accidents. One of the functions of the Rail Accident Investigation Board should be to investigate such accidents itself, or to require reports in relation to such accidents and if these questions which are critical to safety management remain unanswered the report should be returned to its authors with a direction that further investigation be undertaken until all relevant safety issues have been explored and proposals formulated as to how the hazards identified can be removed.

Lest it appear that I am being overly critical of the authors of the reports that have been referred to me I should acknowledge that the resources provided to the Department of Transport may not have been adequate to deal with these matters. The evidence of Mr Hall demonstrates that his staff were spread very thinly and that there were significant limitations on the extent to which they could carry out their safety investigation functions. From his evidence it would appear that a great deal of their time was spent going through the formalities of certification and re-certification and that there was little time for active safety supervision. This means that the independent Rail Safety Inspectorate needs to be properly resourced if it is to carry out its functions.

Another reason for the deficiencies in the reports which I have identified may relate to the inadequate powers of investigation that have been given to the investigators under the Rail Safety Act.

Although I am not able to determine the truth or falsity of what witnesses have said other objective evidence might suggest that when the driver of the train that derailed at Olympic Park on 14 November 1999 stated that he had a proceed indication, that that answer may have been false or misleading. Similarly, when the driver stated in relation to the Hornsby derailment which occurred on 11 January 2000 that the cause of that derailment was that the brakes of his train were not working effectively, this may have been less than an entirely truthful and candid statement of fact. Under the legislation there is no sanction that may be applied to persons who provide false or misleading statements to someone investigating an accident. That deficiency needs to be remedied in the legislation by the establishment of a Rail Accident Investigation Board. The need to compel answers to questions asked in a safety critical investigation is an obvious one.

The fact that the present legislative powers do not work is clear from the report in relation to the Waverton accident on 20 December 1999 where the author of that report referred to the “passivity in the level of co-operation”. It is unacceptable, to say the least, for rail entities to demonstrate any lack of co-operation with a safety critical investigation. The public interest in the safety of rail operations must be paramount. It is obvious that individual employees will wish to protect themselves from blame or prosecution but there need to be appropriate mechanisms put in place to ensure that the truth of what occurred

can be established so that safety improvements can be made without prejudicing the common law privilege against self-incrimination.

The eight rail accidents, and the Glenbrook rail accident, demonstrate there is a number of areas where it is necessary for me to make recommendations in relation to the improvement of the safety of rail operations. During the course of the evidence, many of the matters to which I have referred in this chapter were the subject of evidence. Many of them were raised in circumstances where it was suggested that improvements were being made and I was invited to consider various alternative ways in which these matters could be addressed. Accordingly, before I turn to the methods by which rail safety should be managed, I shall deal with a number of specific safety issues which arose during the course of the evidence.

7. Specific Rail Safety Issues

Training

Deficiencies in the training and recertification of drivers, signallers and train controllers have previously been identified as contributing factors to the Glenbrook rail accident and to many of the other accidents which I have been asked to consider. The lack of training was not confined to the operational employees. In the first and second stages of the hearings I had assumed that the Network Operations Superintendents knew the operations on the rail network that they were employed to supervise.

In the third stage of the hearings Mr Graham Fozzard, the elected Secretary of the Signals Branch of the RBTU was asked his view of the level of supervision of signallers and stated:

> Well there is a problem with the word "supervision". In that regard the NOS, the Network Operations Superintendents do not know the actual operations of the signal boxes.

This state of affairs developed because the relevant trade union prohibited the training of persons other than the signallers in the way in which signal boxes operated. The result was that the Network Operations Superintendents either sat in a corner of the signal boxes and did nothing unless there was some disruption of the timetable or limited their activities to the carrying out of a discrete direction of a supervisor, such as the direction that was given to a Network Operations Superintendent to breathalyse Mr Mulholland, the signaller at Penrith at the time of the Glenbrook rail accident. That officer said in evidence that he was sent to the signal box to breathalyse Mr Mulholland immediately after the accident but did not ask him anything about the accident because the request made of him was to attend the signal box and breathalyse the signaller. Network Operations Superintendents should be trained in the operations of signal boxes if those positions are to continue rather than just sit in the corner of the signal box and do nothing unless there is a disruption to the timetable.

Evidence indicated that several decades ago technical knowledge about how to drive a train or control a signal box was acquired slowly over a long period of time, usually from persons who were experienced in the particular area. A number of drivers gave evidence about having worked with very experienced drivers who taught them not only the way in which trains should be operated, but also taught them about particular risks that might appear and particular precautions that should be followed. I was told by experienced drivers that when they had learned from experienced drivers they were told that if the signal was other than green over green then the appropriate procedure was to take hold of the train and drive it gently along. If anything other than that signal indication was displayed then timetables went out the window and the safe operation of the train was the first priority.

Mr Kevin Band, the Executive General Manager, Safety of Queensland Rail stated that after the operational rules in Queensland were simplified a number of employees told him that this was the first time that they had understood what the rules were about. Some of them had been working in the railways for between 20 and 40 years. Rail employees were required to attend courses but these were described as "chalk and talk" by one

witness. Several experienced rail employees who gave evidence stated that they understood what they were supposed to say about a particular safeworking rule but that they did not understand the intent behind it and it did not translate into what they did in practice. What they did in practice depended upon what they learned from other more experienced employees as part of their on the job training.

It is clear that the discipline within the operations of the New South Wales government railways and the system of on the job training produced safe rail operations. I observed in the second interim report that according to *The Railways of New South Wales 1855 to 1955* there was not a single instance of death to a passenger due to a train accident on the New South Wales railways between 1926 and 1948. This is notwithstanding that between 1905 and 1954 the New South Wales railways grew in the same period from transporting 35,158,150 passengers per year to 278,904,236 passengers per year. This may have been because there was not the coincidence of multiple causes that combine to cause a catastrophic accident or it may be because the attitude towards safety was much stronger and entrenched. That safety culture may have been perpetuated and maintained by the existence of persons who were visibly engaged in safety. Mr Oliver explained:

> Back in previous times there was much more emphasis on having dedicated traffic officers, they used to call them, and they used to be out there to manage the rail safety aspects of the site. Not occupational health and safety, but the protection from other trains and so on, and there was a lot more security then because these people were dedicated to the task, rather than trying to fit it in amongst their other activities on the site.

If it were necessary to recruit additional drivers to the metropolitan network they were usually recruited from the ranks of freight drivers and therefore had acquired some considerable experience in relation to the operation of trains and safety related matters as a result of that experience. It was realised that it would be necessary to recruit 200 new drivers for the 2000 Olympic Games.

Many of these drivers were recruited from the ranks of guards and other operational areas. Unlike the previous decades most of them did not have driving experience before they undertook their training. It was necessary for them to be trained quickly. Unlike some European countries the training facilities did not include modern simulators which could simulate fog, rain or emergencies. The drivers were trained in three basic areas to do with train operation, safeworking and route knowledge.

There has been no adequate substitute for the many years of on the job training that train drivers previously received and the methods by which they were recruited and trained to fulfil these roles has been inadequate, at least until recent times, in a number of respects.

Mr Christopher Dandridge, Employee Relations Manager, Operations Division of the SRA gave evidence about a number of changes in the process of recruitment which were intended to improve the quality of operational staff employed by the SRA.

In January 1999 a new procedure for the selection of guards came into operation. The professional recruitment agency Lewis Cadman Consulting assisted with the recruitment process. Applicants were fully briefed on the functions of the position for which they were applying and then given the opportunity to apply. Lewis Cadman undertook the

original screening and then recommended candidates to proceed to psychometric testing. Psychometric testing was designed to assess such matters as cognitive factors and personal attributes such as attention spans, decision making ability, self confidence and the ability to self monitor. Those who did well went before a selection panel, which included a representative of Lewis Cadman, to be interviewed. The best candidates were chosen after satisfying medical standards. If selected, they then began a training regime.

Mr Dandridge said that the SRA is still to do a validation of that process as to whether it is achieving the ends for which it was designed. Whilst there is no validation process he had received positive feedback as to the performance on New Year's Eve 2000.

In relation to drivers the process of selection was changed in August 1999. At that point consultants were brought in to assist to undertake a job analysis into the competency or behaviour traits that were required to make a good driver. Qualities identified included attention span, self monitoring, safeworking, self confidence and the ability to make decisions alone. There was an interviewing panel which had representatives from Crew Management, a representative from Lewis Cadman and a representative from Mr Dandridge's unit. Psychometric testing was carried out and examined the speed of decision making and self confidence. It was emphasised that if you combined those matters and found that there was a low level of self monitoring, a person could be at risk of making a wrong decision. The psychometric testing, it was said, was designed to pick up personnel who were likely to panic in an emergency situation. This screening process is all designed to minimise the risk of selecting unsuitable persons for the position of driver.

In March 2000 a similar process of recruitment was established in relation to signallers. The recruitment consultants used in that process considered vigilance and concentration as representational task type functions. Conversation skills are of the utmost importance. It is necessary to ensure that applicants have the right attitude to safety. Mr Dandridge thought that the psychometric testing was foolproof because it has a number of reverse questions which meant that the same matter is asked in three different ways. He emphasised that what they were looking for were desirable characteristics rather than academic qualifications. The majority of persons employed in these positions had the School Certificate although there was a not insignificant number with the Higher School Certificate. He agreed that the Higher School Certificate recruits were better in communication techniques. The number of applicants exceeds the demand so that the SRA can be selective.

Mr Dandridge said there had been a policy of encouraging women applicants over the last 18 months. He said that the SRA had an exemption from the Anti-Discrimination Board to try to endeavour to increase the representation of women. At the present time there are 17 women out of 1,290 drivers, 203 women out of 1,050 guards and 30 women out of 350 signallers.

The female recruits have been provided with mentors to give them personal advice and assistance and as a result the retention of women recruits has improved. In 1998 the attrition rate of women was 7.3 per cent. In 1999 it was reduced to 1.5 per cent. Thus previously, approximately seven in every 100 did not last longer than a period of about three to six months and that this was reduced to 1.5 per cent.

The systems for the selection of guards, drivers and signallers are an improvement on the systems that previously existed. The period of time for which the new selection processes have been operating has been too short for any assessment to be made of whether better quality staff are being employed. It was not possible for me during the course of the inquiry to conduct any study to see if this were the case. Nevertheless, I accept that the activity undertaken by the SRA is a genuine endeavour to improve the quality of the staff being recruited into the railway service. This more rigorous process of selection should be encouraged.

Selection of suitable staff is an extremely important first step in improving the safety of rail operations. It is then necessary to ensure that they are properly trained.

Ms Fiona Love, the Manager, Australian Rail Training stated that when she took up her position in 1998 the level of training that SRA staff had received was uneven. She stated that there was:

> …A mastering model where people spent time on the job, and often had access informally to workplace coaches, so there were some aspects of training that were very positive and there were other aspects of training that were very poor.

Counsel Assisting asked her what was unsatisfactory about the mastering model and she stated:

> …What is particularly unsatisfactory in an industry that operates under legislation such as the Rail Safety Act is that we were unable to be able to define the competence of any staff at any point in time, because it may be that they were very competent, it may be that they were struggling to have competence, but we did not have systems in place to help us to be able to articulate the competence of staff in safety critical areas.

Australian Rail Training is owned by the SRA. It trains not only SRA employees, but employees from other businesses such as the construction industry, whose employees are employed in rail operations such as Fleur Daniel, Philips CCTV Installations and Barclay Mowlem. Australian Rail Training is a registered training institution and as such has to comply with national principles in relation to the revision of vocational education and training including competency based training. It teaches all types of staff – drivers, guards, signallers, controllers, station staff, station managers, duty managers, fleet maintenance and so on. It deals with 12,000 to 15,000 trainees each year. During the period prior to the 2000 Olympic Games the numbers went up to 20,000. She said the shortest course was eight hours, the longest course was three years for drivers.

She stated that in recent times there has been a shift from the mastering model to a system of competency based training. Under the mastering model employees would learn informally on the job but their training would also include formal training in the safeworking units.

Under the mastering model the safeworking units were taught in a classroom without practical training involving the practical application of the safeworking rules in variable situations. Trainee drivers spent ten weeks with a driver trainer. No records were kept of

the activities carried out, no formal assessment was conducted and there was no syllabus. It appears the only assessment carried out was by train crew inspectors who asked verbal questions. There was no confirmation in a practical sense of the effectiveness of the on the job training. Ms Love believed, however, that the inspectors made sure that the drivers understood the core safeworking issues.

After ten weeks with a trainer driver the trainees then underwent road knowledge training and were given an oral examination. However, no documentation was kept in relation to the oral examination.

Ms Love was dissatisfied with a number of features of the training systems that existed. She was particularly dissatisfied with the way in which the safeworking rules were taught. She stated that in the sessions dealing with the safeworking units where staff with operational experience were included, there were hours and hours of debate about the meaning of the rules and often, because of this debate the trainer had to leave the room and telephone the safeworking section for an interpretation.

Ms Love's view was that where operational rules are taught, the intention behind the rules should also be taught. The first time that the intention behind the rules was taught was in 1999. Ironically, this was related to the amendments to safeworking rules which had not been authorised by the Department of Transport. Ms Love was of the view that the safeworking rules should be reduced to basic principles and that they should be taught as such. Thus the rules should identify safety principles involved in the rules rather than focusing on whether or not a safeworking unit applied to a particular circumstance. She said that the system of training used now is that recruits are not trained on the specific words, they are trained on the safety principles involved in the rules. In her view, the safeworking units should not be seen as a set of isolated rules but as a set of safety principles that contribute to the safe running of the railway.

In her view, the training should emphasise looking at the key safety points in the job. Recruits should have inculcated in them the relationship between the work they perform and how it relates to the work that other people perform in the operation of the rail network. There also needed to be training in the effective adoption of communications protocols, discipline in their application and an understanding of why it is important that they be followed. The area of communications protocols is an area in which there has been inexcusable neglect.

She stated that in the rewriting of the safeworking units there should be a separation of the narrative material from the procedures and that diagrams should be used as an aid to the understanding of the rules.

When it came to the training of staff in rewritten safeworking units, she stated she did not believe in the "big bang" approach of having one set of rules one day and a new set the next day. She believed a staged introduction would allow a more systematic approach to training and that pilot courses should first be introduced and a curriculum developed. She also thought that there should be an agreed time for the changeover to occur so there can be some assessment of the effectiveness of the new rules and additional training on the job to ensure that the employees understood the changes and that some months after the changes have been introduced a validation process should occur to ensure that the training in the new set of rules had been effective.

She had instituted a system which enables the trainees to participate in the training process through group work, discussion, problem solving and so on. In that style of teaching she said the trainer is more a facilitator than an instructor. Formerly, safeworking procedures had been taught by the trainer doing all the talking while the students sat in silence. When that is done it is difficult to know whether the trainee is understanding what is being said and absorbing it. Under the system in which the trainees participate, the trainers are able to determine whether or not the trainees are acquiring the necessary knowledge.

The introduction of the new system of training enabled Ms Love to determine whether the drivers employed by the SRA were competent or not in their ability to analyse situations, to solve problems and to determine the course of conduct that they should undertake in particular circumstances.

This approach should improve the quality of training that employees are receiving. In addition, however, steps need to be taken to ensure that the existing drivers who were taught under the previous system have the requisite level of competence and understanding of safety procedures. An attempt to achieve that objective was made by the use of a recertification program. Ms Love thought that many drivers saw the previous system of recertification as a routine requirement and more a nuisance than a benefit and consequently it was something which did not affect their behaviour. Evidence about the recertification process demonstrated that, in some cases, it was perfunctory.

There are now refresher courses every 16 weeks involving one day of classroom training and one day of practical training, using participatory systems of training. It will be necessary to monitor if these systems have been effective.

Ms Love also gave evidence about improvements to the training of guards. It was her view that the systems of training for guards prior to 1996 were not well targeted for their responsibilities. Much of the material taught to them as part of their safeworking qualification was never going to be used by them. A new course was commenced in March 2000 with a significant portion of it being practical instruction rather than in the classroom. This has resulted in increased levels of trainee satisfaction from this change.

She said there had been a history of poor training of signallers in the SRA. They had always been denied appropriate access to well structured initial and refresher training. Her view accorded with the evidence of Mr Fozzard, the Secretary of the Signals Branch of the RBTU.

Mr Fozzard stated in evidence that the signals branch of that trade union has 500 to 600 members. His evidence about the way in which signallers acquired their knowledge, skill and qualifications may explain why Mr Mulholland, the signaller at Penrith at the time of the Glenbrook rail accident, did not have the experience or skill to manage the safe passage of trains through an automatic area of signalling during a signal failure. Mr Fozzard gave the following evidence:

> …[H]ave there been deficiencies in the training of signallers?
>
> Certainly.

In what respects?

There was – the whole context of training signallers revolved around the safeworking units or the safeworking manuals, as such. Up until just recently that was it.

What does that mean?

All it meant was that you attended either a class at Petersham, or you did the safeworking in your own time. You sat an examination for safeworking and you either passed or you were found competent or you had sufficient knowledge and you then became a signaller.

That was an examination based upon, in effect, a textbook approach to signalling?

Correct.

Whether or not you passed the exam on the safeworking unit?

You certainly had to pass the safeworking to be qualified, yes.

That is all you had to do?

Yes.

There was no assessment of people within the signal boxes or in any practical environment?

Not until just recently, no.

From your experience, was that an adequate level of training for people to perform signalling functions?

No.

Why Not? What happened when they actually got out on the job?

They had no practical experience. There was no assessment in their competencies or an aptitude to perform their tasks particularly at a time of incidents, how to apply the regulation.

How did they get by at all?

A suck it and see episode.

What does that mean?

Trial and error, if they got it right they just happened to get it right. If they happened to get it wrong they got a paper.

Or an accident happens?

Yes.

And you didn't regard it as being a particularly satisfactory way of training or supervising signallers?

No.

COMMISSIONER:
I don't understand how they could possibly operate a signal box if they had just read the safeworking units and then they go to the signal box?

Well, what actually happened, they actually qualified in the safeworking and then go to a signal box. The signal boxes are graded. You go to a signal box and learn the operations of that box, the local working that applies to it and then take it up.

COUNSEL ASSISTING:
For practical purposes, isn't what would happen would be they would pass the exam, go to the signal box, somebody would teach them in the signal box what they should do to operate the particular signal box, and they may learn good habits or bad habits and that is all they have in terms of their repository of knowledge in order to conduct their affairs?

That's correct.

If the signaller happened to have a good teacher in that signal box he might be a competent and safe signaller, but if he had a bad teacher who had bad habits, he would have no way of identifying those bad habits?

That's correct.

That is, that happens in your observation? People have learned bad habits?

Correct.

And not been aware that they were?

Yes.

What is a bad habit?

Just a simple one is you need to communicate information as soon as it becomes readily available, some people don't even practise that.

What do they do when it comes to communicating information?

They just don't communicate.

It can be seen from this evidence why the weaknesses in the training of signallers contributed to accidents. The accident at Hornsby on 6 July 1999 and at Glenbrook on 2 December 1999 are good illustrations of what happens when the deficiencies identified by Mr Fozzard are permitted to continue.

In August 1999 a competency based training package for signallers was developed. This requires a minimum of three months experience as a train recorder or operator on the passenger information system. The training in signalling activities lasts four months. Then there is a further two month period engaged in related activities of network control operations. They then commence to work as a signaller and undergo assessment. It is said that assessors are now going through every signal box developing training and assessments for persons working on each board.

It is obvious that public safety requires a proper system for the training of signallers, including the system for the assessment of their competence. Such a system would require that adequate time be allocated for the training and recertification of signallers. According to Ms Love shortages of staff have prevented this from occurring.

The history of what has happened in relation to signaller training is a demonstration of the problems that arise when areas of safety management fall somewhere between two organisations. Signallers are part of Network Control for which RAC, now RIC, are responsible. However, the Network Control was, of necessity, contracted to the SRA.

In the previous chapter I identified deficiencies in the training of drivers. One of the greatest deficiencies in the training of drivers was their route knowledge. This is labour intensive and there cannot be any substitute for them being out on the track with an experienced driver learning where the signals are located, what sections of track can be travelled at what speeds, where the points are located for particular movements and the direction their train will travel when the route is set in a particular way. It was the absence of route knowledge which significantly contributed to the accidents at Hornsby on 9 July 1999 and Waverton on 20 December 1999.

An attempt was made to use simulators to provide a substitute for on the job training but one witness said using them “was like sitting watching television”. This is because the simulators currently used at Australian Rail Training are old technology and rudimentary.

From my own investigations overseas I am aware that simulators exist which can be used not only for the purposes of training and measuring the competency of employees, but also for identifying deficiencies in the skills of existing employees. These simulators are expensive. I was told that they cost approximately $2.5 million each. However, I was also informed that a recent derailment at Cronulla cost about $1 million and, according to Mr Band, a derailment of a freight train in Queensland could cost anywhere between $5 million and $10 million.

For reasons of public safety and for reasons of sound economic management I recommend that modern simulators be purchased and used for the training of drivers, signallers, guards and other operational staff. One of the problems with the New South Wales railway system, I believe, is that it has been slow to embrace new technology. Modern simulators are an indispensable tool in the airline industry. With these instruments a pilot can be confronted realistically with emergencies and taught how to

deal with them. Without such simulators there can only be book learning and the experience of other pilots, neither of which is as effective as real life simulation.

What has been regarded as essential for the airline industry should be regarded as essential for the rail industry. The use of modern simulators would enable trainee drivers, and drivers whose competency is being assessed, to be exposed to driving at night, driving in rain, driving when there are signal failures, driving when points are set the wrong way or any of the other many potentially hazardous circumstances to which a driver will be exposed on the track.

These simulators can be programmed with the different routes which drivers will travel, so that they can be trained on the simulators and then be given practical experience on the routes. New recruits require more time than the recently introduced practice of having new drivers travel with an experienced driver for the first week of their duties.

Simulators should also be used for group training of drivers, guards, signallers and train controllers. Co-operation between inter-dependent operational staff is essential for the safe management of trains as demonstrated by the accident at Hornsby on 7 July 1999. Training them together and having them swap roles so that each understands the circumstances in which the other person operates will encourage that degree of co-operation which is essential and build an understanding that safe and efficient train operations depend on teamwork, rather than individual performance. It will also have a desirable effect upon the creation of a safety culture, so necessary in safe rail operations.

There may be reluctance among some employees to do this because of entrenched views held in relation to the separate nature of their various roles. However, it is part of the role of leadership within any organisation to ensure that those barriers are broken down in the interests of public safety. One obvious way of doing that is by the use of audio visual productions in relation to accidents which have occurred in Australia and overseas for the purpose of demonstrating to operational employees the importance of team work to the safe operation of trains.

Evidence was given by two train drivers that when new drivers were employed to deal with the anticipated increase in the demand for rail services created by the 2000 Olympic Games, many of the new drivers were on stand by after the Olympic Games and on many occasions were not required to drive trains. Instead of the new drivers remaining idle at crewing stations they should travel with experienced drivers, particularly driver trainers, and thus learn from their experience.

Even with experienced drivers there may be deficiencies in their training and knowledge. I support the system which exists in Victoria of having principal drivers accompany drivers to ensure their competency and to advise them in relation to the safe operation of their trains and improve route knowledge. The role of principal driver should not be that presently exercised by inspectors, but designed to fill the role of mentor to assist drivers to perform their duties with a high level of competence. If any deficiencies are discovered remedial training should follow.

Principal drivers should report to the train crew manager what they are doing to correct any deficiencies in the drivers within their charge.

Principal drivers should be drawn from experienced drivers and chosen on the basis of their motivation, attitude, performance and knowledge.

The system of principal drivers has been used successfully in other countries. In Germany, for example, there is a position which is known as "team leader – engine". The team leaders are authorised to issue directives to the driving crew or members of the team assigned to them in groups of approximately 30 drivers. They participate in the same regular and special training courses that the members of their team are involved in. They are required to conduct training activities and ongoing monitoring of drivers in their team.

Ongoing communication between the team leader and team members is an important part of their function. They travel with the drivers in their team and observe the application by those drivers of the operational rules and the way they perform their tasks. If the team leader foresees any weaknesses in the driver's skill or knowledge then the team leader liaises with the relevant teaching staff and thereafter travels with the driver to ensure that the deficiency has been adequately addressed.

It is the team leader's responsibility to ensure that the drivers know and understand any changes to the operational rules and if drivers have any questions about their duties, then they direct them to him and he provides the information. Their role is to lead by example and they tend to be the confidant of the drivers in the team.

There are formal procedures in place which require the team leader to accompany each train driver at least six times per year and these journeys are spread evenly over the year. These escorted drives are unannounced and must occupy at least 30 minutes of driving. The results of the driving are documented by the team leader.

In addition to these supervisory tasks the team leaders are themselves required to work at least 12 shifts per year as a train driver.

In France, a similar position exists and the responsibilities are similar. The disciplinary structure involves the interposition of the team leader between the driver and management in such a way that if a driver commits a breach of what would be referred to in New South Wales as a safeworking unit, then management approaches the driver's team leader to find out how it could be that the driver for whom he is responsible committed this breach. If it relates to some change in operational rules which was not properly explained to the driver then the team leader is held responsible and may suffer an adverse sanction.

Mr Worrall, the General Manager and a Director of Thames Trains Limited of the United Kingdom, said that within his company there are standards managers, each of whom is responsible for a particular group of drivers. Part of their duties require drivers be briefed in any change to the rules and if the change arises as a result of an incident, they explain the incident to the drivers so they can understand the policy behind the particular rule. I regard such instruction as the best means by which new safeworking rules should be explained to operational staff, whether they are drivers, guards or signallers. In other words, a designated person responsible for that group of employees should have the personal responsibility for ensuring that every member of the group has been instructed,

either in a group session or by him personally, in relation to any changes and ensure he understands the changes and the reasons for them.

The European and Victorian systems of team leaders and principal drivers have features which could improve the safety of rail operations. I support the continuation of the position of driver trainer. In my opinion there should also be a position of principal driver with the functions which I have identified from the Victorian practice. When a driver makes a mistake a response has sometimes been to punish the driver for failure to comply with the safeworking unit without being certain that the driver knew or understood the operational procedure. Public safety requires a better system of management and the use of team leaders responsible for the ongoing knowledge and competence of drivers in groups of about 30 drivers.

In addition, there also needs to be someone performing a "policeman" role. That role should be carried out through random auditing by authorised officers of the Rail Safety Inspectorate travelling on trains. Their role would be to observe the way in which the drivers, guards and signallers carry out their duties including following the communications protocols. Where deficiencies are revealed they should ensure remedial steps are taken.

Using actual accidents to illustrate the circumstances that an operational rule is designed to avoid would seem to be the best way of communicating the reason for the rule and the best way of increasing safety awareness and establishing a safety culture. Listening to the sequence of conversations that was recorded prior to the Glenbrook accident demonstrated that none of the participants had any expectation of the catastrophe that was about to occur. This is confirmed by the response of the train controller and the disbelief expressed by him when he was informed by the driver of the Indian Pacific that the latter train had been struck in the rear. Playing those audio recordings to drivers and signallers attending a training school must help to demonstrate the importance of communication protocols.

Mr Oliver expressed the concern that there was a "total unwillingness to learn from history in the sense that people don't understand that the reason for a rule is to avoid something which has happened in quite a tragic way in the past". In his view there should be a full segment in each training program in the rail industry which relates to the history of rail accidents, and the sorts of problems both specifically and generically which have occurred in the past, so that people have an historic base with which to work and better understand the reason for the rule.

Examples of accidents need not be confined to Australian examples. Railways fundamentally operate on similar lines throughout the world. There is a wealth of overseas experience that training personnel can draw on to illustrate safety principles being taught.

I have previously mentioned the existence of the UIC. It is one of the international organisations that can provide material on rail safety which can be used to illustrate safety matters during the course of training or as a source of information for the improvement of safety. On 22 October 1993 the safety boards of Canada, the United States of America, Sweden and the Netherlands established the International Transportation Safety Association (hereafter ITSA). Its aims include the formation of

independent investigations into the causes of transport accidents; the exchange of information on transport safety; the promotion of research; training in various transport sectors; the provision of support to ITSA members to help each other in the event of serious or large scale transport accidents; the promotion of exchange programs for researchers from ITSA member states; the provision of information to each other on safety recommendations and their follow up; and the identification of mutual problems so that they can be publicised and solutions sought to rail safety issues at international meetings and conferences. The following organisations are members of ITSA:

The National Transportation Safety Board, USA
The Transportation Safety Board of Canada
The Board of Accident Investigation, Sweden
The Accident Investigation Board, Finland
The Transport Accident Investigation Commission, New Zealand
The Air Transport Accident Investigation Commission, CIS (Russia)
The Commission of Railway Safety, India
The Transport Safety Board, The Netherlands (formerly the Railways Accident Board and Road Safety Board)
The Marine Accident Investigation Branch, UK

This Special Commission of Inquiry has been able to identify internationally the organisations with which a useful and valuable exchange of safety information can be carried out. The officers of these various organisations have shown a willingness to communicate freely when approached. They have universally expressed the view in the course of the overseas investigations that, when it comes to safety, there is nothing that they regard as confidential and their organisations are willing to assist by sharing their experience and knowledge.

Training in safeworking needs to be improved in other respects. It is necessary, when teaching the safeworking units, for teachers to be selective about which safeworking units apply to particular employees in practice and to base training on those safeworking units which are relevant to the employees' particular duties. It is also necessary to ensure their knowledge is kept up to date. Where changes or amendments to safeworking units have been made, that information should be conveyed by face to face instruction. The evidence discloses that only providing a written document or documents does not ensure that the information is understood or even read. The example was given of a driver who retired and on his retirement returned seven years of safeworking amendments in their unopened cellophane packaging.

Mr Band said that a key principle in this respect was to understand the literacy levels and the competency of operational staff who have to apply rules. He believed most people engaged in track side work on the Queensland railways had a reading age of eight years, which is not necessarily maintained throughout their working life. For these people it is necessary that somebody explain what the safety rules are to them and that diagrams be used to ensure that before work is undertaken they know the procedures. He stated Queensland Rail had a major program in place to ensure these problems are overcome.

That practice is a long way removed from the New South Wales practice of informing operational staff by weekly notices of changes in safety rules. Mr Oliver expressed the view that many of those changes are expressed in terms which would be difficult for

anyone to understand. He gave an example of a new crossover installed at Pippita on the Olympic loop. A diagram was distributed showing the altered arrangements in the weekly notice together with all the signalling and adjustments that went with it totalling some 15 pages of tabulations and diagrams. Mr Oliver, who had some understanding of signalling, took a great deal of time to understand the changes. He said a driver who had not been trained in signalling but only trained operationally would not have had any prospect of understanding what those changes to the movement of trains meant. His view was that when information is being communicated it needs to be done on the basis of material the employees need to know to perform their jobs and how any changes will affect them. Mr Oliver thought that distributing 15 pages of data was not only a waste of time, but dangerous because the possibilities of misinterpretation are high.

It can no longer be assumed that all supervisors will have the necessary common sense and ability to go through basic risk management procedures. For this reason specific attention should be given to their training in supervision and planning of worksite protection. The emphasis must be upon avoiding the risk of injury or death, not attempting to determine which safeworking unit should apply in the circumstances. The safeworking unit should provide a guide but if the safeworking unit does not adequately protect the employee against the risk of injury, then further precautions should be taken. A safeworking unit which has as its primary function the protection of employees and which casts the obligation on them to be responsible for their own trackside protection is so obviously deficient that it should never have existed.

The safety training of staff occupying supervisory positions in relation to trackside workers has been inadequate. I have been presented with a large volume of material to suggest that as a result of the tragic accidents at Bell and Kerrabee, RSA has implemented improved systems for managing the safety of trackside workers. I am not in a position, however, to determine whether those procedures adequately dealt with the problem. The Rail Safety Inspectorate should routinely monitor supervisors' activities to ensure that if an organisation claims to have cured the deficiency, that it has in fact done so. The second concern that I have about improving the safety of trackside workers is that with the amalgamation of the former RSA and RAC into RIC, the good work which appears to have been undertaken by RSA may be lost or the momentum may be slowed. It should be the function of the Rail Safety Inspectorate to ensure that that does not happen and that the process for the improvement of safety management for trackside workers continues.

There was evidence about whether or not Australian Rail Training should be associated with another tertiary institution. Dr Leivesley thought that this would make it more educationally professional believing the demands of production would not have the influence that they do at present and thus enhancing a safety culture. I can see the advantage that may arise from such an approach. However, access to the ongoing practical experience of employees within railway operations, and the need to have a close liaison between the training establishment and persons in managerial positions to identify areas of training which require particular care and attention, mitigates against the management separation that Dr Leivesley advocates.

I have set out the attempts at improvement in the selection and training of employees that have been undertaken since 1999. It should be acknowledged that the rail organisations have made substantial progress in improving the training of employees. Those gains

need to be maintained and the process needs to be continued. This together with the establishment of a safety culture will ensure that the safety of rail operations will thereby be improved. Whether a change in methods of training needs to occur can only be determined by an assessment of the effectiveness of the training being undertaken at present. This is a matter which should be monitored by the Rail Safety Inspectorate on an ongoing basis.

The final observation that I wish to make about training is that at the end of a course of training, employees should have an underpinning knowledge of the safeworking units which are relevant to the particular work that they do; an understanding of how they operate in practice; and the competence, skill and experience needed to implement the procedures involved. Methods, however, should exist by which their knowledge can be refreshed. It is difficult for people to keep in mind a large volume of material while on the job. Certain tasks, such as those involved in the carrying out of emergency procedures, must be able to be performed without reference to any written document. The safety and the performance of other tasks would be enhanced, however, if each group of employees in a different occupation had a small handbook identifying in short, clear and concise terms the procedures that they need to undertake in carrying out their duties. They should be required to have it with them at all times when on duty as a means of ensuring their understanding of the rules are not diminished. On the evidence before me, which I have been unable to validate, attempts seem to have been made by each of the rail entities to improve the training of their employees. It is my expectation that this continuing process will take approximately three to five years to complete and will require continual monitoring by the organisations themselves and by the Rail Safety Inspectorate to ensure that the level of competence of the staff is raised to such an extent that rail accidents such as the Glenbrook accident and the other eight accidents are unlikely to recur.

Safeworking Units

The operational rules for the carrying out of tasks by employees of the SRA are known as safeworking units. The safeworking units or their equivalent which have developed have been the main method by which rail safety has been managed for the last one and a half centuries. They were originally borrowed from a United Kingdom set of safeworking units as observed in the second interim report by reference to a quotation from *The Railways of New South Wales 1855 to 1955* where the circumstances of the creation of rules the evening before the first train was due to run in New South Wales from Sydney to Parramatta on 26 September 1855 is described. The circumstances under which the first safeworking units became accepted was described as follows:

> The whole party subsequently adjourned to a hotel, and there in the bar was held the first railway conference in this State. A policeman took the chair and gave instructions for the rules and regulations to be read aloud. These regulations were drawn up from those of the Eastern Counties Railway of England, a copy of which was supplied by Mr Herald. He had previously been in the goods department of the Eastern Counties Railway and was the only one of the six station masters appointed at that time who had any practical knowledge of railway traffic operation.

It is not necessary to discuss the way in which the rules have been modified since that time other than by observing that each time an incident or accident has occurred and there was no corresponding safeworking unit to cover the situation, amendments were made to the safeworking units with the result that the safeworking units currently occupy eight volumes of rules and regulations.

Mr Alexander Claassens represents drivers on a number of committees of the SRA. He started with the railways in 1977 as a cleaner, then became a trainee engineman and then a qualified driver in 1982. At the time he gave evidence he was serving on the SPAD Investigation Committee of the SRA, the Safety Management Training Review Committee, the Safeworking Review Committee, an Occupational Health and Safety Committee, the Joint Consultative Safety Committee, the Joint Consultative Safety Committee and the Millennium Train Design and Implementation Committee.

He was a full time driver from 1982 until 1994 and now spends approximately half his time driving and the rest of his time serving on the committees on which he represents drivers. He was in a very good position to provide evidence about the usefulness of the existing safeworking units to drivers. He said of them:

> My view is that they have become largely irrelevant to the guy that is doing… the job because they are more of a library addition, rather than an actual workbook I can take with me. It is pretty hard to carry all those manuals on the job with you.

He believed from a driver's point of view they were unworkable and impractical. Mr Hall and Mr Edwards expressed similar views. Other witnesses described the safeworking units as confusing, complex and overlapping. Mr Oliver described the safeworking units as "incredible waffle". Mr Jarvis said of the safeworking units "There is so much of it. A mound of paper you can't jump over. Much of it is ambiguous and it is constantly changing". Mr Clemens stated "As a training aid for drivers, as a means of helping drivers to retain safeworking knowledge, I think they fail miserably…".

Another disturbing feature of the safeworking units, apart from their volume and content, is that they were embraced without modification when the rail network was disaggregated in 1996. This was extraordinary given that they had been developed for an integrated rail network and were then applied virtually without alteration to a disaggregated structure. The attempt to make rules designed for an integrated railway fit into a new structure contributed in part to the duplication and overlapping which has developed. Mr Ogg, the Chief Executive Officer of the former RSA said that when an organisation is broken up, formal systems are destroyed and it takes a long time to re-establish the formal systems of safety management. Even less attention is paid to the informal systems that have previously existed. It is clear from the evidence given by Mr Claassens and Mr Jarvis that the replacement of the informal systems of disseminating knowledge about safeworking procedures was not a matter that was given any consideration.

Several witnesses expressed the view that the safeworking units did not have as their primary purpose the safety of rail operations, but the punishment of individual offenders who could be proven to have failed to comply with a particular rule resulting in an incident or an accident. Mr Alex Mitchell said:

> I think a lot of the time they were added on to ensure punishment for the offender, not to make it any more safer.

Mr Band thought that their main function was "butt protection". Accordingly, I was not surprised to hear that many rail employees have lost confidence in them and some appeared to completely ignore them.

Ms Love from Australian Rail Training, as mentioned earlier, stated that during the course of instruction persons who had operational experience would provide different interpretations of the rules. Ms Love said that staff had lost confidence in the safeworking rules and that they do not robustly reflect the contemporary operating environment in the New South Wales railways since disaggregation in1996. She later stated:

> That comment is made after a lot of discussion with people who are experts in the safeworking area and who had also become increasingly concerned with the appropriateness and quality of the rules in the mid nineties…

This lack of confidence does not appear to be confined to operational staff. Management appears to have turned a blind eye to safeworking rules relating to communications protocols and having private audio visual equipment in signal boxes.

I have previously referred to Ms Love's evidence on this matter where she stated:

> It was very difficult to train the rules because every one in the room would have different examples of attempts to apply the rules in variable circumstances where the application of the rules would result in different outcomes, and safeworking training became hours and hours of debate about the quality and appropriateness of the rules, and I believe that got to a point, certainly it was true in my first round of safeworking recertification, if you like, in 1999, and the tremendous time and consultation involved in developing a one day program indicated that the core content of the program was extremely difficult to deal with because of people's experience on the job.

She further stated that:

> The trainer would have to leave the room and ring the safeworking section for a ruling on [the safeworking unit] and the intent. The trainer would then return to the class room and deliver the ruling on the intent.

The first interim report referred to the debate between experienced counsel as to the meaning of safeworking unit 245 and the concession by Mr Garling, who appeared for the SRA, that the safeworking unit was confusing and needed amendment and that it made no provision for a second train passing the signal at stop. Safeworking unit 245 is annexure G to this final report. The safeworking unit uses the expressions "line ahead", "the line between where the train is standing and the next signal", "section" and "section in advance". It was necessary to determine what each meant to make any sense of the rule.

Another illustration of the way in which this safeworking unit was capable of different interpretations arose from the meanings given to the words "caution" and "extreme caution". Drivers had different views about what is meant by driving at caution or extreme caution. The two expressions were used interchangeably. Mr Thomas Lamont, the Safety Audit and Standards Manager for Train Crewing of SRA said extreme caution would be the walking pace, that is a speed of between three and five kilometres per hour. If that were the case it would take a train approximately half an hour to traverse the 1,730 metre distance from the failed signal 41.6 to the end of the overlap circuit.

Mr Hogan, an SRA Operations Inspector for Train Crewing who conducted safeworking schools, said extreme caution was ten kilometres per hour. Mr Marshall, an experienced driver who was one of the co-drivers of the Indian Pacific and who I accept was a careful driver actually drove through this downhill winding section of track with blind cuttings at 18 kilometres per hour.

If employees involved in the management of trains do not understand the safeworking rule, or if interpretations differ, the situation is dangerous. The risks inherent in such circumstances are obvious. Employees for decades have had their own informal set of operational rules. Some of these were in the form of a "catechism" which appeared to have been authorised in some way and which was circulated amongst the staff to give them guidance on the way that they should carry out their duties. This is obviously unsatisfactory as a primary means of the management of the safety of rail operations. There was evidence that what in fact happens is that staff rely on a hard core of knowledge gained over years of experience rather than a knowledge of what is in the rules. Mr Oliver also believes that staff rely on rules, not rules of the safeworking system, but those they have acquired by a long process of indoctrination, observation and simple logic.

It is necessary to determine what the real purpose of safeworking units is. If their purpose is to provide a guide to staff about the way in which they should perform their tasks safely then the rules need to be expressed in simple, clear and unambiguous language tailored to the level of education and experience of the people who have to apply them. Otherwise they will be ignored. I have previously referred to the low levels of education and literacy of many employees on the railway. Many of them do not have English as their first language.

As Mr Mitchell explained, he passed all the relevant courses in safeworking rules and having done so, he said: "I knew a poem but I didn't know the meaning behind the poem." Mr Mitchell could see no correlation between what he was taught in the safeworking school and what he was actually doing when carrying out his job.

The drivers who gave evidence learned safety operation procedures from other drivers and, to quote Mr Claassens, "not the books". Mr Claassens also said:

> It was necessary for drivers to carry with them some material to remind them of applicable operational rules in different circumstances.

Mr Claassens said that he carried with him a book entitled "Safeworking Catechism". It was produced in evidence. It was a small book containing basic safeworking procedures relevant to drivers.

Mr Jarvis said that when he became a driver he was given a small blue book and that provided you were familiar with the contents of the book and one or two other working sheets you had a sound knowledge of safeworking procedures in the New South Wales railways. He stated that in recent times the situation has become chaotic. He said that drivers were often "bitching" about it.

The utility of the safeworking units for drivers is perhaps best illustrated by the evidence Mr Jarvis gave of a traffic inspector, Mr Barry Hall, preparing a quick aid memoire which drivers carried with them. More recently, he said that a Mr Ron Harper had prepared a response book which enabled knowledge to be retained more easily. The fact that drivers work under unofficial versions of the safeworking rules means that there is an obvious need for a simpler set of rules.

I learned that in other countries drivers are provided officially with what they need by way of basic operational rules in relation to the safe management of their train. In Norway this was described as a "drivsbok", or driver's book, which seemed very similar to the 1972 catechism.

Mr Worrall said in the United Kingdom the drivers and signallers are issued with a rule book containing only the rules relating to their responsibilities, instead of receiving a big book with everything in it, without a focus on particular responsibilities. The rule book was split into functional and specific processes for drivers, signallers, shunters, permanent way staff and civil engineering staff. Each had a separate volume containing the material that it was necessary for them to have.

These observations lead me to certain conclusions about the function and content of safeworking units. First, they should be seen as part of a system of safety management and not an end in itself. Secondly, there is a need for safeworking units to deal with infrastructure and rolling stock specifications which may not need to be taught to operational employees. Thirdly, implicit in what I have said, is that it is necessary for the safeworking units to be rewritten so they are clearly and concisely expressed. From the overseas investigations I observed that many rail organisations used pictures and diagrams to communicate content rather than the written word or the written word alone. This is what happens in Queensland. Fourthly, it is necessary for the relevant areas of the safeworking units applicable to particular occupations on the railway to be separated and put in a form which is readily understood and easily applied by operators who need to know these particular rules, exclusive of verbiage and reduced to simple operational procedures.

Mr Mitchell provided an example of this in relation to a procedure for propelling a train which refers to reversing the train. He said that the safeworking unit covering such a movement consisted of 12 pages and this was later reduced to seven pages. He said that he was able to reduce it to six simple procedures:

i. All signals for the route must be cleared;

ii. The line must be completely unoccupied;

iii. The guard must be at the back of the train;
iv. There must be communication between the guard and the driver;

v. The driver must obey the guard's instruction; and

vi. The train must move slowly.

He said in substance there was nothing additional to that set out in the initial 12 pages to enable a train to be propelled safely.

The rules should not contain any more than they need to contain. Unnecessary narrative or explanatory material should not be included in the rules. This does not mean to say that explanation of the rules is not important. In my opinion it is fundamental to an understanding of the rules that employees be taught the principles behind the rules and be given an explanation for the particular rule. This is a matter for instruction in the content of the rules but not to be included in the rules.

It is necessary for people drafting the rules to decide whether to provide information within the rule or not. If the information is not safety critical then it should not be there.

An example of an operational rule which could have replaced safeworking unit 245, was considered in relation to the Glenbrook rail accident by Mr Oliver. His view was that where a driver was passing an automatic signal at stop the need to communicate with the signaller created an inherent risk of confusion or misunderstanding. If the rule applicable to a driver coming upon an automatic signal at stop was:

i. Stop at the signal;

ii. Wait 60 seconds; and

iii. If the signal does not clear, then proceed with extreme caution to the next signal,

the Glenbrook accident, in my opinion, would not have happened. One could assume an experienced driver such as Mr Sinnett would have stopped at signal 41.6 at stop and then waited the 60 seconds without knowing what was on the track ahead. He would have known, however, by reason of his route knowledge that there was restricted visibility ahead and driven his train accordingly. As was explained in the first interim report, as a result of the conversation that he had with Mr Mulholland, he was convinced that the line ahead was clear and proceeded accordingly with catastrophic results.

I thought it was clear that the reason for the rule requiring a driver to proceed at extreme caution when passing an automatic signal at stop is the driver does not know what lies ahead and should assume a worst case scenario and drive accordingly. If that safety message is clearly taught and understood as part of the course of instruction in relation to such a rule, then rail accidents such as the one at Glenbrook should not occur.

The policy of having a simple and clear rule followed by teaching the principles behind the rule, explaining to employees the hazard or risk that it is designed to avoid, has the advantage that employees will start considering the risks rather than seeking mindlessly to adhere to one particular rule or another.

It is not possible to formulate rules which will deal with every circumstance that might present itself in railway operations. According to Mr Oliver:

> There are a lot of situations where the rules in fact never contemplate a situation that may have arisen from the point of view of how humans actually behave in the real world.

Safeworking units simply cannot be all encompassing. That is why it is important to train staff so the principles behind the rules are clearly understood.

The tragic accident at Bell provides a very clear example of the need for this. The risk that a worker would be killed while engaged in track work arose from the fact that he might be hit by a train. He could not be hit by a train on the up main line on which the work was being carried out because trains were being controlled by flagmen. He could only be hit by a train travelling on the down main line. It thus should have been simply a case of applying certain basic principles which are not difficult to identify.

I was informed by Mr Cowling, the Chief Executive Officer of RAC that at present 50 people are involved in rewriting the safeworking units. The rules should be redesigned so that risks are assessed in a particular situation and then appropriate protection against the risk instituted. A system of work such as that which operated at the time of the Bell accident, in which the employees were themselves left to design and institute their own system of safeworking, is not to be tolerated.

Worksite protection should be an essential part of the planning of a job. It should start at an early stage of the work and at a high level. RSA claimed that this was being done. That organisation has since merged with RAC to form RIC. The merged organisation should continue the planning of worksite protection as an essential part of the planning of any infrastructure work. The planning and design of the job should be undertaken by that organisation even if contractors are to be used for part of the work. The Rail Infrastructure Corporation has the responsibilities which the common law attaches to it as the owner and occupier of the land as well as the maintainer of the track.

There should be a basic check list for trackside protection which is comprehensive in its content and which can then be applied by persons who may have limited education or command of English to the particular circumstance. Within each group the supervisor must be trained in analysing risks and trained in worksite protection.

The rewriting of the rules needs to be done with an appreciation of the need to assess the risks from the design stage to the stage of actually carrying out the work. I have not seen an example of any of the redrafted safeworking units but what has been said demonstrates that the rules need to be clear in terms of the identification of the responsibility and accountability for each person involved in the planning and implementation of particular tasks. Mr Oliver's view is that it must be a complete package.

Mr Oliver gave evidence about some of the rewritten rules which he had seen. He said:

> I don't want to tell tales out of school, so to speak, but when some of the drafts have been referred to me for comment I put masses of yellow stickers over them suggesting that these things were defective.

He said that what was happening was that there were subject teams, as they called them, working in particular areas and these subject teams consisted of people with expertise in particular areas who were meeting and framing what the broad content of the rules should be. He then went on to say that this has been subjected to analysis by people with some drafting expertise "supposedly, although I have my doubts about that".

He stated that the process has been that the draft rewritten rule has been circulated for comment from all interested parties. He said those comments are then taken back to those co-ordinating the project at RAC, now the RIC. They are then, supposedly at least, incorporating those suggested amendments which are appropriate for inclusion into the second draft. I am concerned that the project being undertaken will not produce the desired outcome.

It is not for me to redraft the safeworking units. As part of the accreditation process the Rail Safety Inspectorate should ensure that the redrafted rules in content and in function are clear and unambiguous and will maintain the necessary level of safe operations. There should also be a staged introduction of the new rules as proposed by Ms Love with appropriate explanation of the principles behind the rules and why they are being implemented. This process should be monitored by the Rail Safety Inspectorate to ensure that this is done safely and effectively.

The Rail Safety Inspectorate should also ensure when the relevant rules are separated for particular occupations and provided in the form of handbooks, that procedures are in place to ensure that the knowledge of essential rules is in the forefront of the minds of operational employees to enable them to react appropriately in cases of emergency.

It will be necessary from time to time to amend safeworking units. In such circumstances careful consideration should be given to whether it really is necessary to amend them. The reaction, every time an incident occurs which is not specifically covered by a particular safeworking unit, that another amendment to the safeworking units is made should cease. Mr Oliver said in relation to this:

> The current rules…have been the result of incidents which have occurred, and every time an incident occurred somebody tacks on an extra bit, because it wasn't quite covered by the previous rule and it gets more and more complicated. I think it should go back the other way. If you have got a situation where a rule is not covering the situation, the logical thing is to go right back to the beginning and see whether the rule is already too complicated, not make it even more complicated.

What is needed is the establishment of a process for amendments to rules which ensures that incremental changes cannot occur and that amendments happen because there is a

clearly identified weakness in the structure or the principle of the rule. Rule changes should be subject to the approval of the Rail Safety Inspectorate.

I have referred to the example of the employee who appeared not to have read the amendments to the safeworking units that had been sent to him for the seven years prior to his retirement. I was informed during the course of the evidence that as a means of avoiding this procedures were introduced to require employees to sign for the receipts of the amendments to the safeworking units and other safety critical information. Mr Dawes who was in charge of that system said however that not only did many staff simply refuse to sign for receipt of the documentation but some administrative staff insisted that it was not part of their function to distribute material and request receipts. I find this evidence very disturbing. First, it demonstrates a complete lack of discipline in the administration of the rail organisations. If staff refuse to comply with a reasonable request relating to safety then disciplinary action should follow. Secondly, and perhaps this is even more disturbing, such an attitude by the operational employees and the administrative staff demonstrates the exact opposite to the priority that safety matters should be given and once again points to a lack of a safety culture in the organisation. It is a matter for the senior executive levels of the railway organisations and the officials of the relevant trade unions to show leadership and commitment in relation to safety matters.

Accordingly, it seems likely to be ineffective to simply distribute documents and require staff to sign for their receipt. This may simply be seen as another means of ensuring the punishment of "offenders" if an incident occurs which demonstrates a want of compliance with some convoluted rule.

The better approach is to ensure that, where amendments to safeworking units or other safety critical information needs to be communicated to staff, this be done in the form of instructional briefings. The practice should be adopted that where such amendments occur then the principal driver, either in a group or individually, should ensure that the changed procedure is communicated to the drivers and that they understand both its content and the reason why the amendment was made. Person to person communication, in that way, is likely to be much more effective.

It will obviously be necessary for the principal drivers or team leaders to record individually the fact that they have communicated the relevant changes to each driver and for the latter to acknowledge in writing that they have received and understood what the change is.

It is inherent in what I have said that changes should be kept to a minimum and made only where necessary. Otherwise, there will only be a repetition of the existing practice of trying to provide too much information with consequent unnecessary wastage of time and resources.

Communications Technology

In the Glenbrook rail accident and the reports of the eight other rail accidents which I have been asked to consider, deficiencies in communication played a significant causal role in most of these accidents.

In the Glenbrook accident the Indian Pacific had modern communications technology including a satellite telephone system and global positioning system fitted to it. The satellite telephone would have enabled the crew of the Indian Pacific to communicate with the Penrith signal box. Notwithstanding this the driver, when he came to signal 41.6 at stop, was required to leave his locomotive and use a signal post telephone to communicate with the Penrith signal box. The signal post telephone was antiquated technology. He was required to use that technology by virtue of SWU 245 even though the train was fitted with some of the latest communications technology available.

It is ironic that the signaller at the Penrith signal box did not know the position of the Indian Pacific at the time of the accident when the National Rail Corporation customer service centre in Adelaide would have known its location within a few metres because of the global positioning system fitted to the National Rail locomotive pulling the Indian Pacific.

A number of witnesses not associated with the New South Wales railway organisations were called to give evidence about communications technology. Mr Franklin Hussey had been the Crew Operations Manager for the National Rail Corporation and had had an interest in communications, signalling and safeworking in railway operations during the 34 years that he had been in the industry.

He stated that the reason why signal post telephones were specified as a means of communication in the safeworking units was because when the system developed in the United Kingdom, signal engineers took the view that signallers did not really know where a train driver was calling from unless he was required to use a signal post telephone. By that means it was felt the signallers would know precisely where the trains were. The rationale for the use of signal post telephones does not apply in the lower Blue Mountains area because the signal box at Penrith was not fitted with a mechanism which enabled the signaller to determine from which signal post telephone the call was made. He would only know if the call was coming from the up main or down main line.

Since the Glenbrook rail accident, safeworking unit 245 has been amended to enable authority to pass an automatic signal at stop to be obtained by any means available on the particular train and so far there is no evidence of any difficulty associated with this amendment. It is difficult to understand why there was an insistence on the use of signal post telephones at the time of the Glenbrook accident except to say that was the way it had always been done.

Mr Hussey alleges that the introduction of train radio systems combined with track circuiting has been slow to develop in Australia, contrary to what occurred in the United States of America after World War II. In Australia they were not contemplated until an incident in Victoria at Barnawartha in the 1980s when a freight train collided with the rear of the Southern Aurora. He stated that New South Wales was the least developed of all the States until the development of the Metronet and Countrynet systems about five years ago. This is another example of the reluctance of the rail industry in New South Wales to adopt new technology.

The Metronet and Countrynet systems are not compatible with each other. The Countrynet radio system enables trains in country New South Wales to communicate with

other trains on the same radio system, with signallers and with train controllers in the area where they are travelling.

Rail Access Corporation, as it then was, in its risk management report set out how this situation appeared to have developed. Mr Cowling, the Chief Executive Officer of RAC said that there was a perception in 1989 that the WB radio being used in train communications was outdated and a modern form of radio communication should be adopted. In order to do this a comprehensive list of user requirements was produced and expressions of interest were called for, in order to compile a list of possible tenderers.

When these were received it was realised that the functional requirements did not necessarily reflect the requirements of the network as a whole. The requirements of the metropolitan area with its high volume of traffic were significantly different to the requirements of the country network with its lower volume of traffic. It was then said that to implement a metropolitan standard system across the whole network would involve a "grand train radio", whatever that phrase might mean. Because of the high costs said to be involved, another committee was formed and given the title of Train Radio Steering Committee on which FreightRail, CountryLink, CityRail and the SRA were represented. This committee, it is said, produced a much simpler and cheaper method that would meet the requirements of low traffic density areas in the network and RAC continued with the project to implement that system.

A number of serious software faults were not resolved until mid 1997 and the system became operational in October 1998, some nine years after it was regarded as being a necessary innovation.

It appears that the Countrynet system is principally used by freight locomotives and was designed by FreightRail and developed by Philips and there are two different interactive systems in areas of the network where there is a high volume of traffic such as in the Hunter Valley, Goulburn, Orange, Parkes and Dubbo areas. In those areas a land based system operates. In the outlying areas a satellite communication system operates. The interaction between the two systems is achieved by a global positioning system receiver located on the locomotive which identifies the location of the locomotive. This information is received by a computer which interprets whether the locomotive is in the satellite or land based system area and then switches the communications equipment as required. The global positioning system receiver also relays the position of the locomotive to the train controller for that area. The Countrynet system is on all locomotives operated by FreightCorp and CountryLink and on locomotives operated by National Rail Corporation Limited in New South Wales.

The Metronet system was developed for the CityRail network. The Metronet system and the Countrynet system are not compatible. In 1995, some six years after the decision to introduce a more sophisticated radio system, engineers at FreightRail began working on a project to enable the Metronet and Countrynet systems to be able to "talk" to each other. This required access to the Siemens interface document to determine how the Metronet radio in trains could communicate with a fixed base system. The interface document was updated during 1998 and a project to undertake the work was proposed in early 1999 and was formally approved by Mr Cowling's predecessor in June 1999. The document concluded that it was clear that the radio industry has significant difficulties in

implementing new technologies on the network. That problem could be solved by the recruitment of appropriately qualified staff to assist rail experts in introducing a complex computer based radio technology.
In the result, there are five different technologies available for communication on the New South Wales rail network. Three of these are two-way radio systems. These are the open channel WB radio, the Metronet system and the Countrynet system. The WB radio is also known as a 450.050. The Metronet radio only operates within the operation of the CityRail network.

The project manager of the manufacturer of the Metronet for the New South Wales train radio project, was Mr Lawrence Radford. He gave uncontested evidence that the Metronet radio system could have been used on the Indian Pacific and that there is a portable Metronet system that could be carried in a train entering the metropolitan network or be provided to trackside workers to enable them to communicate with signallers, train controllers and trains in the area. The Metronet system could have been implemented for the whole of New South Wales, thereby avoiding the incompatibility that has existed between the Metronet system and the Countrynet system.

For reasons which were not explained to me, when the Metronet system and the Countrynet system were introduced, the incompatibility was known yet the system was introduced notwithstanding that obvious limitation and the consequence to safety involved in having incompatible radio systems which meant trains not equipped with Metronet radios were forced by the safeworking units to use antiquated technology.

The fourth system of communications is by signal post telephone, an antiquated method involving turning a handle on a telephone located at the base of a signal post, and then holding the ear piece while speaking into a microphone located on the post. The fifth method of communication is telephone communication using either the terrestrial based system or via satellite.

I fail to understand why it was decided at great cost to develop two incompatible systems. In my opinion that decision was a disgraceful waste of public monies and has compromised public safety. According to Mr Barry Hedley, the Acting General Manager, Technology and Standards of RAC it was contemplated when the two contracts were awarded for the Metronet and Countrynet systems respectively that the two be able to "talk" to each other, but somewhere in the implementation of the system in the early 1990s that integration was lost and he did not know why and was unable to enlighten me as to how that occurred.

There is an urgent need, in my opinion, for the introduction of a single integrated system of communications for all trains operating on the rail network within New South Wales. If compatibility between Countrynet and Metronet can be established this may achieve this outcome. It is clear that other technology is available to achieve the desirable safety outcome of a single integrated system which can be used by drivers, signallers, controllers, trackside workers and others. If compatibility between Countrynet and Metronet cannot be established, the necessary steps should be undertaken to ensure a new system of communications is introduced. In my opinion, all means available including portable Metronet radios should be used pending the introduction of a single integrated

system of communications for all trains operating on the rail network in New South Wales.

I received evidence that some discussion has taken place to achieve this outcome but resistance has been experienced from several operators who operate interstate.

In my opinion it is highly desirable that there be a national approach to the establishment of a single integrated communications system in the rail industry. This will adequately deal with the concerns of train operators who cross state borders in the course of their operations. However, if an intergovernmental approach cannot achieve that outcome in a reasonably short period of time, then New South Wales should establish its own single integrated communications system for its railway network. It should be a requirement of the accreditation of each train operator that any train operating on the network have the capacity, including by portable Metronet radio, to communicate with signallers, train controllers and track side workers.

Communications Procedures

It is also necessary for procedures to be in place which maximise the safety benefits that the modern communications equipment will bring. I have previously discussed the deficiencies in communications protocols which in my opinion contributed to the Glenbrook rail accident and to most of the other eight accidents. I received a great deal of evidence about safeworking unit 135 which dealt with communication protocols. Notwithstanding the evidence that I received from witnesses in managerial positions, evidence from witnesses who had to deal with operational staff indicated that that protocol was being ignored. The result of loose, informal or casual communication can only lead to a lack of clarity and possible misunderstandings which in turn can produce tragic consequences, as it did at Glenbrook.

I agree with the view expressed by Mr Oliver that matters such as the use of the phonetic alphabet should not be routine. If the process becomes one which is seen to be stilted, then nothing is achieved. However clarity and precision of communication is essential. In safety critical areas such as authorisation of train movements it should be mandatory for protocols to be followed and for the instruction to be repeated by the recipient and for the person giving the instruction and the recipient of the instruction to each write down the wording and read back what each has written and thus avoid misunderstanding. If that procedure had been followed at Kerrabee by each of the persons there involved, notwithstanding the deficiencies in communication technology, the existence of the train that killed the two workers would have been known in advance and that accident would not have occurred.

I also support the use of a specific form of words in safety critical circumstances. Mr Oliver gave evidence of a form of words that could be used for the passing of a signal at stop as follows:

> You are authorised to pass signal SY353 in the stop position and proceed with extreme caution to signal SY359 prepared to stop short of any obstruction.

If authorisation in that form had been given to the driver of the Indian Pacific substituting signal 41.6 and signal 40.8 for the two signals mentioned in the example, and the same form of authorisation had also been given to Mr Sinnett driving the inter urban train, the Glenbrook rail accident probably would not have occurred.

Mr Hussey who was employed by the National Rail Corporation in 1997 said that when its drivers sought to comply with the appropriate protocol they were ignored and on occasions humiliated. Even more disturbing was the fact that he made a complaint to Mr Henry, who accepted that management staff were not adhering to the protocol and who promised to do something about it but that, according to the unchallenged evidence of Mr Hussey, nothing was done. This demonstrates a serious lack of discipline in the railways.

The evidence is that some steps are being taken to improve the adherence to protocol by employees by monitoring transcripts. But it is conceded that there is a long way to go. I regard it as a function of the Rail Safety Inspectorate to monitor and audit the enforcement of appropriate communication protocols. If it is necessary for sanctions to be imposed against rail organisations then the Rail Safety Inspectorate should have the power to do so.

Train to Train Communications

One area about which there are many competing views is the desirability of train to train communications. This is an important issue. At the time of the Glenbrook rail accident the driver of the inter urban train had no way of communicating with the driver of the Indian Pacific or any other trains in the area. The inter urban train passed another inter urban train and an XPT train travelling in the opposite direction and the drivers of both those trains knew where the Indian Pacific was because they had passed it. The signaller at Penrith did not know the location of the Indian Pacific.

The Metronet system could have been modified so as to enable the driver of the inter urban train passing in the other direction to hear the exchanges between Mr Sinnett and Mr Browne, the train controller, and Mr Mulholland, the signaller at Penrith. Had he heard the communications he could have communicated the possible position of the Indian Pacific.

A number of witnesses gave evidence critical of any attempt being made to install a system of train to train communications. Mr Jamie MacDonald, the General Manager, Safeworking Systems and Operational Standards, RAC, as it then was, and who leads the task force rewriting the new safeworking units, expressed the view that such a system would distract train drivers from the track and signals ahead and would contribute to a lessening of safety standards.

That proposition was put to Mr Franklin John Hussey to which he somewhat sarcastically replied “Perhaps we should all shut down our car radio systems”.

Other witnesses were opposed to the institution of train to train communication for different reasons. Mr Worrall expressed the view that conversations between drivers and signalling centres should be discrete because this would avoid any misunderstanding. If more than two persons were party to the communications there could be much misunderstanding. He said that if an emergency did arise, then the signaller can then open

a channel and give instructions to all train drivers. He stated as the drivers were subject to all sorts of distractions in the ordinary course of their duties, train to train radios would be an additional distraction and may, for example, prevent them from observing signals. The evidence against train to train communications I believe is theoretical and subjective and to some extent reflected the reluctance of railway management to adopt new technology.
On the other hand, there was an impressive body of evidence strongly in favour of train to train communications from witnesses who had experience in the advantages of train to train communication or gave examples where it could have avoided accidents. Mr Kevin Band had considerable experience in rail safety matters both in Queensland and in the United Kingdom and at one stage he was the head of safety for the south east area in the United Kingdom and which provided a substantial proportion of the rail traffic within a radius of 60 miles from London.

In 1995 he moved to Queensland and later became the Manager of Queensland Rail for Safety Accreditation. Queensland Rail trains have an open channel which he believes is essential and enables every driver to hear every message. He believes it is essentially safer and furthermore, that it has prevented accidents occurring because often people have been able to hear what is happening around them. On the contrary, he is not aware of any circumstances where misunderstandings have occurred. Nor did he accept that the channel would be used for unnecessary chatter. He stated that it has become a self policing channel and peer pressure prevents unnecessary chatter. He stated:

> I believe that the benefits of people hearing what is going on around them totally outweighs anything else.

He went on to state that if a railway cannot stop abuse of a radio channel it should not be operating trains.

It was also put to him that one of the concerns expressed about train to train communications was that there could be unauthorised interception of the radio channel. He did not believe that someone seeking to do that would have the necessary technical knowledge of train operations in order to appear convincing. In any event he had never heard of any occasion where someone had attempted to interfere with radio communications on trains.

I agree with Mr Band's observation that the benefits of drivers learning what is happening around them totally outweighs the perceived disadvantages. Mr Band stated that Queensland drivers were strongly in favour of train to train communications and would not tolerate them being terminated. I reject the notion that the existence of train to train radio communications would operate as a distinct distraction or that the security concerns are realistic.

Mr Oliver, in favour of train to train communications, gave an example of how it saved a collision near Gosford when a train driver was told a line was clear and was authorised to pass a signal at stop. Unbeknown to the signaller, a freight train was in the section and fortunately the driver of that train overheard the conversation between the driver and the signaller and informed the signaller of his position and a collision was avoided. Mr Hussey was a strong advocate of train to train communications. He referred in particular to an accident in Victoria in which a freight train ran into the back of the Southern Aurora

at Barnawartha. The accident apparently would have been avoided if train to train communication had been available.

Mr Claassens believed that train to train communications were essential. He referred to an incident where there was a breakdown in communication between the signaller and the train driver and it was only because other drivers in the area could hear what the signaller was saying that they corrected the signaller's impression. He believed that there were many cases in the past where such incidents have occurred stating "we certainly believe it is a benefit to us."

It was put to him that open communications could produce an overload of information to drivers and his response was that technology can enable particular areas to be separated onto particular channels.

Mr Claassens' view was that drivers should not be isolated. If drivers are expected to work as a team, the way to encourage that is to have them able to hear communications that are occurring around them. Like Mr Band, he did not believe that there was any realistic concern that the system would be abused by idle chatter or for any other reason.

Mr Bauer, counsel for the RBTU submitted that in the coroner's report on the Cowan embankment accident on 6 May 1990 the coroner had made a recommendation that the SRA introduce train to train communications as a matter of urgency.

Mr Fozzard, a signaller Grade 3 and the elected Secretary of the Signals Branch of the RBTU has been working in the rail industry since 1973. He was asked about train to train communication and he said it should be introduced because drivers would know exactly what was occurring. He stated that it was necessary for it to be monitored and enforced. It should, according to him, include guards so that both the drivers and the guards would be aware of what was occurring around them.

Mr John Brown, the Manager, Network Operations, CountryLink, which covers all areas of the State beyond the CityRail network also supported train to train communications. He had worked in the rail industry for 41 years. His belief was that train to train communications in the country are essential because they allow train control and train drivers to have an understanding of what is going on, where trains are and how they are running. He agreed that although signal indication is the primary matter controlling train movements, it was necessary for drivers to have knowledge of what was going on around the train and in other areas of the rail network.

It was suggested to him that circumstances in the metropolitan area are different from the country because of the amount of rail traffic. His answer was that the communications system could be broken down into sections. In my view, the breaking down of the communications network in the particular sections or areas would overcome the suggested overloading of the amount of audio material being provided to train drivers.

I have formed the opinion that train drivers in this State are very responsible individuals, as they have to be, and that they are very conscious of safety. They are the ones exposed to the greatest danger of a collision and should be given all assistance available to help them in safely carrying out their duties.

Mr Barry Camage, the Train Operations Manager of the SRA, only supported train to train communications in an emergency. He did however agree that if drivers could hear what other drivers were saying in a particular locality, he would be in favour of that change. He supported the principle that train drivers should have access to all information that can be provided to them about matters which affect the movement of their trains.

Mr Clemens supported the notion that drivers should be able to hear what was occurring around them but should only be able to communicate with a signaller. His concern was that if there were not adequate protocols in place there could be a lot of unnecessary talk.

This is not an issue that can be resolved by counting heads. It can only be resolved as a matter of principle. Reports of accidents that I have been asked to consider and the Glenbrook rail accident itself satisfies me that as a general principle drivers should be provided with whatever relevant information is available, so that they have the fullest appreciation of what is happening on the track ahead and behind them. I acknowledge that in a busy metropolitan network there is a risk that the amount of information so provided may serve as a distraction, but the answer seems to me to be to use technology which enables the area of communication to be limited to a particular geographical area. I believe that the concerns about information overload or distraction of drivers will not be borne out.

Some witnesses expressed the view that train to train communications needed to be secure. However no witness could give an indication of anywhere in the world where a mischievous outsider had tried to interfere in the movement of trains. Nor was it something that revealed itself in the course of the overseas investigations.

I acknowledge there is legitimate concern in respect of the desirability of train to train communications. In my opinion, however, this is too negative a view and not based upon any convincing evidence that where train to train communications have been introduced any such risks have materialised. On the other hand, the body of evidence in favour on the other hand, is far more convincing. Train to train communications have been tried and practised successfully in Queensland. Examples have been given whereby they have avoided serious accidents and I have demonstrated why it may have avoided the Glenbrook rail accident. I prefer to accept the practical experience rather than the hypothetical view.

I recommend that train to train communications be introduced on the CityRail network. A risk analysis should be carried out in respect of its introduction so any potential hazards can be identified and controls instituted. The relevant protocol must be strictly enforced. It should be tested on a discrete segment of the network so that its advantages or disadvantages can be properly evaluated.

The Rail Safety Inspectorate should monitor the introduction of train to train communications in the area of the trial so as to be fully informed as to whether or not the perceived dangers materialise or the benefits are as great as has been suggested so that a final decision can then be made.

I also recommend a trial of a system of communications between track side workers and trains be carried out. Had the track side workers at Kerrabee or Bell been able to

communicate with trains, then those accidents would not have occurred. Similarly, if a driver is unsure or wishes to confirm the precise location of a track side group, a broadcast over an open radio would enable the track side workers to hear the communication. This would minimise the risk of the driver suddenly coming upon workers in danger of being struck by the train.

It is necessary for management to keep an open mind on matters going to rail safety and to keep an open mind about embracing new technology and methods.

Network Control Audits

Network Control is concerned with the day to day management of the movements of trains through the rail network and includes the all important work performed by train controllers and signallers, including train monitoring, train timetabling, incident management, track possession management and preparation of operating statistics.

In the Sydney metropolitan area there are approximately 2,500 passenger and freight train movements each day and approximately 900,000 passenger journeys each day. In addition, the New South Wales rail network moves approximately 220,000 tonnes of freight per day over 8,500 kilometres of track, of which 1,700 kilometres are electrified. The metropolitan system is very complicated with approximately 3,000 sets of points which are in use every peak hour on the Sydney metropolitan network. If one of those fails severe disruptions can result.

Network control operations in the Sydney metropolitan area are managed by a Manager of Network Control who has four Regional Operations Managers. Below them are 26 Network Operations Superintendents. The titles would suggest that they exercise a supervisory function over the 348 staff who work below them in the network control area. These staff are spread throughout 30 signal boxes. There is a project in hand to reduce the number of signal boxes in the metropolitan area.

The evidence about network control functions disclosed serious problems. I have already made observations about the lack of experience and training of the signaller at the Penrith signal box, which in my opinion significantly contributed to the Glenbrook rail accident, and the undesirability of Grade 1 signallers with limited experience being permitted to operate Grade 3 signal boxes.

The first interim report observed that the supervisors of both Mr Mulholland and the Penrith signal box did not appear to supervise anything other than on time running. It became apparent that the Network Operations Superintendents not only did not supervise anything other than on time running, but that in general they were not capable of supervising the general operations of the signal boxes, if one accepts the evidence of Mr Fozzard, because they did not know how to work the signal boxes. The reason for this was that there was trade union opposition to Network Operations Superintendents being instructed as to how signal boxes operated because this might produce a loss of jobs for that trade union's members. The result of this was that these 26 persons had duties which largely seemed to be limited to the peak hour periods and to the monitoring of on time running. They sat in the corner of a signal box and observed what was occurring in the morning and afternoon peak hours. What is clear is that they did not provide any actual supervision although employed in supervisory capacities. Mr Doug Anthony, one of the

Network Operations Superintendents said that he did not see himself as exercising a supervisory role, he was there to monitor the trains. The system had been changed from one in which station masters had the responsibility for signal box management. Under that system station masters fully supervised signallers under their control.

There was some evidence that the Network Operations Superintendents were involved in the process of certification of employees. Mr Mulholland, the signaller at the Penrith signal box at the time of the Glenbrook rail accident had been certified by a Network Operations Superintendent as having the capacity to perform the duties of a grade 1 signaller. He was carrying out the duties of a grade 3 signaller at the time of the Glenbrook rail accident. The lack of training and inexperience of Mr Mulholland contributed to the Glenbrook rail accident.

Rail Access Corporation was required to assume responsibility for network control as a result of the 1996 disaggregation. There was a ceiling, however, on the number of staff that could be employed by RAC which thus had no alternative but to contract out the network control function to SRA which had the experienced staff to conduct it because prior to disaggregation they had been responsible for network control. The result was that SRA employees were doing the work of RAC but those employees could not communicate directly with their employer but had to communicate through RAC. The second interim report discussed this unsatisfactory state of affairs. Because of concerns about the quality of work in Network Control, RAC decided to conduct an audit of the employees in the signal boxes and the tasks that they were undertaking. The State Rail Authority refused permission for this to take place and said that it would conduct its own audit. When the audit was completed, it then refused to provide the results to RAC. The reason given was that the SRA was accredited by the Department of Transport and RAC was not entitled to audit independently activities which it had subcontracted to the SRA. So much for co-operation between the various entities on safety critical issues.

Mr Hall, the Executive Director of the Transport Safety Bureau within the Department of Transport was asked about the dispute between RAC and the SRA concerning the auditing of signal boxes and the failure of the SRA to provide any information to RAC about what those audits revealed. He said that the Transport Safety Bureau could not interfere in such a dispute because it involved contractual issues. This demonstrates that the Transport Safety Bureau was ineffective in ensuring that this critical part of the safety of rail operations was being properly managed.

I regard this whole episode as an unsatisfactory state of affairs. The management of the signal boxes and of network control generally is a matter which the first and second interim reports revealed required urgent attention because of the danger to the travelling public that the deficiencies revealed. If the SRA has nothing to hide concerning the way in which it is operating the signal boxes, there is no reason why it would not provide full details of what its audits revealed to RAC or any other operator which had an interest in ensuring that its trains were going to be managed safely through the network in circumstances where RAC had the legal obligation for ensuring competency.

This conduct of SRA is the antithesis of a safety culture in which all persons on the railway should regard themselves as responsible for co-operating with, and being accountable to, other persons or organisations with which they have an interdependency. There is an obvious interdependency between an infrastructure owner, a train operator

and the persons conducting train movements on the rail network. This culture of secrecy and lack of accountability by one organisation to another must cease. It should be a function of the Rail Safety Inspectorate to require safety related information to be produced to all organisations who may be affected by those activities and who have an interest in the way in which network operations are being managed.

The Special Commission of Inquiry heard evidence from officers of the SRA about the audits that were carried out. It transpired that these were no more than paper audits. Officers would attend and ensure that the necessary certificates were possessed by the signallers and that the necessary manuals were available. There was no assessment or determination of the competency, skill or experience of the people who worked there. This is a most important matter and needs to be monitored and audited. According to the SRA it has recently instituted a system for the auditing of those matters but I have not been provided evidence of any result of that activity.

The auditing of the competency levels of people working in network control is obviously vital. There is no reason why the SRA should not proceed with that task as expeditiously as possible. An independent assessment however of whether or not the results thereby obtained are justified must be done by an outside body such as the Rail Safety Inspectorate so as to ensure that the safety standards are achieving the desired objective. Without independent assurance that safety standards are being met, the travelling public has no adequate protection against the risk that another major rail catastrophe may occur.

These types of checks and balances are the only way of ensuring that the standard of safety performance of the network control function is in accordance with community expectations. Openness and accountability will also engender a culture which is the antithesis of the present situation.

Sydney Train Control

It will be apparent from the above observations that I have made about the number of train movements and the complexity of the infrastructure that the management of network control functions is very complex. Train control movements on the CityRail network are managed from Sydney terminal. There are several different rooms involved in the management of different tracks. The different rooms are equipped with varying levels of technology, ranging from computerised train describer systems to a pen and pencil and ruler approach for plotting and measuring train movements and progress as was the case with West control in relation to the Glenbrook accident. The CityRail area managed by Sydney train control extends north to Newcastle, west to Lithgow and includes non-electrified areas as far as Mudgee, Bowenfels, Canberra and Nowra on the south coast of New South Wales.

I am of the opinion that there is a necessity for a single modern control room for train controllers. It was suggested that this was undesirable because a system failure could close the whole rail network, but evidence indicated that back up systems could be put in place against this contingency. Further, in any event, a risk assessment done prior to the design stage would no doubt lead to the identification of appropriate controls for any such potential hazard.

Mr Anthony Eid, the Manager of Train Control, agreed that the train control facility resembled a "rabbit warren". Mr Eid said a number of layouts had been examined to determine if they could be adapted by Sydney train control. The desired system was one where there was a centralised room where the whole CityRail network can be summed up at a glance. A centralised control room would also enable key personnel to be in the same room, including support staff. At the present time such staff are separately located and have to be contacted by telephone, which Mr Eid said was undesirable. If they were in the one location it would be less likely that critical information would be overlooked. The existing control room was described by Dr Leivesley as "about 1940's Britain before World War II brought a learning curve in control rooms".

A modern control room exists in Brisbane for the control of whole of the metropolitan network in Brisbane. Mr Band said that the control room is about the size of court room 10A where the Special Commission of Inquiry sat. In the Brisbane control room there are panels containing an electronic diagram of the whole rail network on which every train movement can be seen. In the same room are situated all necessary support staff such as rolling stock defect co-ordinators and technical experts who deal with problems such as signalling, electrical faults, infrastructure defects, and so on. This means that instant advice is available to overcome any operational problems that arise.

Mr Eid stated that if all dark territory were eliminated he could manage the whole of the Sydney network from one control room. At present the describer boards in the Sydney control centre extended to North Sydney in the north, Bondi Junction in the east, Auburn in the west, Regents Park in the south and in the area from Waterfall to Wollongong, up from Wollongong to Port Kembla and on a branch line to Moss Vale. He said that the way the SRA runs trains it is important to have a view of the location of the trains at any given time.

Mr Band expressed the view that a similar control room was not only desirable in Sydney, it was necessary. He said modern contemporary systems require an overview of signallers and train controllers and other expertise in order to obtain advance knowledge of the state of the rail system at any particular time in order to act appropriately. It was essential for any such system to have the whole of the system mimicked on one or several large screens. This would mean that there would not be any dark territory. As the first interim report observed, this accident occurred in an area of dark territory.

Mr Band believed that the Sydney rail system would run more safely if there was one large central control room because this would provide an overview of everything that was happening and enable quick responses to occur. He gave the example of signal equipment malfunctioning causing an alarm to sound which can then result in a signal engineer being dispatched without delay to the site and sometimes, by use of a computer console, it may not even be necessary to attend the signal to correct a defect. The system runs more efficiently because it is not necessary to rely upon operational calls coming in to manage various scenarios when there is some defect in the system.

The need for such a centralised control room has previously been identified. Sometime earlier steps were taken in that direction and a plan was put in place for the establishment of such a control room. It was subsequently abandoned, it appears, after considerable financial outlay.

The advantages of a centralised train control room include:

i. The capacity to have an overview of the whole of the network.

ii. The ability to locate the different sections of the incident management groups in one location. At present the defects section, the electrical trouble section, the signalling trouble section, the security section and the infrastructure section are all located in different areas. If an incident arises which requires attention from one of these areas it is necessary to telephone them. If they are all in the same room then problems can be managed more quickly and efficiently and much more effectively.

iii. A centralised control room would eliminate all dark territory. Although steps have been made to eliminate dark territory since the publication of the first interim report some remains. The result of having dark territory, apart from the obvious risk to passenger safety which the Glenbrook accident revealed, is that the best information that train controllers can ever have is historical information. The train controller can only be told by a signaller where the train was at a particular point in time. This is unsatisfactory and the technology does exist to enable the position of all trains on a network to be mimicked or otherwise illustrated. The efficiency and safety benefits are obvious.

In addition to better train management, a centralised control room would also enable better passenger management which would reduce the risk of accidents occurring on railway stations on crowded railway platforms. This can be done by the monitoring of closed circuit televisions on all railway station platforms. When special events occur in the metropolitan area and the public is encouraged to use public transport, it is obvious that passenger safety requires careful monitoring of railway stations in those circumstances. This was done efficiently and safely during the 2000 Olympic Games.

The safety implication for improving the train control facilities is that in degraded modes of operation accidents are more likely to occur, particularly if employees acting under the imperative of on time running are trying to have the infrastructure perform more efficiently than it is capable of doing. The communication of information so that defects can be quickly detected and making the movement of trains no longer dependent upon historical information or telephone calls from signallers, will increase the efficiency of the rail network enabling it to better cope with the likely heavier future demands.

With the advances that have been made in technology it is only a matter of time before train control functions can be performed with the assistance of computer technology. Mr Vincent Neary, who was a former signal engineer, explained that the signalling in the Sydney metropolitan area was designed in 1976 and such signalling was designed to last at least 20 years. If it is looked after that period can be extended interminably. He said however the problem is that as the equipment became obsolete replacement parts became difficult to obtain. He believed the signals in the metropolitan area had reached their use by date and he gave as an example of this, the fact that in 1997 a new timetable was introduced which caused chaos resulting in trains being later and later until it was abandoned. The reason for this was that the signalling equipment could not cope with the new timetable. The evidence suggests that on a normal working week day the SRA would carry approximately 900,000 people and in ten years' time the number would increase to between 1.2 million and 1.5 million passengers per day. The rail network

currently transports 280 million passengers per annum and in 20 years time it is expected that it will transport 400 million passengers per annum. Instead of train controllers having to work out themselves where to put various trains, given their likely dwell times in railway stations, the number of stops that they would have to make during the course of their journey and other such considerations, the computer could determine these immediately an incident occurs and provide the train controller with a list of alternative means by which train movements can be managed. The computer is likely to produce scenarios which contain fewer elements of risk than human calculations. The more the risk of error is minimised or reduced the less risk there will be of an accident occurring.

A centralised control room using up to date computer technology should, in my opinion, be the long term objective in the network control area. The complexity of the Sydney rail network may require the continued use of both train controllers and signallers but, in my view, they should all operate from one centralised control room for the reasons that have been given. These improvements will obviously take substantial capital investment and many years to achieve. However, planning should be based upon where it is expected the network will be in 20 years time.

Automatic Train Protection

The tragic accident on 19 October, 1999 at Ladbroke Grove near Paddington in London has renewed the debate over the issue of ATP in the inquiry being conducted by Lord Cullen into that accident. Lord Cullen and Professor Uff QC, the chairman of the Southall Rail Accident Inquiry, sat jointly to consider the introduction of ATP in the United Kingdom. I understand they have recommended a form of ATP called train protection warning system. Fundamentally, it is an electronic version of a train stop. It achieves electronically what train stops achieve mechanically.

The New South Wales rail infrastructure is significantly different from the United Kingdom system. The most significant difference is that train stops are fitted to most signals in the Sydney metropolitan area and there is a project to have all signals so equipped. When the Glenbrook rail accident occurred train stops had not been fitted to the signals in the Blue Mountains area but since this accident considerable progress in rectifying this deficiency has been made. The purpose of a train stop is to ensure that if there is a SPAD then the arm on the train stop will connect with the trip valve on the train, apply the emergency brakes and bring the train to a stop. I earlier described how catch points are sometimes located so as to prevent collisions with other trains.

ATP is based upon computer technology which is designed to control the distance of one train from another. If a train is travelling too fast or it becomes too close to the train in front warnings are given, and if ignored, the brakes on the train are automatically applied. Instead of having a predetermined block with signals on it and overlap sections to allow for the time that it might take a train to stop after passing a signal, the blocks with ATP are continuous and are determined by the position of other trains in relation to the subject train. As with conventional signalling the purpose of ATP is to ensure that trains do not crash into each other. If one train is encroaching too closely on the train in front, the ATP applies the brakes and avoids any possibility of a collision between them, determining what is a safe distance between trains.

In a conventional signalling system, if the block is 300 metres between signals, with moving block technology of a kind used in advanced ATP systems, the distance may be reduced to 150 metres as a moving block. The technology enables the precise location of trains on the track and in relation to each other to be determined at any point in time and calculates safe distances between them. It ensures safe driver behaviour because it indicates the parameters within which the driver may operate the train. If the parameters are exceeded then the brakes are applied.

There are three levels of ATP. Level 1 is a system which determines what the signal in advance is showing to the driver and if the train is travelling too fast to stop at a signal at stop, the brakes of the train are automatically applied. If that system were introduced in New South Wales train stops and catch points would become mostly redundant. The estimated cost of introducing level 1 ATP in New South Wales is approximately $200 million to $300 million.

In order to have an increase in capacity, it is said by its proponents that a higher level of ATP is necessary. Level 2 ATP operates without signals so drivers operate from indications in the driver's cab. It operates on track circuits, with transponders which convey information to a train, and operates with fixed blocks of track with the computer determining when it is safe for the train to move into the next block. The computer analyses what is happening on the track and gives the driver an indication of the maximum speed at which he should travel. If the driver is exceeding the safe speed as determined by the computer, a warning sounds and if the driver does not respond to the warning the brakes on the train are automatically applied.

It thus removes the potential for drivers to misread signals and significantly removes the risks associated with human error. The cost of installing level 2 ATP in New South Wales was estimated by Mr Hedley to be in the order of $600 million to $900 million. Level 3 ATP is a moving block system. It has a dramatic influence on high speed travel and in my opinion it is essential if high speed lines are ever built. It is much cheaper to install moving block ATP when the line is built and when trains are purpose built for it.

ATP can be introduced in stages. It is possible to start with level 1 ATP then upgrade the system in time to level 2 and then to level 3.

The rolling stock currently used in New South Wales is not designed for ATP to be fitted. Further, adding sophisticated equipment to the existing rolling stock and infrastructure to perform this task is an expensive procedure. Equipment added to existing rolling stock and infrastructure is more liable to fail and consequently can be much more expensive than building purpose built ATP moving block lines and rolling stock. If introduced it would need to be introduced in stages and it would be necessary to segregate particular trains in the fleet of rolling stock to operate on the sections of track where it is installed.

Mr Hedley gave extensive evidence about the present state of ATP and what it is designed to do. The division in which he is employed develops and maintains infrastructure and rolling stock standards in New South Wales and also provides technical advice to both RAC and the maintenance contractors, and sometimes to operators such as the SRA. His division also advises the government regarding the expansion of the network or new technology.

Mr Hedley stated that parts of the metropolitan system have reached capacity. For example, the Cronulla line during peak hour is operating at 120 to 130 per cent of seating capacity. The North Shore line is approaching that capacity, as is the Eastern Suburbs line notwithstanding that the latter line was built only 20 years ago.

Mr Hedley expressed the view that the adoption of ATP is inevitable for a number of reasons including its ability to increase the capacity on some lines and the reduction that it will bring in the instance of SPADs. He stated that to adopt any such technology it must undergo a rigorous analysis in order to ensure no substantial loss of money.

A trial of ATP on certain lines has commenced. Mr Cowling, the Chief Executive Officer of the former RAC and the Acting Chief Executive Officer of RIC, regarded train stops as a primitive method of train protection. Mr Cowling was in favour of the installation of ATP and he proposed to introduce equipment on a trial basis to determine what best suits Australian conditions. He stated that an amount of $1.5 million has been set aside for this testing and he said that he hoped in six to nine months from when he gave evidence in November 2000 to be able identify a suitable system. He stated that it was necessary to have more layers of protection or train movements to overcome driver mistakes. He agreed the system should be embraced on a national level in order to make it compatible with interstate trains and the mistake that occurred with the introduction of separate Countrynet and Metronet radio systems should not be permitted to happen with the introduction of ATP.

Mr Hedley expressed the view that the first section of track on which it should be introduced is the Illawarra line because it is serviced by a fleet of rolling stock that operates solely on that line and that would be an ideal pilot program. Elsewhere, it would be more difficult to commence a trial because it would be necessary to equip all rolling stock on the fleet with ATP technology.

A number of other witnesses gave evidence in relation to the desirability of ATP. Mr Worrall, when asked his view about ATP said “I nail my colours to the mast, I am a devotee of ATP.” He described ATP as a generic acronym which applied to a number of systems. He expressed the view that ATP systems will be introduced into the United Kingdom with priority on high speed lines and in due course everywhere else. He said “So it isn’t a question of whether, it is just a question of when.” The reason for this was the emphasis placed on ATP as a result of the incidence of SPADs in the last 12 to 14 years as public knowledge about their incidence has increased. I have previously discussed the way in which public attitudes and expectations have changed in relation to safety in the earlier chapters of this report.

Mr Worrall said that a lot of SPADs result from human behaviour and, despite the work being done on human behaviour aspects and driver training, the risk of SPADs continued. He stated that at some stage there is a point of no return, no matter how much work is done to address the human behavioural issues, and it is necessary to have another line of defence, namely technological means of avoiding the risk of accidents.

He stated that in 1994 two pilot lines were used for a trial of ATP in the United Kingdom and the decision was thereafter made that ATP could not be fitted to the whole of the United Kingdom train system.

Mr Arthur Smith, the Chief Operations Manager of the SRA expressed himself to be in favour of ATP to the level 2 standard. He stated it would involve substantial work to rolling stock and corresponding work to the infrastructure and he expressed the view that ATP in one form or another was inevitable in metropolitan Sydney. He stated that the mechanical system of train protection in place, by natural evolution, would have to be replaced by an electronic system. Ultimately, the only impediment to the introduction of ATP, according to Mr Smith, was financial but I believe there are other serious impediments. He stated however, that whilst the initial cost of ATP was higher, the track side signalling costs would be reduced and the monitoring from remote locations of the system would also reduce costs.

Mr Band speculated that any attempt to fit ATP on the existing rolling stock in New South Wales may produce the result that occurred in Queensland, namely that ATP equipment has now become the greatest single item of maintenance on the Queensland system and accounts for more than 50 per cent of rolling stock defects.

Mr Band also referred to the serious problems that occur when ATP equipment is installed on old rolling stock. In 1988 Queensland Rail first put in a Swedish system of automatic train control, just north of Brisbane. Following its installation there were two train collisions, one in 1989 and one in 1994, resulting from the installation of ATP. The first collision was brought about by the driver having insufficient air left within the braking system to apply the brakes on the train as the Swedish system had been bought off the shelf and had never been designed to cope with the problem of low air. The second accident in 1994 occurred because the driver kept overriding the system.

These accidents led to a decision to enhance the system and the Westinghouse organisation was retained to develop a more advanced system. That was introduced, from about 1997, between Rockhampton and Townsville. There have been some very acute operational problems with that system. To illustrate the difficulties he said that faults on the ATP system account for more than 50 per cent of the entire rolling stock defects.

Following an incident which occurred in 1996 at Bowen Hills in Brisbane, a full evaluation of train protection systems for the Brisbane suburban system was undertaken and it was decided not to proceed with ATP in Brisbane.

He was asked about the advisability of an ATP system for the Sydney network and stated that with the level of technology available he believed it should be approached with caution. He stated that even with 12 years of experience Queensland Rail was still having problems with the ATP system and it brought trains to a stand once nearly every journey. He stated that Queensland Rail was implementing ATP on the Mt Isa corridor, which is a freight line with cross over loops, and the evaluation that was made was that every train will be brought to a stand by a self inflicted brake application because of technical issues that have not been able to be resolved.

Mr Band said that ATP has been successfully implemented on high speed lines in Germany, France and Hong Kong, but has not yet been able to be successfully implemented on densely trafficked suburban lines.

Mr Oliver was also critical of the reliability and efficiency of ATP systems currently available. He stated:

> [T]he ATP system has to take the most pessimistic view. The ATP system will enforce the speed to cope with the worst possible braking scenario, and the worst possible set of conditions in terms of weather conditions, the state of the rail and that sort of thing.
>
> So a skilful driver on the suburban system will be able to adjust his or her driving style to the actual conditions. The ATP won't let you do that. Safety wise, because of the failure tendencies of ATP, they produce an extra degrading into the system, that the level of intensity of the ATP system, you would have to have, the intense part of the suburban system is so great, you will have such huge numbers of the ATP devices that the failure rates would start getting high.
>
> Each time you have a failed ATP system, you are back into degraded mode, where you have to depend on the human behaviour, and as we have seen so often, the real problem is not so much equipment issues, but what happens when that equipment fails and the people then have to get into force.
>
> So that down the track, I can imagine that you may get serious advantages but I think in the current state of development you would find that you were getting, if anything, more Glenbrooks, not fewer.

Problems of reliability appeared to have affected different systems of ATP in other countries. In Europe there is a system called the European Train Control System project which is trying to develop a standard technology for the whole of Europe using ATP technology and computerised control of trains. In the United States of America, another system called STCS was attempted and the evidence was that following trials, "it sunk without a trace".

The evidence does not disclose that there is any level 2 ATP system which has been used anywhere, which would be suitable and reliable for the Sydney network.

Mr Lane had reservations about spending $1.5 billion on ATP systems. He referred to the earlier evaluation of the cost of installing ATP in the United Kingdom and the conclusion that it was far too costly, having regard to the safety benefits that might be achieved.

On the present level of technological development of systems of ATP, I do not recommend its installation for the following reasons:

i. There is no system yet developed anywhere which could reliably be used on the complex Sydney rail network .

ii. The major impediment to improving the number of trains on the Sydney network and the frequency of peak hour services is the dwell time at busy city stations. ATP does not improve dwell times.

iii. The cost of somewhere between $1 billion and $1.5 billion for technology which cannot be demonstrated to be reliable, would not be justified. In the last decade there has been a vast amount of public money wasted on less than satisfactory communications systems (Countrynet and Metronet) and train control systems (the Queen Street project). Embracing level 2 or level 3 ATP technology is likely to produce the same outcome.

iv. Safety would be improved by expenditure of a much lesser amount of money on what have been referred to as the soft issues of training, supervision, auditing and better rail safety management, rather than technological devices. However, if the government, for whatever reasons, were to reject the recommendations of the Special Commission of Inquiry for a Rail Safety Inspectorate and a Rail Accident Investigation Board then it would be essential to spend a large sum of money on improving the technology to attempt to achieve the same safety outcomes by other means.

It may be inevitable that advances in technology will produce means by which trains can be operated and controlled which will minimise the extent of human involvement and provide technical barriers to accidents occurring. The technological advances should be monitored and a careful evaluation made if a stage is reached where the level of efficiency of the CityRail network can be improved to enable it to cope with the demands created by an increase in passenger numbers from the current 900,000 passengers per weekday to the predicted figure of up to 1.6 million passengers per weekday in ten years time. Together with an examination of the reliability of any system developed, a rigorous process of analysis of the safety implications should also be undertaken by the Rail Safety Inspectorate before a decision on implementation is made.

Random Alcohol and Other Drug Testing

Section 61 of the Rail Safety Act 1993 makes it a condition of accreditation that an accredited person must ensure that all railway employees, employed, or contracted, by the person to perform railway safety work, are not under the influence of alcohol or other drugs when about to carry out, or while carrying out, railway safety work.

Railway safety work is defined as work as a driver, guard, observer or engine man on a train, work at a railway station or other place as a station master, operator or operator of train signals, or shunter of trains or work which otherwise relates to the movement of trains, and work on or about railway infrastructure relating to the repair, maintenance or upgrading of railway tracks or rolling stock.

The section provides to the effect that the Director General may, at any time, arrange with accredited persons for random testing of any person carrying out railway safety work, on railways owned or operated by those persons, for the presence of alcohol or any other drug to ensure that accredited persons are complying with the terms of their accreditations.

Section 61(4) states “Schedule 2 has effect”. Schedule 2 relates to alcohol or other drugs and authorises the random breath testing of railway employees, where an authorised officer has reasonable cause to believe that a railway employee is about to carry out railway safety work.

A railway employee is to be regarded as being about to carry out railway safety work "if the employee has left home, or a temporary residence, for work and has not commenced work after having so left home or the temporary residence." The schedule then goes on with considerable detail to identify the circumstances under which a breath analysis may be required and the circumstances under which urine and blood samples can be obtained.

The mechanism by which random testing for alcohol or drugs may be conducted is limited to circumstances where the Director General of the Department of Transport has made the necessary arrangement with an accredited person for this to be done or, after an accident or incident has occurred. What is significant is that there is no random alcohol or drug testing of employees actually engaged in railway safety work.

In my opinion, this is a serious omission from the legislative framework. Although there is no evidence that any serious problem exists at the present time, it is necessary for the protection of the public and the employees themselves that the deterrent effect of random alcohol and drug testing be introduced to minimise the risk of a problem developing in this area. The prevalence of the use of alcohol and so called recreational drugs is widespread in the community. Public safety requires measures to control this risk.

In the public interest, the law at present authorises random breath testing for motorists, who may be driving in the course of their employment or on a private journey. Train drivers, signallers, and other persons carrying out safety critical work, are responsible for the safety of members of the travelling public. In my opinion, the law in relation to the random testing of railway employees should not be limited to circumstances where the Director General of the Department of Transport makes an arrangement with an accredited railway entity for this to occur. Nor should the circumstances be confined to testing after an accident has occurred.

One of the purposes of random testing of motorists is to act as a deterrent so that motorists will be discouraged from driving with the prescribed concentration of alcohol, because, to do so constitutes the commission of a criminal offence for which various sanctions are available.

I recommend that the random testing of railway employees for both alcohol and other drugs engaged in railway safety work as it is defined by the Railway Safety Act 1993. Inspectors employed by the Rail Safety Inspectorate, in addition to the classes of persons identified under the present Rail Safety Act, should have authority to conduct such random tests.

Random breath tests are relatively easy to administer. Requiring employees to provide a urine sample, or blood and hair samples, raises practical difficulties. It will be necessary to establish an appropriate protocol in consultation with the trade unions to ensure that the privacy of employees required to provide a sample is respected. Where an accident or incident has occurred, it should be mandatory that any railway employee involved undergo a breath analysis, as is the position at present, and that, in addition, the provision of urine and blood and hair samples for analysis is mandatory if the accident or incident falls within Part 1 of Schedule 1 to the Rail Safety Act 1993.

Whilst I am not required to draft the necessary legislation, an example of the type of provision that I have in mind is section 211A of the Police Service Act 1990, as amended,

which provides for the random selection of a police officer to undergo a breath test, or submit to a breath analysis for the purpose of testing for the presence of alcohol, or to provide a sample of the police officer's urine or hair for the purpose of testing for the presence of prohibited drugs. This selection may be conducted on a random or targeted basis. Subsection 211A(2) confers the same powers in relation to an incident in which a person is killed, or seriously injured, as a result of a police motor vehicle pursuit, or the discharge of a firearm by a police officer, or, in which a person is killed while in police custody. Finally, subsection 211A(3) provides to the effect that a police officer may be breath tested, or required to undergo breath analysis, whether or not there is any suspicion that the officer has recently consumed alcohol.

It is noteworthy that section 211B of the Police Service Act 1990, as amended, provides that the regulations under that Act may establish a code of behaviour regarding the consumption of alcohol and the use of prohibited drugs by members of the Police Service. Further, that the regulations may make provision for, or respect to, the following:

i. The consequences for police officers of testing positive for alcohol or prohibited drugs, or of otherwise breaching the code of behaviour;

ii. The consequences of any member of the Police Service conspiring with, or aiding or abetting, any police officer to breach the code of behaviour;

iii. The evidentiary value of a certificate relating to the analysis of a sample; and

iv. The conduct of follow up testing of police officers who have tested positive for alcohol or prohibited drugs, including provisions as to the frequency of any such follow up testing.

In addition to the deterrent effect of random testing for alcohol and other drugs, evidence was given about the introduction of occupational safety performance assessment technology (hereafter OSPAT) into the rail industry. This technology has been successfully used in mine sites as a means of quickly screening employees who are about to engage in safety critical work to determine if they are impaired, for any reason, from safely engaging in their work. The test takes approximately 30 seconds and involves the movement of a cursor on a screen. If the concentration or performance of the employee is impaired, his performance of the task will be outside his normal range, indicating that he is impaired in his ability to carry out his work. A supervisor then manages the employee at that stage. The system has built into it mechanisms which prevent employees cheating for the purpose of getting a day off work. Their performance is measured against their normal performance on similar tests and the computer makes the assessment.

The failure to perform this 30 second test within normal limits given age, experience, reaction time, speed of information processing and other variables may not be due to alcohol or drugs, but due to fatigue, stress, anxiety or depression or some other factor which has impaired the ability to concentrate and perform the simple tasks required of them.

If the employee is under the influence of alcohol or drugs, the OSPAT system will detect that before the employee becomes a danger to himself and to others, and before serious consequences, which might otherwise result from that impairment, are able to materialise.

In my opinion, the use of the OSPAT technology, or some similar technology, as a means of monitoring whether employees are in a fit state to carry out safety critical work, is highly desirable. If an employee does not know whether alcohol that he may have earlier consumed might still be within his bloodstream, in a sufficient quantity to impair his performance of his work, then he could voluntarily undertake the OSPAT test, rather than risk being involved in an accident in which he or others could be injured or killed.

I regard the use of such technology for a short 30 second test at the time of signing on as a highly desirable innovation which, together with random testing for alcohol and other drugs, will significantly remove the risk that alcohol and drug use poses for persons engaged in what are often highly dangerous railway activities.

8. The Structure of Rail Safety Management

Introduction

The second interim report recommended a restructuring of the New South Wales railways, including the merger of RAC and RSA. It recommended that the newly merged entity be a single statutory authority to be known as the Rail Infrastructure Authority. However, the Transport Administration Amendment (Rail Management) Act, 2000 constituted a State owned corporation with the name Rail Infrastructure Corporation.

It also recommended that an Office of the Rail Regulator be established and that the Office of the Co-ordinator General of Rail be formally established to manage, among other things, the merger of RAC and RSA.

The report also recommended that a Rail Safety Inspectorate and a Rail Accident Investigation Board be established and that development of the legislation dealing with their establishment should not be commenced until after the delivery of this final report.

I took that course for a number of reasons. The first was that the time by which the second interim report was required did not enable time for sufficient consideration of the powers and duties of the Rail Safety Inspectorate and the Rail Accident Investigation Board and the interrelationships between them and the Office of the Rail Regulator. Secondly, I wanted to receive further evidence, not only in relation to the specific rail safety issues that I have already dealt with, but also in relation to the way in which the three recommended structures could best fit together to achieve the most efficient and safest administrative structure for the government's management of rail safety.

The views of witnesses with a wide range of experiences and interests in the rail network were sought concerning the Rail Safety Inspectorate and the Rail Accident Investigation Board during the second and third stages of the hearings. It is important to identify the breadth and nature of that experience and the near uniformity of view which has emerged about the way in which rail safety management should be structured.

The second interim report recommended the establishment of the Office of the Rail Regulator, which was subsequently established by the Transport Administration Amendment (Rail Amendment) Act 2000. Mr Christie, the Co-ordinator General of Rail, gave the following evidence:

> My view also is that the Rail Regulator would not only deal with the satisfactory performance of the rail system, in relation to the expectations of customers, but also would deal with safety issues.
>
> Do you see there being any inconsistency between punctuality, or as it is colloquially referred to, on time running and safety?
>
> Your Honour, whilst I believe that there are some who would argue that the safety regulator in a rail system should be totally divorced from the setting of other standards, particularly punctuality, standards of performance generally in the system, I believe that there is a nexus between the two and that a well run rail system, a well disciplined rail system, which is achieving good results

> in other areas, will also tend to be a safety conscious system and the question of safety is pre-eminent as far as I am concerned, but I am suggesting that the setting of standards for safety and the setting of standards for other aspects of the system should be compatible.

As the second interim report stated, I do not agree that the Office of the Rail Regulator should be both a performance regulator and a safety regulator. There can be no doubt that if trains are running in accordance with the timetable, and there are no infrastructure or other defects, then the degraded mode of operation, which often gives rise to accidents, will not occur. The danger to public safety that exists is the attempt to meet performance standards in relation to punctuality of services when, for reasons due to infrastructure failure, defective procedural rules, poor training, inadequate communications technology or otherwise, this cannot be safely achieved. Mr Christie was the only witness who did not acknowledge the possibility of a conflict between meeting performance standards and ensuring the safety of operations. Achieving punctuality and reliability in rail performance will enhance safety but must not be permitted to assume a priority ahead of rail safety when performance targets are not being met.

Mr Ian Robinson, the Acting Director General of the Department of Transport supported what he called a co-regulatory model. What I understood him to mean was that individual rail entities and the industry as a whole must have safety standards in force to manage the risks of any activities undertaken. The role of the safety regulator is to assess the adequacy of those controls and standards and to monitor their effective implementation. The means by which that is done is by requiring the rail entities to satisfy the regulator that they have systems and standards in place, and approved by the regulator, which will ensure that safety will be properly managed. According to Mr Robinson, this is achieved by co-operation between the safety regulator and the rail entities, and by communication between them.

The structural model that Mr Robinson favoured was one where the rail entities were responsible for ensuring the safety of their own activities, with the safety regulator being part of the Department of Transport and thus subject to the direction of the Minister for Transport. He did not accept that this structure had any undesirable feature and pointed out that in appropriate circumstances, as in the case of the Special Commission of Inquiry, if an accident caused sufficient concern to the community, the government could direct an independent judicial inquiry. He stated:

> I think the nature of our system is that Ministers and Governments have to report to Parliaments and to the community, and it is that very system that holds them accountable for what actions they take.

Mr Paul Hayes was the Director of Policy of the New South Wales Department of Transport. He described his duties as 'leading the department's policy group, which acts as the central policy arm within the transport portfolio'. His major functions were of a strategic advisory nature and the co-ordination of various projects, in particular the development of major portfolio policy initiatives through the department's Director General, the Minister for Transport and the cabinet process. His strategic advisory responsibility was as the Director of a policy group which was the Minister's source of policy advice, principally on matters relevant to the operation of the Passenger Transport Act 1990 and the Transport Administration Act 1988.

I have previously referred to Mr Hayes' criticism of the present system of certification of individual rail employees by the Department of Transport. Mr Hayes expressed views similar to Mr Robinson about the necessity for the rail entities themselves to be responsible for the safety management of their own organisations and employees. He pointed out that otherwise the safety regulator would be, in effect, running their businesses for them without actually controlling the businesses, 'which does not lead to a good result for either the regulator or the relevant operator'.

Mr Hayes was also critical of the present difficulty which the Transport Safety Bureau faced of having what he called 'physical check activities'. He said:

> What is needed is a move away from that to a systems risk management approach where these particular tasks . . . are linked to management and elimination of risk.

In Mr Hayes' view, it would need to be made very clear that the Inspectorate was independent of the rail industry. Under the present system, the rail safety component of the Transport Safety Bureau's activities is funded by accreditation fees paid by railways. It should be very clear that the Railway Safety Inspectorate is not the servant of the railway organisations. The Rail Safety Inspectorate is the servant of the travelling public in particular, and the community in general, for the purpose of ensuring the safety of railway operations. Consequently, the funding arrangements for the Rail Safety Inspectorate should reflect its integrity and operational independence.

Mr Hayes supported a separate Rail Accident Investigation Board in addition to the Rail Safety Inspectorate. He said:

> I think there is a clear capacity for such a body, subject to it being lean and mean, as it were, given the propensity of organisations to expand without proper control, and that in itself it should have a reporting role to ensure that it also is accountable for its actions, given the obvious propensity for tension in terms of its actions with the other bodies.

He believed that it would create public confidence in the safety of rail operations. He said that it would be reasonable for it to have a part-time chairman with the power to co-opt investigators in order to avoid 'bureaucratic expansion'.

Mr Hayes' view was that the Rail Safety Inspectorate should report to parliament, but through the Minister for Transport rather than directly. He stated:

> If you look at it from a purely procedural point of view, there needs to be a Minister of the Crown to table those relevant reports direct to the Parliament.

Mr Hayes' view about the need for the independence of a Rail Safety Inspectorate was based upon his view that where organisations, such as the former RAC, had an obligation to produce income from the use of the track, there might be commercial considerations which should affect the way in which safety was managed:

> The point I was also trying to lead to is the fact that, at the end of the day, there would be commercial considerations which should be taking priority

> over safety, and that cannot be countenanced. For this reason, there needs to be a mechanism in place to ensure that, although the Rail Safety Inspectorate comes under the umbrella of the Minister for Transport, it is not subject to direct ministerial control.

Mr John Hall, the Executive Director of the Transport Safety Bureau, supported the existence of an independent Rail Safety Inspectorate.

Mr John Cowling, the Chief Executive Officer of RAC, was asked his views about the best methods of ensuring the safety of rail operations, conducted on the infrastructure which his corporation owned and managed on behalf of the government. He strongly favoured an independent Rail Safety Inspectorate. His view was that the Inspectorate should audit compliance with safety standards. He continued:

> And I might add that the squabbles between myself and the operators at the present time, relating to auditing their rolling stock, is because there is no clear explanation of who is responsible for that, so we are – RAC is trying to step into the breach to make sure somebody does it, but I would welcome the restructure of the industry, making sure it is very expressly clear who has responsibility for that. Of course, the operators have responsibility to maintain, according to the standards, but there has to be an independent person that checks their compliance.

He expanded on the way in which he thought the safety regulator should operate. He said:

> The way I could see the system working is that the regulator could ask each rail entity to prepare a safety plan, and then receive the safety plan and ensure that the combination of all the safety plans covered all the risks on the system, and that the safety regulator could be looking for gaps in the plans and it should be looking to make sure there is sufficient overlap in all the key hazards and, if the safety plans were inadequate in total, then it should be his [sic] responsibility to make sure that somebody's plan covered the gaps.
>
> Then I think, having agreed a safety plan, it should be appropriate for the Inspectorate to ensure that the plan was carried out so, if there were elements of the plan that needed to be introduced in the following year, then it would be the Inspectorate who could go to the particular entity and say okay, you agree to improve your braking systems, or to move signals, or whatever the particular issue was. The inspector could go along and make absolutely sure it was happening.

Mr Terrence Ogg, the Chief Executive Officer of the former RSA, gave this answer to a question by senior counsel for his corporation in relation to the recommendations in the second interim report:

> I think the structure will go a long way towards addressing some of the problems that have existed in the last four years. I think that putting the functions of RAC with the functions of RSA will assist the process. I think having a Regulator, with powers relating to standards, and meeting the

> government's expectations and the users' of the systems expectations, will greatly assist the owner/maintainer in its relationships with the operators of the system.
>
> I think separating the safety aspects from the regulation aspect is a very worthwhile operation, and I think having an independent Accident Investigation Board will also add significantly to the system that will operate in New South Wales, and I think with goodwill and excellent implementation, New South Wales will have a system which is certainly the best in Australia, in our experience, and probably best relative to Europe as well.

Mr Simon Lane, the former Chief Executive Officer of the SRA stated in evidence that he had not seen the second interim report, and was not aware of its recommendations, but he was aware of the proposal to have a Regulator and the Rail Safety Inspectorate, and a separate Rail Accident Investigation Board, and thought those proposals were appropriate.

The two trade unions, which between them cover approximately 90 per cent of the employees in the New South Wales rail system, are the Australian Services Union, New South Wales Branch, and the RBTU.

Mr George Panigiris, the Assistant Secretary of the Australian Services Union, New South Wales Branch, supported the existence of an independent Rail Safety Inspectorate and a separate Rail Accident Investigation Board. In relation to the latter, he said:

> I think it is clearly in everyone's best interest to do that because, if you allow investigations to be part of an organisation, let's say, for argument's sake, reports to a Minister who is responsible for that part of the industry, there would have to be, I think, a conflict of interest in relation to that.

Mr Roger Jowett, the National Secretary of the Australian Rail, Tram and Bus Industry Union, stated that his trade union placed 'prime importance on the role of safety, both in relation to our own members, the travelling public, and also the various infrastructure facilities'. He had been a trade union official since 1972 and a member since 1995 of the Executive of the Australian Council of Trade Unions. He supported the existence of an independent Rail Accident Investigation Board and, when asked whether he supported the existence of an independent Rail Safety Inspectorate, he said 'most definitely'.

The RBTU filed a helpful submission in relation to rail safety management, which included a number of annexures to which I have made reference from time to time in this final report. The Secretary of the New South Wales Branch of that trade union, Mr Nick Lewocki, gave evidence about the deterioration in the level of safety in rail operations since the 1996 disaggregation. His view, stated on several occasions, was 'self regulation won't work'. He gave a number of examples including circumstances where the trade union had had to impose its own speed restrictions on trains passing work sites and where some train operators were breaching the maximum hours that drivers were permitted to drive. He also stated that wagons manufactured overseas were being used on the escarpment between Moss Vale and the south coast of New South Wales, where the braking system had not been able to hold a train, and the trade union had to place bans on the train until braking engineers had examined the train and, thereafter, the braking

system was changed. His view was that with the existence of State owned corporations, instead of an integrated railway, and the introduction of private train operators from within and outside New South Wales onto the rail system, it was necessary to have a separate Rail Safety Inspectorate.

Mr Klaus Clemens, the General Manager, Organisational Development of the SRA of New South Wales stated:

> ...I am very, very supportive of the Inspectorate idea and the independent safety investigator.

In addition to the support which the proposals for an independent Rail Safety Inspectorate and an independent Rail Accident Investigation Board received from persons in positions of management, there was also evidence from a number of witnesses who were experts in rail safety, in relation to the Rail Safety Inspectorate and the Rail Accident Investigation Board.

Mr Band supported the function of a separate Office of the Rail Regulator. He said:

> I believe that there is a very subtle but importance difference between the function that regulators perform. I believe that safety regulation is a part, and different from, another form of regulator that might look at infrastructure condition, and I believe the most successful part of the fragmentation of the UK railways, for example, was by putting into being two regulators. A rail regulator that looks at the track, the condition of the track, and to ensure that operators individually and collectively get fair play and fair play from two points of view.
>
> One, to prevent the manager from gold-plating a railway that the government can't afford or need and, secondly, from the operators' point of view because if you are going to have a debate about let's say issues of automatic train protection, that is a matter of issue that needs to be well thought through and well understood to make sure all players get fair and just treatment.
>
> I don't think we have ever really been able to work out who benefits and who pays so there has to be a fair and just play for everybody from a rail regulator's point of view.
>
> However, you can regulate your railway and you can do many things to your railway which doesn't imply unsafe, such as you can allow a railway infrastructure to deteriorate as long as you slow down the speed of trains, so a deterioration of a network doesn't of itself imply an unsafe network.
> So I believe you need a safety regulator to ensure the safety and that is all they focus on and I believe the other form of regulation is the condition of the infrastructure to ensure that everybody gets fair play. I believe it is the most successful part of the restructure of the UK and it is my view as to what you need here in New South Wales.

Mr Edward Oliver, an expert retained by the Department of Transport, gave the following evidence:

Do you support the existence of a separate Rail Safety Inspectorate?

Absolutely. I have been arguing for that in every possible forum for at least ten years, so nothing makes me happier than to see you recommend it.

Why?

Because it is the only way in which a safety supervision process can be applied which is free of commercial and, to put it bluntly, political motivations. It is the only way in which the railway system can understand that its safety performance is being monitored by people who are dedicated to safety performance, whose only objective is safety performance, and where any departure from safety performance will not be kowtowed to by commercial considerations.

Should the Inspectorate be part of a Department of Transport or should it be somehow separated from a government department?

There are two parts of that and I am not sure how I can weigh them up. I believe that from a public perception point of view, and from a political reality point of view, it is important that it be properly independent. You can't have even the appearance of somebody getting in the way. On the other hand, I think it is vital that there be communications to the Minister and the Director General in such a way that, if this Inspectorate sees a problem, they can get on the 'phone to the Minister and say, 'Hey, Minister, you have a real problem here', or similarly, to the Director General, and they need to be able to do that without going through intermediaries. There has to be direct path. I favour independence, but it has to be accompanied by a system to ensure the rapid communication of problems. And another witness expressed one of my concerns, which is that the thing could be marginalised by insufficient funding, or simply be ignored, and the independence has to be structured in such a way that it can't be insufficiently funded and it can't be ignored.

What view do you have about whether there should be a Rail Accident Investigation Board which operates separately and independently from the Rail Safety Inspectorate?

Again, I think there are two separate aspects which have to be weighed up. One is the independence, perceived independence, guaranteed independence. The other is that there has to be a process for rapid communication, so that as soon as a problem arises, it can be acted on immediately – I mean as soon as it is identified – it can be acted upon immediately without having to wait to go through some remote reporting process; that, on day one, the investigator should be able to say to the Inspectorate, to the Minister, to the Director General, to the executives, to the Co-ordinator General and anyone else, "do this forthwith. Don't wait for it to get around and process all the 54 stages of the report. Do it now". I would also support a thing that Mr Hall, I believe, said, that there is considerable advantage in having the Inspectorate involved in the investigations. I think that, unless they are involved in the investigations to a substantial degree, they will become remote from the

> investigations and, indeed, even feel under threat. And, also, there is a vast body of expertise there, which should be used to best effect. So that I would envisage the Board as being the managers, rather than a ground level of these investigations [sic], to ensure their independence and quality and reliability, all those sorts of words, but not so much as being the doers of the investigations, except in extreme cases.

I have previously referred to the evidence of Dr Sally Leivesley, an international expert in safety, who was retained by the Director General of the Department of Transport. She was asked her view about the independent Rail Safety Inspectorate and stated:

> All my reading of the facts that came out of the interim report, and going through the hearings and talking with the personnel, lead me to the view that an independent Inspectorate was essential.

She favoured an Inspectorate that was located within the Department of Transport. She stated:

> The reasons that I went the route that I did were that the rail service is like a family, and it operates like a family, and what I find is that, like many other service organisations, where people are quite committed to the service they are doing, they learn more through example and guidance than by punishment, or the feeling that they are being viewed by people who are remote from the organisation. In other words, it is like learning from the parent in the family and what I had felt was that the success of the safety management that was really going to come from an Inspectorate that about 80 per cent of the time was leading and setting the standards and providing the top layer of safety management capability, and helping them along the way with that, and only about 20 per cent of the operation would be the actual negative, or side that was looking at the full exposures.
>
> What I had felt was that, in having the Inspectorate in the family, that this could be managed in an independent form, as long as the reporting was through to the Minister.
>
> If there is any chance that there could be corruption of the independence of that Inspectorate, then I would view a totally independent body as being the most important part.

She observed that if the Inspectorate were placed outside the department, that could provide a 'pathway for the governments to externalise the blame, there may not be the same commitment to doing the job well'.

She was asked about the placing of the Inspectorate in a department other than the Department of Transport. She was opposed to this because:

> [That] was still taking the Inspectorate out of the rail family and my view was that it was a problem that really had to be resolved by all the bodies working very closely together and with a heavy level of influence, because I don't

> think that you can train the railway personnel with abstract concepts or, shall I say, the warm fuzzies of risk management.
>
> I think it is dedicated, hard and practical work with the Inspectorate being on the scene, being visible and taking people through the task that they are perhaps not correctly performing, and it is that level of person to person interaction which I think will actually teach a lot of people in the field and also leave people with the view that, if they do commit an offence, which is more by deliberate or institutional ways of beating the system to meet other goals, that there is a strong likelihood that they are going to be found out.

She also expressed the view, no doubt based upon overseas experience, that:

> With an Inspectorate, particularly if there is a major reform, I think what you will find is that that expertise will grow as the Inspectorate actually performs a very professional management of its operations and there is a commitment to having that Inspectorate as an independent Inspectorate.

Dr Leivesley stated that she had had discussions with Mr Christie, the Co-ordinator General of Rail, and came to the view that the Office of the Rail Regulator should not be the safety regulator 'because it would mean that the conflict between the production side of the business, and the safety, could be compromised at the level of the person who is not directly accountable to the people'.

It was not only at the level of senior management, the trade unions, and the safety experts that there was agreement about the need for an independent Rail Safety Inspectorate.

Mr Terrence Worrall, the General Manager and a Director of Thames Trains Limited, who also held a position of an advisory nature in relation to safety matters with the former RAC, was asked his view about the desirability of an independent Rail Safety Inspectorate and he supported it by saying:

> If it is truly independent, whatever one might call it, and as long as it has adequate and properly declared objectives and is staffed by persons who are competent to conduct such activities, then that would be the type of organisation that I would support.

From this body of evidence, the only conclusion that can be drawn is that there is strong support among witnesses from rail management, trade unions, the rail bureaucracy and independent safety experts for the existence of a separate Rail Safety Inspectorate and Rail Accident Investigation Board. Indeed, none of this evidence was contradicted in cross-examination or submission by any person or entity represented before the Special Commission of Inquiry.

All of this evidence confirms my own independent view, expressed in the second interim report, that a separate and independent Rail Safety Inspectorate and a separate and independent Rail Accident Investigation Board are essential.
Apart from the need for a separate and independent Rail Safety Inspectorate and a separate and independent Rail Accident Investigation Board, there seems to be an

inadequate and inefficient allocation of resources to rail safety. During the course of the hearings it became apparent that over the last several years each of the rail organisations reached an awareness that safety management was inadequate, if not inefficient, and each then sought expert assistance in an attempt to improve their safety records. I received in evidence reports by Booz Allen Hamilton, Det Norske Veritas, Richard Oliver International and I was told about safety reviews conducted by Mr Kevin Band and Mr Terry Worrall, who both gave evidence, and another safety review by Mr Peter Medlock. I also received evidence about task forces, safety groups and numerous safety committees, all of which were supposed to have been established to deal with the safety issues which obviously loomed large well before the Glenbrook and other rail accidents. In many respects the Glenbrook and other rail accidents were inevitable because of the unstructured and undisciplined way in which the obvious safety problems that were developing or existed were approached.

There is only one solution to those problems and that is the establishment of a properly funded Rail Safety Inspectorate to oversee and co-ordinate safety measures and to put in place procedures which will ensure, so far as it is possible to do so, the safety of the travelling public. It is for this reason that such a body, in my opinion, is essential as previously demonstrated. I am not alone in that view.

It is not simply a matter of each of the rail entities having lacked the ability to co-ordinate successfully in respect of safety, thereby giving rise to a need for an effective supervisory body such as the Rail Safety Inspectorate. The evidence discloses that the individual rail organisations were struggling with what was necessary for the safe operation of the railways. Some rail organisations adopted Australian Standard 4292 as the basis of their risk management while others adopted a combination of Australian Standards 4292 and 4360 as the basis for their risk management.

In the case of the SRA its adoption of both AS 4292 and AS 4360 appears to have produced little more than a bureaucratic structure. When what the bureaucratic structure was supposed to do is compared with the evidence that I heard from operational employees such as drivers and signallers, it is clear that whilst the bureaucratic structure may have generated a lot of activity, it has achieved very little, up to the present, in terms of safety outcomes for operational staff and the travelling public.

On the uncontested evidence before me, rail operations were not being conducted with a proper regard to safety. The focus of the culture, such as it was, remained very much one of on time running. Safety matters were either subjugated, in whole or in part, to on time running or ignored.

I do not wish to be unduly critical of the Transport Safety Bureau which is charged with the responsibility of overseeing safety. When one examines the tasks that it had to undertake and the resources that it had for so doing, it is obvious that it could not fulfil the object of the Rail Safety Act, namely to promote the safe construction, operation and maintenance of railways. Mr Hall, the Executive Director of the Transport Safety Bureau, said in evidence that he had three staff in the rail operational branch, four staff in the infrastructure section and three staff in the rolling stock area, out of a total of 23 staff. The Transport Safety Bureau was not only responsible for the safety of rail operations but also for buses, taxis, hire cars and ports.

It was also necessary for the Department of Transport, through the Transport Safety Bureau, to accredit not only railway organisations, but also their employees. The State Rail Authority alone had 5,000 to 6,000 employees who require certification. It is obvious that there was no prospect of the Department, with such a deficiency of manpower in the Transport Safety Bureau, being able to oversee, generally or in any particular area, the safe construction, operation and maintenance of railways in New South Wales.

Even when a particular problem presented itself and the Transport Safety Bureau tried to do something about it, it was ignored. Mr Hall said in evidence that he had identified safety issues that the SRA needed to address and they had not been attended to.

There are many examples of urgent safety matters not being addressed by rail organisations, which the Transport Safety Bureau was in turn required to monitor. These include incompatible radio systems, inadequate safeworking units, poor training, deliberate disobedience by staff of safety directions from superiors and staff refusing to follow communications protocols. Inadequate resources, particularly staff levels, prevented the Transport Safety Bureau from so doing.

One of the reasons why train operators such as the SRA can afford to ignore directions relating to safety from the Transport Safety Bureau is that there is no effective sanction. The only criminal sanction is that provided for by section 77 of the Rail Safety Act, which provides a maximum penalty of 100 penalty units or something more than $10,000 for any failure to maintain safety systems, devices or appliances as defined. Otherwise, the Director General of the Department of Transport may, pursuant to section 51 of the Act, direct an accredited person to undertake remedial safety work and, if that person fails to comply with the direction, the Director General may arrange for the work to be undertaken on behalf of the person and may recover the cost from him, if the cost of the work is likely to be less than $100,000 or such other amount as is specified as a condition of the accreditation. Alternatively, the Director General may amend, vary or remove the conditions of any accreditation pursuant to section 34 of the Act. Failing these measures, the only sanction that the Director General of the Department of Transport can exercise is to suspend or cancel accreditation pursuant to section 36 of the Act. This, however, is an idle threat. The effect of the suspension or cancellation of accreditation of the SRA for non-compliance with safety directions of the Transport Safety Bureau would be that 900,000 rail passengers per week day in the Sydney metropolitan area alone would be without rail transport. Lack of sanctions and lack of resources are two of the reasons why the Transport Safety Bureau has not been effective in dealing with rail safety issues.

The second interim report expressed the view that the existence of an independent Rail Safety Inspectorate should not deprive the Department of Transport of a role in relation to transport management. I envisaged that the Department of Transport should have a strategic role in the planning of transport services to meet changing needs. It should have overall responsibility for the co-ordination of rail, bus and road transport in the Sydney metropolitan area and in rural New South Wales and it should provide strategic advice to the government. However, in my view, there must be an independent Rail Safety Inspectorate. The primary object of a Rail Safety Inspectorate should be the continual improvement of rail safety.

Rail Safety Inspectorate

The work of the Rail Safety Inspectorate should be divided into several functions. Whilst I shall set out in some detail below what I consider would be appropriate functions and duties of the Rail Safety Inspectorate they should not be taken to be exhaustive. The primary one should be accreditation. It should not be part of its function to certify the competence of railway employees performing railway safety work. It is the responsibility of each rail organisation to ensure that its employees have adequate training and sufficient competence to carry out their duties safely. It should not be the function of an external body such as the Rail Safety Inspectorate to do what is required of the rail organisations as employers by the common law. Nevertheless, the accreditation function of the Rail Safety Inspectorate should include the examination of the activities of an applicant to ensure that it has a proper safety management system in place in respect of all of the activities. Following the grant of accreditation, its primary function should be to ensure that the accredited organisation is carrying out its activities in accordance with the approved safety management system and the relevant safety standards.

An applicant for accreditation should be required to satisfy the Rail Safety Inspectorate of, among other things, that:

i. It has a rigorous and robust safety management system which conforms to the highest international standards of safety management and practice.

ii. It has an effective safety management plan for the implementation, monitoring and ongoing improvement of its safety management system.

iii. The members of the board, the Chief Executive Officer and any other officers holding senior managerial positions consider the safety of the organisation's activities as its first priority.

iv. It has an effective system for identifying safety risks in its operations and effective mechanisms for controlling those risks, monitoring the effectiveness of the controls, and adjusting the controls in light of results of the monitoring.

v. It has an effective system for determining the priority of activities for removing, reducing or controlling particular risks.

The legislation should provide that the Rail Safety Inspectorate be required to make public notices of accreditation issued by it.

The Rail Safety Inspectorate should have the responsibility of ensuring that an accredited organisation complies with all elements of its accreditation and any conditions attached to the accreditation by the Rail Safety Inspectorate. As part of that function the Rail Safety Inspectorate should have the power to impose a range of sanctions to enforce compliance including the power to prosecute the accredited organisation, its individual board members, Chief Executive Officer and the person identified as the designated officer responsible for safety.

The Rail Safety Inspectorate should have the power to conduct a safety audit of an accredited organisation. Such an audit should encompass any matter which is referred to

in an organisation's accreditation. The Rail Safety Inspectorate should also have the power to inspect any person who, or thing which, might give rise to an unsafe activity or outcome.

The legislation should provide that the Rail Safety Inspectorate be required to make public its reports of safety audits or inspections. The Minister for Transport should have the power to direct the Rail Safety Inspectorate to conduct a safety audit or inspection of an accredited organisation. Reports of any such audit and inspection should be made public.

The Rail Safety Inspectorate should have the power to serve any accredited organisation or any person who appears to be employed by or otherwise associated with an accredited organisation with a notice requiring that specified action be taken, or requiring that person to refrain from taking specified action, which an authorised officer has reasonable cause to believe may give rise to an unsafe activity or outcome. It should be an offence, with provision for an appropriate maximum penalty or penalties, to fail to comply with such a notice.

The Rail Safety Inspectorate should have power to approve any variation to an accredited organisation's safety management system and no such variation should be made without the approval of the Rail Safety Inspectorate.

The Rail Safety Inspectorate should have the power to examine proposed appointments in the case of an accredited organisation, or existing appointments in the case of an applicant for accreditation, to the board of the organisation and to all senior positions, including Chief Executive Officer, to satisfy itself that any such appointee or proposed appointee has the appropriate level of understanding and commitment to the safety of rail operations in which the organisation is or is seeking to be involved. The Rail Safety Inspectorate should have the power, if not so satisfied, to provide a written report in that regard to the person or persons responsible for making the appointment.

All accredited organisations should be required to provide to the Rail Safety Inspectorate a report in writing of any incident or accident which has or may have given rise to an unsafe activity or outcome.

All accredited organisations should be required to provide annually, or more frequently if required, a revised safety management plan identifying the improvements in safety management that have been made since the grant of accreditation or since it last submitted a safety management plan, whichever has last occurred. The Rail Safety Inspectorate should have the power to reject any such safety management plan if in the Rail Safety Inspectorate's view the plan is inadequate in any respect or respects.

The Rail Safety Inspectorate should have the power to allocate the responsibility for any particular safety matter which does not appear to be, or likely to be, adequately addressed by any accredited organisation, or about which there is or may be a dispute, to any one or more accredited organisations. That organisation should thereafter be accountable and responsible for ensuring that that matter does not give risk to an unsafe activity or outcome.

The Rail Safety Inspectorate should have the power to enter upon land, including premises, and rolling stock and require any person to produce any document, including a document in electronic form, or thing which an authorised officer reasonably believes relates to a rail safety matter and to require any person to provide information orally, electronically or in writing which relates to any matter which does or may effect the safety of rail operations. It should be an offence to fail to provide the document, thing or information requested. It should also be an offence to provide false or misleading information to an authorised officer.

The Rail Safety Inspectorate should have the power to monitor and ensure compliance by accredited rail organisations with recommendations made by the Rail Accident Investigation Board. The legislation should also require that any accredited rail organisation that is referred to in or otherwise affected by any recommendation contained in any investigation report by the Rail Accident Investigation Board must, within 60 days of the release of any such report, inform the Rail Safety Inspectorate in writing as to each such recommendation, whether it accepts or rejects the recommendation in whole or in part only. In the event that the accredited organisation rejects any such recommendation in whole or in part, the legislation should require it, at the same time as it notifies the Rail Safety Inspectorate of the rejection, to provide its written reasons therefore. If any such recommendation is accepted in whole or in part only, the legislation should also require the accredited organisation to state in writing how it proposes to implement the recommendation and the timetable for the implementation of the necessary remedial action.

The legislation should also provide that in the event that the Rail Safety Inspectorate does not agree with the reasons for the rejection in whole or in part of any such recommendation or alternatively, if any such recommendation is accepted in whole or in part by the accredited organisation, but the Rail Safety Inspectorate considers that the proposed remedial action is either not to be carried out in a timely manner or is inadequate, then the Rail Safety Inspectorate should have the power to direct that the remedial action be concluded within such time and in such manner as the Rail Safety Inspectorate may specify in writing. The legislation should also require the accredited organisation to complete the specified remedial action within the stated time. Finally, the legislation should provide that the Minister for Transport may, by written notice to the accredited organisation, and the Rail Safety Inspectorate, extend the time for completion of the remedial action and, if such extension is granted, the Minister must provide written reasons for extending the time. All notices and correspondence passing between the Rail Safety Inspectorate and any accredited organisation relating to a recommendation of the Rail Accident Investigation Board contained in any investigation report, and any ministerial correspondence relating to an extension of time, should be made public.

The legislation should require the Rail Safety Inspectorate to provide written reasons to the Minister, which should be made public, for any action or failure to take action against an accredited rail organisation in relation to any non-compliance by that accredited rail organisation with the terms of its accreditation or a recommendation contained in a Rail Accident Investigation Board investigation report.

I reiterate that safety is paramount in the conduct of rail operations. Accordingly, the legislation should provide that if a dispute should arise between the Rail Safety Inspectorate and the Office of the Office of the Rail Regulator in relation compliance

with rail performance standards or any other matter, the direction given by the Rail Safety Inspectorate should prevail. Similarly, if an accredited organisation were to receive a direction from the Office of the Rail Regulator which was or maybe inconsistent with a direction from the Rail Safety Inspectorate the direction from the Rail Safety Inspectorate should prevail.

The Rail Safety Inspectorate should be provided with the necessary resources to retain experts including specialists in engineering, organisational safety, statistical analysis, and human factors to enable it to carry out its functions. It should also be sufficiently resourced with legal officers for the purpose of giving it advice in relation to the relevant legislation, enforcement action including drafting notices and prosecutions.

I have considered various structural arrangements for the Rail Safety Inspectorate but have come to the conclusion that it should be part of the Department of Transport. The legislation creating it should preserve its independence from ministerial control. I reiterate that the Rail Safety Inspectorate should be separate and independent from the Office of the Rail Regulator created by the Transport Administration Amendment (Rail Management) Act 2000.

Rail Accident Investigation Board

In addition to the Rail Safety Inspectorate there should be a Rail Accident Investigation Board. The distinction between the Rail Safety Inspectorate and the Rail Accident Investigation Board is that the Rail Safety Inspectorate is charged with the responsibility of accreditation, monitoring of the safety performance of rail organisations operating on the New South Wales rail network and ensuring their compliance with the terms of their accreditation.

The functions of a Rail Accident Investigation Board are intrinsically different to those of a Rail Safety Inspectorate. Whilst I shall set out in some detail below what I consider would be appropriate functions and duties of the Rail Accident Investigation Board they should not be taken to be exhaustive. The Rail Accident Investigation Board necessarily has as its primary object the examination of accidents and incidents from a purely objective perspective to determine what has occurred, why it has occurred and what needs to be done to rectify any deficiencies identified by the investigation. The Rail Accident Investigation Board has no interest in determining blame and can therefore examine the role of any organisation which may have contributed to an accident, including the adequacy or inadequacy of the Rail Safety Inspectorate's monitoring of any accredited organisation involved in the accident or incident. On the other hand, it is fundamental to the functions of the Rail Safety Inspectorate to consider safety responsibility, to monitor whether any accredited organisation or organisations are properly discharging their safety responsibilities and to determine, when an accident or incident occurs, whether they are in breach of a condition of their accreditation and to ensure compliance and, where appropriate, to prosecute for offences.

Such Boards exist in other countries where they are multi-modal. The Canadian Transportation Accident Investigation and Safety Board Act 1989 established a Board of that name now known as the Transportation Safety Board (hereafter Canadian TSB). There are many features of the Canadian legislation which would be beneficial in the creation of the Rail Accident Investigation Board in New South Wales. Apart from

having the power to investigate railway accidents and incidents, the Canadian TSB has the power to examine any situation or condition that it has reasonable grounds to believe could, if unattended, induce a railway accident or incident. The Canadian TSB has not more than five members, at least three of whom are full time members. The legislation establishing the Canadian TSB provides that no finding by it is to be construed as assigning fault, or determining civil or criminal liability, and none of its findings are binding on the parties to any other proceedings.

In New Zealand there is a specialist investigation body, whose function is to determine the circumstances and causes of accidents and incidents, with a view to avoiding similar occurrences in the future. It was created by the New Zealand Transport Accident Investigation Commission Act 1990, which established a Commission of not less than three members and not more than five members. One of the commissioners must be a barrister or solicitor of not less than seven years standing, or a District Court judge.

One of the express functions of the New Zealand Transport Accident Investigation Commission is to co-operate and co-ordinate with overseas accident investigation organisations. The Commission has the same powers as are conferred on a Commission of Inquiry by the Commissions of Inquiry Act 1908 (New Zealand).

The Commission may appoint any suitably qualified person to be an assessor for the purposes of any investigation and it may co-opt any assessor to be a member of the Commission. A co-opted member of the Commission is entitled to attend and speak at any meeting of the Commission, but is not entitled to vote on any question unless authorised to do so by resolution of the Commission.

The Commission must investigate a rail accident if it involves the death of any person. The Transport Accident Investigation Commission Act 1990 (New Zealand) confers power on the Minister to direct the Commission to investigate an accident or incident, contains provisions for the notification of accidents, and prohibits findings or recommendations from being admissible as evidence in any proceedings, except a coroner's inquest or administrative review proceedings against the Commission.

In the Netherlands, there is a Dutch Transport Safety Board, the Chairman of which is Mr Pieter van Vollenhoven who is also the Chairman of ITSA, to which reference has previously been made. He has expressed the view in a paper delivered by him that independence is a minimum requirement to ensure that safety is the sole interest that investigations serve. In his opinion, "[i]t must be beyond a shadow of doubt that no single interest has influenced the findings or recommendations." The Dutch Transport Safety Board, for budget purposes, comes under the Netherlands Ministry of Transport, but is fully independent and has extensive powers.

In a paper, titled *Independent Accident Investigation: Every Citizen's Right, Society's Duty*, given in Belgium on 23 January 2001, Mr van Vollenhoven said in relation to previous forms of independent investigations:

> It was not until much later that the public began to question significance or worth of these investigations. For if the intention was to learn from them and if so many conflicting interests were involved, they had to meet one very basic condition. They had to be carried out independently of all interests but

> one. And that one interest was safety. There could not be even the slightest suggestion that any other interest influenced the findings of the investigation, or the committee's recommendations.
>
> Increasingly, people began to realise that government inspectors were not independent. After all, they were closely involved in drafting regulations, and monitoring compliance. They were, in fact, both judge and jury.
>
> ….But experience shows, in practice, the word "independent" is open to many different interpretations. According to the dictionary, 'independent' means 'free of control and autonomous'. I regret to say that this definition does not apply to many 'independent' investigations.
>
> As I have already pointed out, many investigations are still carried out by government agencies. In my experience as Chairman of ITSA, governments are reluctant to give up this responsibility. Often, they see criticism of the findings as a motion of no-confidence. What's more, they are convinced that their inspectors are acting in good faith. But what I feel governments fail to understand is that in carrying out these investigations themselves – however well they do so – they are inviting criticism. And the only way for them to put a stop to this criticism is to set up independent safety boards. Boards who are self-supporting and anchored in law and they address their recommendations directly to the parties concerned.
>
> Because any suggestion of conflict of interests is a threat to the credibility of investigations and their findings.

Mr Brian Langton, the then shadow Minister for Transport, proposed an amendment to the Rail Safety Bill on 8 September 1993. Hansard for the Legislative Assembly records Mr Langton addressing the House as follows:

> The Opposition will move to strengthen the Bill by adding a new part IV to establish to establish a railway accident investigation and safety bureau which would be a small high powered group with the authority of the Crown.

There should be an independent Rail Accident Investigation Board in New South Wales. I now recommend that the Rail Accident Investigation Board have the powers and functions hereafter stated. It will provide an objective measure of the safety performance of the industry. As Dr Leivesley observed, statistical information in relation to accidents is of little assistance when it comes to determining how safe an industry is. When it comes to determining how safe an industry is, an industry can go along for many years with a large number of potentially serious incidents occurring because it is not being safely managed until contributing factors coincide and a disaster results. The community cannot afford the catastrophic consequences that might arise from trains carrying up to a thousand passengers colliding.

Having heard the evidence in relation to the Glenbrook rail accident and having examined the safety performance of the rail organisations in a number of areas following disaggregation in 1996, I consider that in many respects an accident of the kind that occurred at Glenbrook was inevitable. It is only by the vigilance of the Rail Safety

Inspectorate and the investigatory functions of the Rail Accident Investigation Board that events can be anticipated and safety can be managed so as to prevent such an accident.
I do not envisage that the Rail Accident Investigation Board will need to have many staff. It could have a part time chairman who should be legally qualified and experienced. The other members of the Board, who could also be part time, should include an expert in accident investigation, a person with senior managerial experience, a person with sound knowledge of the rail industry and its operations and a person with safety management experience, not necessarily from the rail industry.

The Board should have employees who are skilled in system safety accident investigation, human factors, organisational and management systems and data analysis. In addition the Board should have the power, provided that a conflict of interest would not thereby be created, to engage on a temporary basis the services of persons having technical or specialised knowledge to assist the Board. It would need to have a senior executive responsible for its day to day operations.

Accredited rail organisations should be required to report any accident or incident to the Rail Accident Investigation Board, to conduct their own internal investigation and provide reports of that investigation to the Board.

The Rail Accident Investigation Board should not be involved in investigating every accident or incident on the railway. It should determine for itself which accidents it should investigate. The Rail Accident Investigation Board should investigate any accident or incident if directed in writing by the Minister for Transport to do so.

The Board will then decide whether or not to direct the rail organisation to investigate the accident again after considering whether there are any areas of weakness in the investigation conducted by the rail organisation. Alternatively, it should be able to undertake its own investigation or appoint an outside expert with appropriate qualifications, engineering or otherwise, to conduct an independent investigation into the circumstances of the accident or it could use its own investigators for that purpose. That is a decision that the Board should make.

The Board should have the capacity to conduct investigations at different levels. It should have the power if necessary to hold public hearings at which witnesses can be compelled to attend and be examined in a way not dissimilar to the way in which this Special Commission of Inquiry proceeded. This should only occur in cases where the seriousness of the accident and the public concern justifies a full public hearing.

The investigation reports, including any interim reports, of the Rail Accident Investigation Board should be tabled in Parliament as soon as they are completed and thereafter be made public. If Parliament is in recess, then provision should be made in the legislation for the reports to be made public as soon as they are completed, whether or not Parliament is session. The Board should also provide an annual report to Parliament.

It should be part of the ongoing functions of the Rail Accident Investigation Board to collect, analyse and report on data in relation to rail safety matters not only from New South Wales but also from interstate and overseas. The Board should have the power to distribute the information thereby obtained to the Department of Transport, the Rail Safety Inspectorate and any accredited organisation.

In addition to its accident and incident investigation function, the Rail Accident Investigation Board should:

i. Maintain a no fault incident and near miss reporting system for the entire rail industry.

ii. Monitor rail accident investigations throughout the world, maintaining a library of such investigation reports.

iii. Maintain the incident database currently compiled by the Transport Safety Bureau, and report annually on the safety performance of accredited organisations to Parliament.

The Board should be funded by the government and not the rail industry.

The legislation should provide that proceedings of the Board and communications made in the course of investigations may neither be disclosed nor used, other than by the Board and may not be used in any legal or other proceedings except a prosecution for perjury or a prosecution under the relevant rail legislation.

The legislation should contain an appropriate secrecy provision, binding upon all members and officers of the Board, prohibiting disclosure of any information obtained in the course of the discharge of their functions or duties.

The legislation should provide that, save for coronial proceedings, an investigator is not compellable to appear as a witness in any court proceedings.

The legislation should provide that any statement by any member or officer of the Board relating to an investigation is inadmissible in any legal, disciplinary, or other proceedings.

The structural arrangements in relation to the Rail Accident Investigation Board are a matter for government. The second interim report recommended that it be a separate and independent body. Any structural arrangement which ensures that it is both separate and independent will accord with my recommendation. Any structural arrangement which weakens its separation or independence will, in my opinion, detract from the robust structure for the management of rail safety which I have recommended in this final report.

9. Recommendations

I make the following recommendations:

Training

1. Selection processes for all safety critical staff should include psychometric testing.

2. The training of railway employees should include:

    i. The development of safe behaviour as the principal object of training.

    ii. Emphasis on teaching of the safety rationale for all rules and procedures.

    iii. Practical examples drawn from Australian and overseas experience to demonstrate the consequences of failure to apply operational rules and procedures correctly or in a thoughtful manner.

    iv. An appropriate balance between the practical work experience and classroom components of any training program.

    v. The use of modern, interactive simulators as a core component of training programs.

    vi. Emphasis on the importance of team work in rail operations including ensuring that operational employees have a clear understanding of the duties, roles and pressures involved in the work of other operational occupational groups.

3. Trainers of safety critical staff should have and maintain operational experience.

4. Trainers of safety critical staff should develop and maintain their training skills.

5. The performance of training organisations and individual trainers be regularly assessed by accredited rail organisations and audited by the Rail Safety Inspectorate.

6. The processes and techniques used for the assessment of the competency of safety critical staff be upgraded and strengthened to ensure such assessments are effective and regularly performed.

7. There should be random auditing by the Rail Safety Inspectorate of the assessments of the competence of safety critical employees.

Train Drivers

8. All train drivers should have comprehensive route knowledge at all times.

9. The Rail Safety Inspectorate should conduct random audits of drivers to determine their competency and the adequacy of their route knowledge.

10. All trains be fitted with data loggers to enable, among other things, train driver performance to be monitored.

11. Train drivers with less than three years driving experience be classed as provisional drivers.

12. All Provisional drivers rostered on standby should travel with experienced drivers.

13. A class of principal driver be created to instruct provisional drivers.

14. The position of team leader be created to be responsible for a group of approximately 30 drivers to act as a mentor and to instruct them individually or collectively on any safety related matter.

15. Each team leader should be responsible for the technical competence and safety behaviour of each driver in his team.

16. The Rail Safety Inspectorate should conduct random audits to determine whether the team leader system is being implemented effectively.

Trackside Workers

17. No trackside worker should be required to be solely responsible for his own protection.

18. All trackside work supervisors should be trained to assess and control risks to trackside workers.

19. The Rail Safety Inspectorate should conduct random audits of the safety protection of trackside workers.

Safeworking Units

20. The project to rewrite the safeworking units should be given the highest priority.

21. The objectives of the project to rewrite the safeworking units should be to:

    i. Develop safeworking units structured around a core set of fundamental principles.

    ii. Eliminate undesirable or unnecessary material within the rules.

    iii. Eliminate undesirable or unnecessary rules.

    iv. Ensure the safeworking units are concise and easy to read and expressed without unnecessary narrative content.

v. Use diagrams and illustrations when appropriate.

22. Continual and detailed input into the redevelopment and redrafting of the safeworking units should be sought from persons with expertise and experience in:

    i. Training, both in the development of training programs and the teaching of safeworking units.

    ii. Operational activities including train drivers, signallers, guards, train controllers, worksite supervisors and any other occupation within the rail environment which may have to apply the safeworking units in their day to day duties.

    iii. Human factors.

    iv. Engineering expertise in each of the railway engineering disciplines.

    v. Drafting of operational procedures in other hazardous industries.

23. Handbooks should be prepared for distribution to persons employed in specific safety critical railway occupational groups and contain the particular safeworking units relevant to each group.

24. The Rail Safety Inspectorate should be responsible for approving all redrafted safeworking units.

25. The Rail Safety Inspectorate should ensure there is proper testing of the safeworking units to ensure that they are unambiguous and easily understood.

Communications

26. The Rail Safety Inspectorate should instigate and develop a standard for railway communications within twelve months of its establishment.

27. The Rail Safety Inspectorate should ensure that the standard for railway communications, once developed, is fully implemented.

28. Until a uniform and integrated communications system is implemented in accordance with the standard, all types of communications equipment should be permitted for the communication of safety critical information.

29. No train is to be operated without being equipped with operative radio communications equipment.

30. The existing communications protocols should be reviewed and redeveloped following consultation with other relevant organisations.

31. The revised communications protocols should incorporate a requirement that drivers be informed of route changes.

32. The revised communications protocols should incorporate a requirement that drivers be informed of the likely location of any trackside workers they may encounter.

33. All communications protocols should be strictly enforced by accredited rail organisations.

34. It should be a condition of accreditation that rail organisations strictly control the use of any private audio or visual device in areas where safety critical communications occur.

35. The Rail Safety Inspectorate should conduct random audits of compliance by accredited rail organisations with the communications protocols.

36. The Rail Safety Inspectorate should supervise a trial of train to train communications to evaluate their advantages and disadvantages.

37. If the trial satisfies the Rail Safety Inspectorate that train to train communications should be introduced, then they should be implemented as soon as possible.

Network Control

38. The existing Network Control centres should be modernised by centralising the train control function, including the functions currently performed by signallers.

39. Train controllers should be provided with the necessary support to enable them to effectively and safely control the movement of trains from a central location, including:

    i. Computerised train control systems which provide a real time display of the position of trains and computer generated solutions to assist controllers to minimise or avoid disruptions to normal operations.

    ii. Ensuring that all support functions required by train controllers are located within the same centralised train control rooms.

40. No train controller should be required to manage disruptions to normal operations without the immediate personal assistance of a senior supervisor.

Drug and Alcohol Testing

41. There should be random breath testing by authorised officers of the Rail Safety Inspectorate of railway employees engaged in safety critical work.

42. There should be drug testing of railway employees involved in an accident or incident.

43. The Rail Safety Inspectorate should examine the advantages and disadvantages of introducing a system which enables the immediate and reliable assessment of the fitness to commence duties of safety critical employees.

Overseas Contact

44. All accredited rail organisations, the Department of Transport, the Office of the Rail Regulator, the Rail Safety Inspectorate and the Rail Accident Investigation Board should each avail themselves of the information and expertise in respect of rail safety management which exists in overseas rail organisations.

Rail Safety Inspectorate

45. The second interim report recommended that there be established a Rail Safety Inspectorate.

46. The primary function of the Rail Safety Inspectorate should be the accreditation of rail organisations in New South Wales.

47. The Rail Safety Inspectorate should refuse accreditation to any organisation unless it is satisfied, in addition to any other matters, that:

    i. It has a rigorous and robust safety management system which conforms to the highest international standards of safety management and practice.

    ii. It has an effective safety management plan for the implementation, monitoring and ongoing improvement of its safety management systems.

    iii. The members of the board, the Chief Executive Officer and all other officers holding senior managerial positions consider the safety of the organisation's activities as its first priority.

    iv. It has an effective system for identifying safety risks in its operations and has effective mechanisms for controlling those risks, monitoring the effectiveness of the controls, and adjusting the controls accordingly.

    v. It has an effective system for determining the priority of activities for removing, reducing or controlling particular risks.

    vi. It has the resources, including sufficient numbers of employees, to ensure that the safety of rail operations can be maintained under any circumstance.

48. The Rail Safety Inspectorate should be required to make public all notices of accreditation issued by it.

49. The Rail Safety Inspectorate should have the responsibility to ensure that each accredited rail organisation complies with its accreditation and any conditions and restrictions specified in the accreditation.

50. The Rail Safety Inspectorate should be given the power to impose a range of sanctions, including prosecution of individual board members, chief executive officers and the accredited organisations, to enforce compliance with the accreditation and any conditions or restrictions specified in the accreditation.

51. The Rail Safety Inspectorate should be given the power to conduct safety audits of any accredited organisation.

52. The Rail Safety Inspectorate should be given the power to inspect any person or thing which might give rise to an unsafe activity or outcome on the rail network.

53. All safety audit reports of the Rail Safety Inspectorate should be made public.

54. The Minister for Transport should be given the power to direct the Rail Safety Inspectorate to conduct a safety audit or inspection of an accredited organisation.

55. The report of any audit or inspection directed by the Minister for Transport should be made public.

56. The Rail Safety Inspectorate should be given the power to serve any accredited organisation, or any person who appears to be employed by or otherwise associated with an accredited organisation, with a written notice requiring specified action to be taken or stopped, which an authorised officer of the Rail Safety Inspectorate has reasonable cause to believe may give rise to an unsafe activity or outcome on the rail network.

57. Legislation should be introduced to make it an offence, attracting substantial penalties, for failure to comply with such a notice.

58. The Rail Safety Inspectorate should be given the power to approve any variation to an accredited organisation's safety management system, including internal structural changes, provided that the Rail Safety Inspectorate first receives a disposition statement and is satisfied that a proper safety validation process has been conducted and that the variation will not reduce the level of safety of rail operations.

59. Legislation should be introduced to make it an offence for an accredited organisation to vary the safety management system with which it obtained accreditation without the prior written approval of the Rail Safety Inspectorate.

60. The Rail Safety Inspectorate should be given the power to examine proposed appointments and existing appointments to the board and senior management positions, including that of the chief executive officer, of an accredited organisation to enable it to satisfy itself that any such appointee or proposed appointee has an appropriate level of understanding and commitment to the safety of the rail operations in which the organisation is, or is seeking to be, involved.

61. The Rail Safety Inspectorate should be given the power, if not so satisfied, to provide a written report to that effect to the person or persons responsible for making the appointment.

62. The Rail Safety Inspectorate should be given the power to reject a safety management plan of an accredited organisation if the plan is, in the opinion of the Rail Safety Inspectorate, inadequate in any respect.

63. The Rail Safety Inspectorate should be given the power to allocate or remove the responsibility for any particular safety matter to or from an accredited organisation.

64. Authorised officers of the Rail Safety Inspectorate should be given the powers to enter upon land, including premises and rolling stock, and to require an accredited organisation or any person who appears to be or to have been engaged in any rail activity, to produce any document, including a document in electronic form, or any thing which an authorised officer reasonably believes relates to a matter which does or could affect the safety of rail operations.

65. Authorised officers of the Rail Safety Inspectorate should be given the power to require any person to provide information orally, electronically, or in writing which the authorised officer reasonably believes does or may affect the safety of rail operations.

66. The legislation should make it an offence to fail to provide the document, thing or information requested.

67. The legislation should make it an offence to provide false or misleading information to an authorised officer.

68. The Rail Safety Inspectorate should be given the power to monitor and ensure compliance by accredited rail organisations with the recommendations made in any report of the Rail Accident Investigation Board.

69. The legislation should provide that any accredited rail organisation that is affected by any recommendation made in a report of the Rail Accident Investigation Board, within 60 days of the release of the report, inform the Rail Safety Inspectorate in writing, as to each such recommendation, whether it accepts or rejects the recommendation in whole or in part and, if rejected in whole or in part, provide written reasons for such rejection.

70. The Rail Safety Inspectorate should be given the power to require an accredited organisation to inform it in writing how it proposes to implement a recommendation made in a report of the Rail Accident Investigation Board and the proposed timetable for its implementation.

71. The legislation should provide that in the event that the Rail Safety Inspectorate does not agree with the reasons for the rejection in whole or in part of any such recommendation or alternatively, if any such recommendation is accepted in whole or in part by the accredited organisation, but the Rail Safety Inspectorate considers that the proposed remedial action is either not to be carried out in a timely manner or is inadequate, then the Rail Safety Inspectorate should have the power to direct that the remedial action be concluded within such time and in such manner as the Rail Safety Inspectorate may specify in writing and the accredited organisation should be required to comply with such direction.

72. The legislation should provide that the Minister for Transport may, by written notice to the accredited organisation, and the Rail Safety Inspectorate, extend the

time for completion of the remedial action and, if such extension is granted, the Minister must provide written reasons for extending the time.

73. The legislation should provide that the Rail Safety Inspectorate give written reasons to the Minister for Transport for any action or failure to take action against an accredited rail organisation in relation to any non-compliance by that accredited rail organisation with the terms of its accreditation or with any recommendation contained in an investigation report of the Rail Accident Investigation Board.

74. The legislation should provide that all notices or correspondence passing between the Rail Safety Inspectorate, the Minister and an accredited rail organisation relating to any recommendation contained in a report of the Rail Accident Investigation Board be made public.

75. The Rail Safety Inspectorate should be provided with the necessary funding to retain experts, including specialists in engineering, organisational safety, statistical analysis and human factors, and to employ or retain legal officers and to otherwise finance its activities.

76. The Rail Safety Inspectorate should be within the Department of Transport.

77. The legislation whereby the Rail Safety Inspectorate is created should provide for its independence from ministerial control.

78. The legislation whereby the Rail Safety Inspectorate is created should provide for its independence from and paramountcy over the Office of the Rail Regulator created by the Transport Administration (Rail Management) Amendment Act 2000.

79. A project team should be established within the Rail Safety Inspectorate, over and above its normal staff establishment, for the specific purpose of ensuring that the recommendations in this final report are implemented by each relevant accredited organisation and that the Rail Safety Inspectorate should report in writing to the Minister for Transport at not less than six monthly intervals regarding the implementation of these recommendations and all such reports should be made public.

Rail Accident Investigation Board

80. The second interim report recommended the establishment of a Rail Accident Investigation Board.

81. The Rail Accident Investigation Board should have as its primary role the independent, impartial and unbiased investigation of accidents and incidents for the purpose of identifying any matter which may have or did contribute to an incident or accident or which might contribute to an incident or accident in circumstances similar to those which occurred.

82. The legislation should provide that the Rail Accident Investigation Board may conduct its own investigations or require an accredited rail organisation to conduct an investigation and provide it with a report.

83. The legislation should provide that any incident or accident involving an accredited organisation be notified to the Rail Accident Investigation Board in writing as soon as practicable after its occurrence and in any event no later than 24 hours after the occurrence.

84. The Rail Accident Investigation Board should have the power to conduct public hearings at which witnesses can be compelled to attend and be examined.

85. The Rail Accident Investigation Board should collect, analyse and report on data relating to rail safety matters within New South Wales.

86. The Rail Accident Investigation Board should have as one of its functions the collection and analysis of information in relation to rail safety from interstate and overseas.

87. The Rail Accident Investigation Board should have as one of its functions the ongoing liaison with overseas rail safety organisations, including membership of and participation in international railway organisations and conferences.

88. The legislation should provide that the Rail Accident Investigation Board be required to provide such information to the Department of Transport, the Rail Safety Inspectorate and any accredited rail organisation.

89. The legislation should provide that proceedings of the Rail Accident Investigation Board and communications made in the course of its investigations may not be disclosed, other than by the Board, and may not be used in any legal or other proceedings except a prosecution for perjury or a prosecution for an offence under the relevant rail legislation.

90. The legislation should provide that save for coronial proceedings an investigator authorised by the Board is not compellable as a witness in any court proceedings.

91. The legislation should provide that any statement by a member or officer of the Rail Accident Investigation Board relating to an investigation is inadmissible in any legal, disciplinary or other proceedings.

92. The legislation should provide that no member or officer of the Rail Accident Investigation Board may disclose any information obtained by the Board in the course of the discharge by it of its functions.

93. The Rail Accident Investigation Board should maintain a confidential system for the reporting to it of any incident which did or may have caused an unsafe activity or outcome in the course of rail operations.

94. The Rail Accident Investigation Board should make public each of its investigation reports.

95. The Rail Accident Investigation Board should publish an annual report to be tabled in Parliament.

ANNEXURE A

SPECIAL COMMISSION OF INQUIRY

Commissioner
The Honourable Mr Acting Justice P.A. McInerney

Counsel Assisting
Christopher Barry QC and David Cowan

Solicitors
Christine Johnpulle (Solicitor instructing Counsel Assisting)
Marina Rizzo (from 10 April 2000)
Carole Dawes (until 27 March 2000)

Rail Safety Adviser
Norman Thompson (seconded from Transport Safety Bureau, New South Wales Department of Transport)

Commissioner's Staff
Mary O'Farrell – Associate (from December 1999 to January 2000)
Meg Kelly – Associate (from January 2000 to January 2001)
Lauren Kelly – Associate (from January 2001 to February 2001)
Peter Moon - Tipstaff

Office of the Special Commission of Inquiry
Cheryl Slatyer
Stephanie Butterfield
Elizabeth Lee
Cheryl Drummy
Tina Foukas
Damien Freeman
Victoria Pomfret
Susanna Taylor
Lucy Thomas
Cuong Hoang
Stella Vaughan
Geoff Fletcher

(Each of the above at various different times)

IT Consultant
<e.law> Australia Pty Limited
Bruce Grant and Alison Stanfield - Directors
Rebecca Grant - Project Manager

ANNEXURE B

LIST OF PARTIES AND THEIR REPRESENTATIVES

Counsel Assisting
Christopher Barry QC and David Cowan instructed by Christine Johnpulle

Australian Rail, Tram and Bus Industry Union, New South Wales Branch and its members
Harold Bauer instructed by McClellands

Damien Mulholland
Alexander Shand QC (until 19 April 2000) instructed by Hemphill & Co

David Willoughby and Peter Marshall
David Conti (until 19 April 2000) instructed by Connery & Partners

Director General, Department of Transport
Michael Finnane QC (until 12 October 2000), Patrick Saidi and Glenn Bartley (from 22 November 2000) instructed by the Crown Solicitor

Great Southern Railway
Andrew Harris QC (until 19 April 2000) instructed by Phillips Fox

Kevin Patrick Sinnett and David Clarke
Peter Capelin QC (until 19 April 2000) instructed by White Barnes

Lawrence Peter Radford
Neil McAteer, Solicitor (on 1 December 2000), Arthur Robinson & Hedderwicks

Michael Vincent Browne
Braddon Hughes (until 19 April 2000) instructed by Hughes & Taylor

National Rail Corporation Limited
Jeffrey Hilton SC (until 19 April 2000) and James Stevenson (until 8 June 2000) instructed by Minter Ellison

Rail Access Corporation
John West QC (until 12 October 2000) and Ian Neil instructed by Allen Allen & Hemsley

Rail Services Australia
John Gleeson QC and Martin Shume instructed by Freehills

Relatives of the deceased and injured passengers
Peter Bodor QC, John Nicholson SC (on 6 March 2000) and Michael King, instructed by the Legal Representation Office

Co-ordinator General of Rail
Bruce Collins QC (10 to 12 October 2000, 20 October 2000 and 5 December 2000) instructed by Blake Dawson Waldron

Simon Benedict Lane
Peter Garling SC and Simon White (each on 13 November 2000) instructed by Mallesons Stephen Jaques

State Rail Authority of New South Wales
Peter Garling SC and Simon White instructed by Mallesons Stephen Jaques

ANNEXURE C

ALPHABETICAL LIST OF ALL WITNESSES

Alexander, John Norman, Resignalling Design Manager, State Rail Authority of New South Wales

Andrews, Colin Geoffrey, General Manager, Resources, Rail Services Australia

Anthony, Douglas Aubrey, Network Operations Superintendent, State Rail Authority

Band, Kevin, Executive General Manager, Safety, Queensland Rail

Bates, Geoffrey John, Passenger

Boyd, Ross John, Assistant Manager, Train Crewing Section, State Rail Authority

Brown, John Leslie, Manager, Network Operations, Countrylink Network, State Rail Authority

Browne, Michael Vincent, Senior Train Controller, State Rail Authority

Bruce, Ronald Ian, Acting Group General Manager, Metropolitan, Rail Access Corporation

Bryon, Jeffrey Martin, Senior Product Manager, Argus Communications, Rail Access Corporation

Camage, Barry William, Manager, Train Operations, State Rail Authority

Carty, Gregory John, Signal Electrician, Rail Services Australia

Christie, Ronald David, Co-ordinator General of Rail

Claassens, Alexander, Train Driver, State Rail Authority

Clark, Carl Charles, Inspector of Police

Clarke, David Luke, Guard, State Rail Authority

Clemens, Klaus Josef Ewald, General Manager, Organisational Development, State Rail Authority

Collins, Ian Lesley, Driver, State Rail Authority

Collins, Paul David, XPT Train Driver, Countrylink (former member of the Safeworking Division of the State Rail Authority)

Connolly, Ellen, Journalist, Sydney Morning Herald
Conroy, Rashelle, Constable of Police, Penrith Crime Scene Section

Cowling, John Michael, Chief Executive Officer, Rail Access Corporation

Craft, John Richard, Station Master, Mount Victoria

Craven, David Keith, Training Officer, State Rail Authority

Creighton, Ronald Stanley, General Manager, Passenger Fleet Maintenance, State Rail Authority

Crofts, Kevin Thomas, Chartered Mechanical Engineer, Interfleet Technology Limited

Curtin, John Scott, Principal Engineer, Signalling, Rail Access Corporation

Dandridge, Christopher Leslie Colin, Employee Relations Manager, Operations Division, State Rail Authority

Dawes, John Emile, Network Manager, Train Crewing, State Rail Authority

Day, Richard Anthony George, General Manager, Rail Development, State Rail Authority

De Bortoli, Tania, Passenger

Edwards, David Stanley, National Manager Safety, National Rail Corporation Limited

Eid, Anthony Peter, Manager, Train Control, State Rail Authority

Evans, William Morgan, Passenger

Evatt, Elizabeth, Museum Director, New South Wales Toy and Railway Museum, Leura

Field, Ronald Laurence, Driver, State Rail Authority

Fozzard, Graham John, Secretary, Signals Section, Australian Rail Tram and Bus Industry Union, New South Wales Branch

Freeman, Kenneth David, Resident

Gadd, Laurence George, Signal Electrician, Rail Services Australia

Garner, Lisa Gay, Passenger

Golbach, Steven, Passenger

Grilanc, Serge Gabor, Passenger

Haddad, Gabriel, Taxi Driver

Hall, John Reginald, Executive Director, Transport Safety Bureau, New South Wales Department of Transport

Halls, Wayne Andrew, Operations Inspector, State Rail Authority

Hancock, Basil Stuart, Passenger

Hannen, Paul, Senior Constable of Police

Hartman, Christopher Roy, Regional Network Operations Superintendent, State Rail Authority

Hayes, Paul Anthony, Director, Policy, New South Wales Department of Transport

Hedley, Barry Robert, Acting General Manager, Technology and Standards, Rail Access Corporation

Henry, Owen Roger, General Manager, Safety, Rail Access Corporation

Herd, Shanthi Elizabeth, Project Officer, Safeworking, Rail Access Corporation

Higgins, William Leslie, Station Master, Glenbrook

Hill, David, Former Chief Executive Officer, former State Rail Authority

Hogan, Neil David, Operations Inspector, State Rail Authority

Hollier, Warren Eric, Passenger

Hook, Ian Ramsey, Train Driver, State Rail Authority

Howard, Keith Rodney, Crew Area Manager, State Rail Authority

Hussey, Franklin John, Principal, Frank J Hussey Consulting Services Pty Limited

Hunter, Damian Marc, Passenger

Jamieson, John Robert, Principal, Jamieson Foley & Associates Pty Ltd, Consulting Engineers

Jarvis, Charles Richard, Train Driver, State Rail Authority

Jenkins, Lesley Olive, Passenger

Jolly MBE, Warren Stewart, Manager, Corporate Safety, State Rail Authority

Jowett, Roger Gavin, National Secretary, Australian Rail Tram and Bus Industry Union

Kennedy, John Francis, Medical Practitioner

Kitanov, Michael Peter, Training Officer, Australian Rail Training

Kopjar, Daniel Anton, Maintenance Employee, State Rail Authority

Lamont, Sean Ian, Train Recorder, State Rail Authority

Lamont, Thomas Leo, Safety Audits and Standards Manager, State Rail Authority

Lane, Michael John, Rail Safety Auditor, Signals and Electrical, Rail Access Corporation

Lane, Simon Benedict, Former Chief Executive Officer, State Rail Authority

Leamey, Garry Raymond, District Signals Engineer, Rail Services Australia

Lee, John, Acting Executive Director, Communications and Marketing, State Rail Authority

Leivesley, Sally Elizabeth Carr, Managing Director, Risk Operations International Pty Limited

Leonard, John Francis, XPT Train Driver, State Rail Authority

Lewocki, Nikolai, Secretary, Australian Rail Tram and Bus Industry Union, New South Wales Branch

Liu, Ronald, Station Assistant, State Rail Authority

Love, Fiona Lindley, Manager, Australian Rail Training

MacFarlane, Ian Bruce, Rail Safety Engineer

MacFarlane, James Malcolm, Former Manager, Safeworking Section, State Rail Authority

Marks, William Joseph, Signaller, State Rail Authority

Marshall, Peter Charles, Train Driver, National Rail Corporation Limited

May, Julian, Principal Brake Engineer, State Rail Authority

McColl, Philip, Fleet Manager, Flemington Maintenance Centre, State Rail Authority

McDonald, Jamie Ian Milton, General Manager, Safeworking Systems and Operational Standards, Rail Access Corporation

McIlwaine, Gary David, Barrister-at-Law, Member of Rhodes Peninsula Group

Millanta, Lesley Bernard, Maintenance Operations Manager, Passenger Fleet Maintenance, State Rail Authority

Minchin, John Gregory, Project Manager, Rail Services Australia

Mitchell, Alexander Hamilton, Manager, Safeworking Competency Standards, State Rail Authority

Mitchell, Steven Ronald, Car Builder, State Rail Authority

Mulheron, Stephen, Senior Rostering Officer, State Rail Authority

Mulholland, Damien Mark, Signaller, State Rail Authority

Mulholland, Peter, Network Operations Superintendent, State Rail Authority

Narouz, Peter, Relief Signalman, State Rail Authority

Neary, Vincent, Railways Signals Engineer, former State Rail Authority

Ogg, Terrence Geoffrey, Chief Executive Officer, Rail Services Australia

Oliver, Edward Howard, Independent Adviser, New South Wales Department of Transport

O'Loughlin, Robert Charles, Consultant

Panigiris, George, Assistant Secretary, Australian Services Union, New South Wales Branch

Pantich, Michael, Train Manager, Great Southern Railway

Peters, Frederick Paul, Driver Trainer, Flemington Maintenance Centre, State Rail Authority

Phillips, Roland Neil, Safety Officer, Department of Transport

Plim, Lindsay Owen, Passenger

Plumber, Larry James, Passenger

Poynton, Paul Alexander, General Manager, Safety and Standards, Rail Services Australia

Prestwidge, Kenneth Robert, Acting Manager, Audit and Compliance, State Rail Authority

Radford, Lawrence Peter, Project Manager, New South Wales Train Radio Project, Transportation Systems, Siemens Limited

Ralph, Francine, Senior Constable of Police

Rance, Anthony Robbin, Passenger
Reath, Jennifer Suzanne, Passenger

Ripinskis, Uwe, Network Operations Superintendent, State Rail Authority

Robinson, Ian Richard, Acting Director General, Department of Transport

Salter, Rudolph, Passenger

Savage, Edwin Leon, Manager, Network Operations, State Rail Authority

Sheather, Kenneth Neil, Regional Network Operations Superintendent, Blue Mountains Area, State Rail Authority

Sinnett, Kevin Patrick, Train Driver, State Rail Authority

Smith, Arthur William, Chief Operations Manager, State Rail Authority

Smith, David Gerard, Train Driver, State Rail Authority

Smith, Mark, Train Driver, State Rail Authority

Stojanovski, Vojo, Infrastructure Worker, Rail Services Australia

Stoyef, Robert Adrian, Passenger

Szacsvay, Paul Anton, Senior Engineer, Rail Services Australia

Taylor, Warrwick Shane, Supervisor, Operations Control, State Rail Authority

Thompson, Roger Kenneth, Chief Foreman, State Rail Authority

Vilcins, Aivars Alfreds, Passenger

Ward, Craig Bruce, Passenger

Ward, Margaret, Passenger

Watson, Mack, XPT Train Driver, State Rail Authority

Watson, Patrick John, Passenger

Webb, Todd James, Train Recorder, State Rail Authority

Wells, Martin Edward, Train Services Technician, Great Southern Railway

Willoughby, David Edmund, Train Driver, National Rail Corporation Limited

Worrall , Terrence, Director and General Manager, Thames Trains Limited

Young, Douglas Grant, Brake Engineer, State Rail Authority

Zima, John Walter, Electrical Mechanic, State Rail Authority

ANNEXURE D

LIST OF EXPERTS

Overseas Experts

Atkinson, John Terence, Manager, Rail Safety, Land Transport Safety Authority of New Zealand, New Zealand

Bassett, Phil, Lead Consultant, Eurostar (UK) Limited, United Kingdom

Burtch, Terry M, Director General, Rail Safety, Transport Canada, Canada

Catmur, James R, Director, Arthur D Little Limited, United Kingdom

Clarke, Richard J, Vice President and Managing Director, Arthur D Little Limited, United Kingdom

Clementson, Brian, Director, Safety and Quality, Virgin Trains, United Kingdom

Dölp, Wolf-Ekkehart, Bauassessor, Leiter Betriebsverfahren Fahrdienst, DB Netz AG, Deutshe Bahn Gruppe, Germany

Drangsholt, Ole M, Director, International Affairs, Jernbaneverket, Norwegian National Rail Administration, Norway

Eke, Philip, Operations Training Manager, Eurostar (UK) Limited, United Kingdom

Halland, Erik, Head of Section, Rolling Stock Safety, Jernbaneverket, Norwegian National Rail Administration, Norway

Hausmann, Anita, Projektleiterin im Bereich Personal (NPE), DB Netz AG, Deutshe Bahn Gruppe, Germany

Hill-Smith, David, Business Development Director, AMEC Rail Limited, United Kingdom

Holbrook, Dan, Senior Investigator, Locomotive Operations, Rail/Pipeline Investigations Branch, Transportation Safety Board of Canada, Canada

Holtebekk, Helge, Konserndirektør Trafikksikkerhet, Trafikksikkerhet, NSB, Norway

Hortman, Ronald, Senior Engineer, Signalling, Technical Authority, Jernbaneverket, Norwegian National Rail Administration, Norway

Ingebrigtsen, Karl Ove, Fagsjef Risiko-og Beredskapsanalyser, Drift og teknikk, Operativ Trafikksikkerhet, NSB, Norway

Johannassen, Jan C, Senior Engineer, Technical Authority, Telecommunication, Jernbaneverket, Norwegian National Rail Administration, Norway

Johnson, Ken, Executive Director, Transportation Safety Board of Canada, Canada

Larsen, Sverre Røed, Senior Adviser, Corporate Staff Human Resources, NSB, Trafikksikkerhet, Norway

Legrand, Robert, SNCF, Direction de L'Infrastructure, Département Systeme d'Exploitation et Sécurité, Centre d'Etudes de Sécurité, Expert Exploitation, Sureté de Fonctionnement, France

Leinweber, Jürgen, Sicherungstechnik, Leiter Stellwerke, DB Netz AG, Deutshe Bahn Gruppe, Germany

Lindner, Hans-Reiner, Leiter Grundsätze Verbundbroduktion, Ressort Technik, DB AG, Deutshe Bahn Gruppe, Germany

Lowenger, Mike, Vice President, Railway Association of Canada, Canada

Löwer., Gerd-Erich, Betriebsleiter DB Netz AG, Leiter Systetelle Fahrweg, DB Netz AG, Zentrale, Deutshe Bahn Gruppe, Germany

Maidment OBE, David J, Director, International Risk Management Services, United Kingdom

Metzdorf, Ehard, Teamleiter Regelwerk, DB Regio AG, Germany

Michel, Christa, Dienstleistungszentrum, DB Sprachendienst Personaldienste, Germany

Mortureux, Yves, SNCF, Direction de l'Infrastructure, Département Systeme d'Exploitation et Sécurité, Centre d'Etudes de Sécurité, Expert Exploitation, Sureté de Fonctionnement, France

Muir, Len, Driver Standards Manager, Eurostar (UK) Limited, United Kingdom

Muttram, Rod, Director, Railtrack Safety and Standards Directorate, United Kingdom

Nelson, Aidan, Deputy Director, Railtrack Safety and Standards Directorate, United Kingdom

O'Neill, Mark, Head of Validation, Railtrack Safety and Standards Directorate, United Kingdom

Østreng, Vidar, Viseadministrerende direktør, NSB, Norwegian State Railways, Norway

Porath, Rick, System Manager, Signals and Communications Operations,
Canadian National, Canada

Rasch, Morten J, Head of Section, Traffic Safety Signalling, Jernbaneverket, Norwegian National Rail Administration, Norway

Reason, Professor James, Department of Psychology, University of Manchester, United Kingdom

Regimbal, Mike, Senior Adviser, Operational Safety and Regulatory Affairs, VIA Rail Canada, Canada

Rygh, Knut, Safety Manager, Norwegian Railway Inspectorate

Stuifmeel, Jan, Policy and Risk Management, Railway Safety, Railned, Norway

Taylor, Roger K, Controller, Industry Safety Liason, Railtrack Safety and Standards Directorate, United Kingdom

Tom, Alvan, Assistant Chief Engineer, Signals and Communication, Canadian National, Canada

Tucker, Bill, Director General, Investigation Operations, Transportation Safety Board of Canada, Canada

Worrall, Terrence, Director and General Manager, Thames Trains Limited, United Kingdom

Wedzinga, Andres, Legal Affairs, Railway Safety, Railned, Norway

Interstate Experts

Band, Kevin, Executive General Manager, Safety, Chief Executive's Group, Queensland Rail

Bonham, Sean, Manager, Train Services, Central, Connex Trains Melbourne Pty Limited

Broom, Barry, Manager, Safeworking Safety, Chief Executive's Group, Queensland Rail

Carolan, Bernie, Acting Managing Director, Bayside Trains

Donaldson, Kent, General Manager, Operations and Safety, Australian Rail Track Corporation Limited

Duffy, Michael, Manager Signal and Operational System, Technical Services, Queensland Rail

Gray, Simon, Risk and Quality Assurance Manager, Australian Rail Track Corporation Limited

Gullick, Phillip, Customer Service Manager, Western, Bayside Trains

Marchant, David, Chief Executive Officer, Australian Rail Track Corporation Limited

Nikandros, George, Safety and Quality System Manager, Technical Services, Queensland Rail

Ponton, Adrian, Manager, System Safety, Freight Australia

Poynton, Terry, Head of Safety, National Express Group (Australia) Pty Limited

Sargant, Thomas, Head of Infrastructure, National Express Group (Australia) Pty Limited

Scheuber, Bob, Deputy Chief Executive, Queensland Rail

Simmons, Martin, Manager Rail Safety, Connex Trains Melbourne Pty Limited

Thompson, Brent, Manager New Business, Signal and Operational Systems, Queensland Rail

Turrell, Peter, General Manager, Operations, Freight Australia

Walsh, Wayne G, General Manager, Trains, Bayside Trains

Welsby, Leon, General Manager, Strategic Development, Australian Rail Track Corporation Limited

ANNEXURE E

LIST OF EXHIBITS

Exhibit Number	Document
1.	Letters Patent issued 9 December 1999 Letters Patent issued 14 April 2000 Letters Patent issued 23 August 2000 Letters Patent issued 27 February 2001
2.	Instrument of Appointment of Counsel Assisting dated 10 December 1999
3.	State Rail Authority CityRail Network Plan
4.	Working timetable for the Lithgow/Blue Mountains line
5.	Aerial photograph of accident scene
6.	Curve and gradient diagram
7.	Train control diagram
8.	Audio recordings of conversations between train drivers, signallers and train controller
9.	Transcript of Exhibit 8
10.	Signal Control System Diagram
11.	Data Logger Analysis Report – Locomotive NR9 Glenbrook (NSW) Collision
12.	Data logger summary chart
13.	CCTV Analysis Chart and Data Logger
14.	29 Department of Transport photographs
15.	24 photographs produced by the Rail, Tram and Bus Union, New South Wales Branch
16.	Further 23 photographs submitted by the Rail, Tram and Bus Union, New South Wales Branch

Exhibit Number	Document
17.	24 photographs produced by the WorkCover Authority of New South Wales
18.	Three pages of photographs produced by Rail Access Corporation
19.	94 photographs produced by the New South Wales Police Service
20.	Composite Video tape
21.	Circular No. 424 (Special) and Circular No. 425 (Special) "Passing Signals at Stop Using the Metronet Train Radio System"
22.	RAC Weekly Notice No. 48
23.	RAC Weekly Notice No. 49
24.	Chart showing distance between signals on up line
25.	Series of photographs produced by Rail, Bus and Tram Union, New South Wales Branch
26.	Safe Working Unit 110 - Working signalling equipment
27.	Safe Working Unit 111 - Working an interlocking machine
28.	Safe Working Unit 113 - Working points and signals at an interlocking
29.	Safe Working Unit 117 - Failure of civil or signalling equipment
30.	Safe Working Unit 130 - The train control communications network
31.	Safe Working Unit 131 - Basic train control duties
32.	Safe Working Unit 135 - Train radio protocols
33.	Safe Working Unit 140 - Maintaining an on-time service
34.	Safe Working Unit 141 - Basic duties of train crews
35.	Safe Working Signalling Unit 126 – Double colour light signals with staggered lights
36.	Photograph of former signal board from Glenbrook railway station

Exhibit Number	Document
37.	Nine photographs of Glenbrook Railway Station and its approaches
38.	Emu Plains – Blaxland track diagram
39.	Safe Working Unit 245 - Passing an automatic signal at stop - Automatic and Track Control (Bi-directional)
40.	Glenbrook derailment detailed survey of accident site
41.	Train register for Springwood for 2 December 1999 (up line)
42.	Train register for Penrith for 2 December 1999 (up line)
43.	Signal diagram (shown to Mr Willoughby by Mr West QC)
44.	"Warning to Driver- condition affecting line" form handed to Mr Willoughby by Katoomba Signal Box
45.	Mr Willoughby's mobile phone account
46.	Portable two-way radio handset
47.	"Outline of Rail Industry Structure" produced by Department of Transport
48.	"Submission as to National Rail Corporation and its relationship with other rail entities" produced by National Rail Corporation Limited
49.	Signal Diagram shown by Mr West QC to Mr Halls
50.	Statement of Wayne Halls dated 6 March 2000 and notes dated 7 December 1999
51.	Draft new Safe Working Unit 245 produced by National Rail Corporation Limited
52.	Safe Working Unit 132 - Transposing trains
53.	Safe Working Unit 144 - Using train lights
54.	Safe Working Unit 214 - Sending and accepting a train - Automatic and Track Control (Bi-directional)
55.	Safe Working Unit 710 - General requirements for protecting a train

Exhibit Number	Document
56.	Safe Working Unit 711 - Situations which require a train to be protected
57.	Safe Working Unit 712 - Protecting a train
58.	Safe Working Unit 724 - Incorrect signal indication
59.	Transcript of Inspections held on 28 February 2000 by the Commissioner
60.	Transcript of Inspections held on 29 February 2000 by the Commissioner
61.	Draft National Code of Practice for Railways: Operations and Safeworking - Fixed Signals at Stop
62.	Draft National Code of Practice for Railways: Operations and Safeworking - Communications Protocol
63.	Rail Safety Alert dated 8 December 1999 – "Passing Signals at Stop"
64.	Safety Alert No.9/99 – "Passing Automatic Signals at Stop"
65.	Memorandum dated 18 February 2000 from Jamie McDonald (General Manager, Safeworking Systems and Operational Standards, RAC) to Michael Holt together with a list of recipients
66.	Letter dated 15 February 2000 from Jamie McDonald to Mr Hall and others regarding Voice Based Communication Protocols
67.	i. Memorandum dated 10 February 2000 from Jamie McDonald to Mr Holt and others regarding the new Voice Based Communications Protocol to replace existing Safe Working Unit 134 and 135 ii. Safety Alert No. 1/00 "Communications Protocols" iii. Draft Safe Working Unit 135 - Network Communication Protocols
68.	Three photographs: One of signal post 40.8 and two of signal telephone 40.8
69.	Three photographs of Penrith Signal Box
70.	One photograph of Penrith Signal Box

Exhibit Number	Document
71.	Paper “Signals and Dark Territory” by John Curtin, Principal Signal Engineer, RAC
72.	Report “Accident Reconstruction of the Collision at Glenbrook, NSW on 2nd December 1999” by Mr Kevin Croft
73.	i. Mr Croft's calculations, “Estimated initial speed for various driver reaction times and structural strengths of vehicles” ii. Mr Croft’s additional calculation iii. Mr Croft's third set of calculations
74.	Six photographic slides of electrical components of signal
75.	Signal power unit diode
76.	Four Statements of Kenneth Sheather
77.	Track Circuit History Card for signal 40.8
78.	Supplementary statement of David Stanley Edwards, National Manager Safety, National Rail Corporation Limited
79.	i. General Order Number 12/99: Internal memo to signallers regarding private televisions and radios ii. General Order Number RNOM 002/2000 regarding private televisions and radios
80.	Shed Day Book 24 March 1999 to 21 December 1999
81.	Running Day Book for 30 August 1999
82.	Vehicle Repair Book for Vehicle No. STR 713B from 16 November to 21 December 1999
83.	Arvo Day Book 6 July 1998 to 20 December 1999
84.	Extract from Statement of Kevin Patrick Sinnett dated 3 December 1999
85.	i. Australian Rail Training - Student Workbook CityRail Drivers - Section 1 Current safeworking procedures ii. Australian Rail Training - Student Workbook CityRail Drivers – Section 2 Amended safeworking procedures

Exhibit Number	Document
85.	iii. Australian Rail Training - Student Workbook CityRail Drivers - Section 3 Amended safeworking procedures
86.	Transponder report of relevant Metronet calls to 2 December 1999
87.	Third Supplementary Statement of John Scott Curtin Estimate for provision of indications at Penrith covering Lapstone to Valley Heights
88.	Glossary of words used in the procedures manuals and other State Rail Safeworking Publications- 1992 Version
89.	Glossary from Safeworking Procedures: Engineering work – 1996 Version
90.	State Rail Authority: "An Introduction to Safeworking Manuals"
91.	SRA Safety Management Team Organisational Chart
92.	Chronology of events
93.	Coroner's Report into the Deaths of Trevor Lawrence Ratcliffe and Darren Raymond Easter at Kerrabee on 18 August 1998
94.	Department of Transport, "Independent Inquiry Report: Fatal Collision between a Rail Services Motor Vehicle and a Freight Train near Kerrabee 18 August 1998"
95.	Department of Transport, "Independent Inquiry Report: Fatal Accident Near Bell on 15 October 1998"
96.	Report prepared for Department of Transport by BHP Engineering Pty Ltd, "Investigation into the derailment of Train 81D at Hornsby on 9 July 1999"
97.	Department of Transport, "Railway Investigation Report: Derailment of Run No. 99 EP at 870 points at Olympic Park on 2 September 1999"
98.	i. Rail Access Corporation, "Railway Investigation: Derailment at Pippita on the Olympic Park Loop, 14 November 1999" ii. Summary of Findings and Recommendations
99.	Department of Transport, "Inquiry Report: Suburban Train Derailment, Hornsby, NSW 11 January 2000"

Exhibit Number	Document
100.	Department of Transport, "Independent Inquiry Report: Suburban Train Derailment, Redfern 6 April 2000"
101.	Department of Transport, "Investigation Into the Derailment of Train 96-B at Waverton on 20 December 1999"
102.	Submission of Mr Ron Christie, Coordinator-General of Rail
103.	Submission on behalf of National Rail Corporation Limited relating to the adequacy of risk management procedures and recommendations for the improvement of safety of rail operations
104.	Submission on behalf of Rail, Tram and Bus Union, New South Wales Branch.
105.	i. Letter from Jock Murray (Director General) of the NSW Department of Transport with caption "Department of Transport's Submission to the Special Commission of Inquiry into the Glenbrook Rail Accident - Stage 2" ii. Dr Sally Leivesley, "Overview Report to the Director General of the Department of Transport on the Adequacy of the Risk Management Procedures Applicable to the Circumstances of the Railway Accident at Glenbrook"
106.	State Rail Authority, "Special Commission of Inquiry Into the Glenbrook Rail Accident: Report by State Rail Authority New South Wales"
107.	John Cowling, "Statement on behalf of Rail Access Corporation"
108.	Rail Services Australia, "Report prepared for the Special Commission of Inquiry Into the Glenbrook Rail Accident"
109.	Joint Submission from the Chief Executive Officers of Rail Services Australia, State Rail Authority and Rail Access Corporation in relation to recommendations to improve safety matters
110.	i. Letter from Ian Robinson, Acting Director General, Department of Transport to Mr Barry QC Department of Transport, "Proposal for Improved Rail Regulation"
111.	i. Letter dated 6 November 2000 from Mr John Cowling, CEO of RAC to the Special Commission of Inquiry into the Glenbrook Rail Accident with caption "Status of phase 1 interim recommendations"

Exhibit Number	Document
	ii. Attachments to the said letter ii. Letter from Mr John Cowling, CEO of RAC to the Special Commission of Inquiry into the Glenbrook Rail Accident with caption "Interpretation of interim recommendation 5" iii. Attachments to the said letter
112.	Train Control Communication Protocol Monitoring for the month ending October 2000
113.	i. Det Norske Veritas Management Systems, "Rail Access Corporation Evaluation Report Stage 2, 7-23 April 1999" ii. Det Norske Veritas Management Systems, "Rail Access Corporation RSRS Evaluation Report Stage 2, 11-20 January 1999"
114.	Department of Railways Mechanical Branch, "Safe Working Catechism - For the Guidance of Locomotive Engine Drivers, Observers and Trainee Enginemen," Seventh Edition
115.	i. Letter dated 1 August 1997 from Mr Hussey to Mr Henry regarding Train Radio Protocol in NSW ii. Letter dated 1 August 1997 from Mr Henry to Mr Hussey iii. Letter dated 12 August 1997 from Mr MacFarlane to Mr Hussey

ANNEXURE F

QUEENSLAND RAIL SAFETY VALIDATION STANDARD

UNCONTROLLED COPY WHEN PRINTED

Safety Management System

QUEENSLAND RAIL

Standard
STD/0005/WHS

SAFETY VALIDATION

Version:	**2.0**
Issue Date:	24 May 1999
Effective Date:	05 July 1999
Review Date:	05 July 2004
Status:	Approved
Controlled Copy No:	xx
Authorised by:	Graeme Silvester Workplace Health and Safety Systems Manager
Endorsed by:	Kevin Band Executive General Manager Safety

Preface

This document is a ***standard*** within the ***Safety Management System*** (SMS). The SMS is comprised of ***policies***, ***standards*** and ***specifications*** which are mandatory.

Note: Words that are in bold/italics are specific terms that have formal definitions in the ***Safety Management System***. Please refer to STD/0002/WHS for a definition of those terms.

List of Revisions

This section is used to list the key changes that have been made to previous versions or revisions.

2. Scope
- Point 2. deleted 'standards'.
- Point 5. deleted 'legislative changes'.
- Second paragraph has been moved to section 5.2 (4).
- Third paragraph example deleted.
- New last paragraph relating to rollingstock.

3. Definitions
- Definitions put into bold/italics throughout document.
- Significant Safety Change and Minor Safety Change removed as they are contained in STD/0002/WHS (suggested modification to both definitions).
- New definitions:
  * Interface.
  * Person responsible for the change.
  * Qualitative Analysis.
  * Quantitative Analysis.
  * Responsible Manager.
  * Semi-quantitative Analysis.

4. Responsibilities
- Added 4.2 Workplace Health and Safety Systems Manager

5. Requirements
- List of three requirements modified.
- 5.1 Assessment of Safety Implications:
  * 5.1.1 Scope of Change - point 2. deleted.
  * 5.1.2 Risk Assessment and Risk Management - expanded to encompass the risk approach used in the Tilt Train Validation.
  * 5.1.3 Interface with Other Systems.
  * New Section 5.1.4 Coordination Plan.
  * 5.1.5 Circumstances Requiring a Safety Case - modified to make more succinct as to when a ***safety case*** shall be prepared.
- 5.2 Safety Case:
  * Minor modifications to make requirements clear.
  * Note added at end of section linking to Appendix 8.2 and Guideline 7.1.
  * 5.2.1 Safety Certifications
    - 1. Purchasing - 1.4 Purchasing Policy changed to SAFEPOL 15 Materials and Services Management.

- 4. Training/Competence - paragraph added on Workplace Health and Safety Inductions for specified work to meet requirements of Workplace Health and Safety Regulation 1997.
- 5. Medical Fitness - 'safety related activities' changed to '***safety related work***'
- New point 9. Workplace Health and Safety Plans added to meet requirements of Workplace Health and Safety Regulation 1997.

  * New Section 5.2.2 Workplace Health and Safety Representatives.

- 5.3 Validation of Safety Case:
  * Modified to reflect '***responsible manager***'.
- New Section 5.4 on Supplementary Signoff Certificates.

7. Guidelines
- 7.1 now Safety Certification for Infrastructure Related Work.

8. Appendices
- 8.1 now Examples for which a Safety Case must be prepared (was Guideline 7.1).
- 8.2 now Safety Validation Flowchart. Has also been changed to 4TQ Flow of which it was originally intended and modified to reflect changes in requirements.

CONTENTS

1. Purpose

The purpose of this document is to set the requirements for the validation of safety related issues associated with change. This document supports SAFEPOL 16 Change Management.

The purpose is to enable QR to improve the ***safety*** of its operations and apply the change management process to ***ensure safety risks*** associated with change are identified and managed.

2. Scope

This ***standard*** applies to all forms of change which have the potential to affect ***safety***, including changes to:

1. Physical Infrastructure.
2. Procedures, Processes, Systems.
3. Organisational Structure.
4. Job roles and responsibilities.
5. Changes external to QR and changes to interfaces (development of neighboring land and usage of level crossings etc.)

This ***standard*** does not apply to routine changes that are controlled by existing rules and procedures.

This ***standard*** does not apply to the validation of technical requirements for ***rollingstock*** which is covered by STD/0068/TEC Rollingstock Validation, Acceptance and Registration.

3. Definitions

With the exception of the following definitions which are specific to this ***standard*** all terminology used within this ***standard*** is in accordance with STD/0002/WHS Terminology and Definitions for the Safety Management System.

Coordination Plan	A document which clearly delineates the responsibilities of each party/functional area involved in the change and shows the relationship between the parties.
Interface	A boundary between different functional or business responsibilities or processes where safety risks are to be considered.
Person	The person who has initiated/requested

Responsible for the Change	the change.
Quantitative Assessment	Provides specific and calculated numerical results. The results of a quantitative assessment are determined using mathematical techniques.
Qualitative Assessment	Provides non-numerical results. Often the results of a qualitative assessment are unable to be counted but consider quality issues or 'suitability for purpose'.
Responsible Manager	The manager responsible for funding and/or implementing the change proposal.
Semi-quantitative Assessment	Provides imprecise numerical results. A semi-quantitative assessment usually provides results as small a number of broad categories. Results of semi-quantitative assessment often have values of low, medium or high; or may be in a simple numerical form, eg. on a scale of 1 to 6.

4. Responsibilities

4.1 Executive General Manager Safety

The Executive General Manager Safety has responsibility and authority for determining the requirements of this ***standard***.

4.2 Workplace Health and Safety Systems Manager

The Workplace Health and Safety Systems Manager has responsibility and authority for determining the requirements of this ***standard***.

4.3 Direct Reportees to the Chief Executive

Direct Reportees to the Chief Executive are responsible for implementing the requirements of this ***standard***.

5. Requirements

The requirements of this ***standard*** are as follows:

1. Safety implications resulting from a change proposal ***shall*** be assessed.
2. A ***safety case shall*** be prepared to record the change process.
3. The ***safety case shall*** be validated prior to the implementation of the proposed change.

5.1 Assessment of Safety Implications

All change proposals ***shall*** be evaluated to identify the effects of the change on current ***hazards*** or ***risk*** controls.

The initial assessment will be commensurate with ***risk*** and may be very basic or a judgemental decision.

5.1.1 Scope of Change

The ***person responsible for the change shall*** identify the scope of the change including:

1. Identifying the aims of the change;
2. Determining whether the change has ***safety*** implications; and
3. Determining if the proposal is either a ***significant safety change*** or a ***minor safety change***.

5.1.2 Risk Assessment and Risk Management

The ***safety risks*** associated with the change ***shall*** be identified and a quantitative or qualitative analysis carried out. Those ***workers*** undertaking ***risk assessments shall*** be trained in accordance with STD/0011/WHS Safety Training and Accreditation.

When assessing the ***risks***, the person responsible for the change must consider:

1. The objective of the change and what it aims to achieve;
2. Safety factors incidental to the change, including Interface with other Systems;
3. The procedure used to identify the ***hazard***(s);
4. The method used to analyse the ***risk***; and
5. The control measure(s) proposed to manage the ***risk***.

Where possible, a ***quantitative assessment should*** be taken to the ***risk assessment***. A ***quantitative assessment*** will give a numeric value to the likelihood of an ***accident*** occurring and the expected level of loss. Where a ***quantitative assessment*** cannot be employed, alternatives ***shall*** be considered including the ***semi-quantitative assessment*** described in STD/0007/WHS Safety Risk Management, or an entirely ***qualitative assessment*** can be used.

For many new applications there is often only enough data available to support a qualitative analysis. In these situations a qualitative ***risk assessment shall*** be used. The ***risk assessment should*** benchmark the ***safety*** of the proposed change with and against other existing systems.

5.1.3 Interface with other Systems

The person responsible for the change must analyse the interface with other systems both within Queensland Rail and systems external and known to Queensland Rail.

5.1.4 Coordination Plan

When there is a need to manage an interface, a ***coordination plan*** which identifies the responsibilities of each party ***shall*** be developed. Where applicable, the plan ***shall*** include the following:

1. The functional areas (internally or externally) and their area of responsibility.
2. The points at which the interface occurs or the limits in which the interface occurs.
3. The subject matter to be considered and resolved across each interface in terms of:
   - 3.1 Concept/Design,
   - 3.2 Construction and Implementation,
   - 3.3 Inspection/Testing/Commissioning,
   - 3.4 Monitoring and Maintenance,
   - 3.5 Modification, and
   - 3.6 Decommissioning and Disposal.
4. Determination as to which party agrees to accept responsibility for each phase listed in (3) above, or each component of a phase where there is a split.
5. The information needs of each party at the interface to allow adequate monitoring of the ***safe*** operation of the interface.
6. Procedures for assessing and monitoring the compatibility of engineering and operational parameters.
7. Procedure for review of the ***coordination plan***.
8. Procedure for access to the plan by other parties.

5.1.5 Circumstances Requiring a Safety Case

Once the scope of the change has been determined, the interfaces have been identified, and risk assessments have been carried out, the need for a ***safety case*** must be established.

If the proposed change does not affect ***safety*** issues or if the change is routine and controlled by existing rules and procedures, then a ***safety case*** is not required.

A ***safety case shall*** be prepared if the proposed change affects safety and:

1. is not routine;
2. is not in accordance with existing practices and procedures; and/or
3. the ***person responsible for the change*** determines that the change or risk is not acceptable.

5.2 Safety Case

1. The person responsible for the change ***shall*** compile and issue the ***safety case*** to parties identified in the ***coordination plan***.
2. The person responsible for elements identified in the ***coordination plan shall*** certify their defined responsibilities have been fulfilled or will be fulfilled.
3. The ***safety case*** must be written in the present tense and must include:
   - 3.1 The ***person responsible for the change*** and the ***responsible manager***.
   - 3.2 The scope of the ***safety case***, including the purpose, objectives, and inclusions and exclusions;
   - 3.2 Description of proposed change;
   - 3.3 ***Risk assessment*** and ***risk management***;
   - 3.4 ***Coordination plan*** (if applicable); and
   - 3.5 Signed safety certifications (by each party identified in the coordination plan) for work which has been completed and/or work to be completed in the future.
4. The safety requirements ***shall*** be achieved either by adherence to established designs, specifications or operating and maintenance procedures in particular subject areas as per the change proposal, or by demonstration of adequate capabilities in those areas by other means.
5. The ***safety case should*** be started at the concept stage but ***shall*** be completed prior to the implementation of the change.

6. A handover certificate ***shall*** be signed by the person in charge of any handover of responsibilities at an interface concurrent with the introduction of each change (or component of the change) stating the change is ***safe*** for a stated purpose of use.

Note: refer to Appendix 8.1 for example for which a ***safety case*** must be prepared and Guideline 7.1 for an example of what a ***safety case*** might consist of for Infrastructure related change.

5.2.1 Safety Certifications

For each of the individual safety certifications included in the ***safety case***, the following headings, where applicable, ***shall*** be addressed:

1. Concept/Design;
2. Construction/Implementation;
3. Inspection/Testing/Commissioning;
4. Operation;
5. Monitoring/Maintenance;
6. Modification;
7. Decommissioning/Disposal; and
8. ***Risk assessment*** and ***risk management***.

Where the ***standards*** and procedures used can be accessed they ***shall*** be listed.

Where applicable, the following factors must be considered in safety certifications:

1. Purchasing. The procedures used for ***ensuring*** purchased services and products meet the specified safety requirements ***shall*** be listed. The procedures may include:
   - 1.1 Purchasing documents - ***specifications*** and ***standards***;
   - 1.2 Verification of supplied product prior to acceptance.
   - 1.3 Where appropriate, traceability of manufacture and repair;
   - 1.4 SAFEPOL 15 Material and Services Management.
   - 1.5 Proven Technology.
2. ***Plant*** and Equipment. An analysis of any new equipment or systems proposed must be included. When designing, manufacturing, purchasing, or importing ***plant*** and equipment, the requirements of STD/0013/WHS Plant and STD/0010/WHS Registration of Workplaces, Plant, Plant Design and Construction ***shall*** be adhered too.

3. Contract and Consultant Management. The procedures and processes used for the assessment and management of contracts, subcontractors and consultants in respect of ***safety*** issues must be recorded.

   The record of contractors, subcontractors and consultants who have demonstrated their ability to meet ***safety*** requirements ***shall*** be kept.

4. Training/Competence. The training to ***ensure*** that ***workers*** are competent for new or changed systems ***shall*** be in accordance with STD/0011/WHS Safety Training and Accreditation and must be listed or defined.

   Where QR is the employer for ***specified work***, General and Site Specific Workplace Health and Safety Inductions for specified work ***shall*** be given in accordance with Part 8 of the Workplace Health and Safety Regulation 1997.

5. Medical Fitness. The systems to ***ensure*** that ***workers*** who are engaged in changes to ***safety related work*** have the physical and mental fitness, and the capacity to perform the work must be listed.

6. Designated Hazardous Substances. The regulations, design codes and standards used for the control of designated hazardous substances must be documented.

7. Emergency Response. The procedures for action in the event of an emergency arising must be recorded.

8. Documentation. The procedures and processes for the control of ***safety*** related documentation must be listed.

9. Workplace Health and Safety Plans. Where QR is the principal contractor for a construction workplace; principal contractor for demolition work; or if we are the employer for specified work, then a workplace heath and safety plan in accordance with Part 8 of the Workplace Health and Safety Regulation 1997 must be prepared.

10. Other Factors. The following items, where applicable ***shall*** be considered:

    10.1 The maintenance of ***safe*** operations during any system changes.

    10.2 Process control to ***ensure*** activities directly affecting safety ***shall*** be carried out under controlled conditions.

    10.3 Work site operation and management.

    10.4 Access control and protection.

    10.5 Compliance with design documentation and the use of practices and procedures consistent with the intent of the design.

    10.6 Procedures to ***ensure*** use of approved and current plans and specifications.

    10.7 The independence of ***workers*** performing inspection and testing.

10.8 Compatibility between new work and other existing areas.

10.9 Verification of conformance of the system to the design and to the operational parameters.

10.10 The processes for handover of changes systems and responsibility allocation.

10.11 The provision of as-constructed plans.

10.12 Use of appropriate maintenance practices, procedures and records and preventative or corrective action to be taken when prescribed limits are reached or infringed.

10.13 The need to prevent inappropriate re-use of decommissioned infrastructure or equipment.

10.14 The need to eliminate as far as practicable, any ***public hazard*** associated with the decommissioned infrastructure or equipment, giving consideration to both short and long term conditions.

5.2.2 Workplace Health and Safety Representatives

Where the change involves changes to the ***workplace***, ***plant*** or substances used at a ***workplace***, and the changes affects safety or could affect safety, the Workplace Health and Safety Representative ***shall*** be consulted in accordance with Section 77 and 78 of the Workplace Health and Safety Act 1995.

5.3 Validation of Safety Case

1. A ***minor safety change*** may be validated by the ***responsible manager***, or the ***person responsible for the change*** may request the Executive General Manager Safety to validate the ***safety case***.
2. A ***significant safety change*** must be validated by the Executive General Manager Safety. In those cases the Executive General Manager Safety may select qualified people from key disciplines to form a panel to validate the ***safety case***. A safety validation certificate will be issued which will form the authority to carry out the ***significant safety change***.

5.4 Supplementary Signoff Certificates

Where the safety validation certificate is issued with conditions which need to be complied with, the ***responsible manager shall ensure*** that such conditions have been met prior to implementation of the change. Alternatively, the change proposal may need to be modified to overcome the deficiencies for which the conditions were imposed.

Where there is a significant time lag between the issue of the ***safety case*** and implementation of the change, the ***responsible manager***, prior to the implementation of the change, ***shall ensure*** that the circumstances have not substantially changed since the issue of the ***safety case***.

Where conditions have been imposed or where there is a significant time lag, the ***responsible manager shall***, if applicable, obtain Supplementary Signoff Certificates from each of the parties in the coordination plan or those having responsibility for key aspects of the change. These certificates ***shall*** confirm compliance with conditions set out in the safety validation certificate and that the change is safe for a stated purpose or use.

5.5 Implementation

1. Version 2.0 of this ***standard*** takes effect from 05 July 1999.
2. All ***workers*** undertaking ***risk assessments*** associated with safety validation ***shall*** be trained within six months of Risk Management training becoming available. In the interim, ***risk assessments*** for safety validation ***shall*** be conducted in accordance with current practices, with specialist advice available from the Safety Risk Manager, Safety Division.

5.6 Monitoring

The Workplace Health and Safety Systems Manager is required to ***audit*** compliance with this ***standard*** as per the Annual Safety Audit Plan developed by the Executive General Manager Safety.

The monitoring ***shall*** establish:

1. Compliance with the ***standard***; and
2. Effectiveness of the implementation and on-going management.

5.7 Review

The Workplace Health and Safety Systems Manager ***shall*** review the relevance and effectiveness of this ***standard*** at least every five years in conjunction with ***audit*** findings, legislative changes, responses to ***accidents*** and ***incidents*** or where other proposals are made as part of the ***Safety Management System*** or identified best practice.

The review will take account of the latest versions of the Hazard and Risk Inventory, and how well this ***standard*** integrates with other elements of the ***Safety Management System***.

Changes or additions required to this ***standard*** as a result of the review can be made only by the Workplace Health and Safety Systems Manager.

6. Associated Documents

6.1 STD/0002/WHS Terminology and Definitions for the Safety Management System

6.2 Hazard and Risk Inventory
(held by the Executive General Manager Safety)

6.3 Master List of Safety Management System Documents
(held by the Executive General Manager Safety)

6.4 SAFEPOL 15 Materials and Services Management

6.5 AS 4292 Parts 1-6 Railway Safety Management

6.6 STD/0010/WHS Registration of Workplaces, Plant, Plant Design and Construction

6.7 STD/0011/WHS Safety Training and Accreditation

6.8 STD/0013/WHS Plant

6.9 Workplace Health and Safety Regulation 1997.

7. Guidelines

7.1 Safety Certification for Infrastructure Related Change

Typically, the ***safety case*** for infrastructure related change will include Safety Certification for the following areas:

1. Civil and ***Track***;
2. Building and Facilities;
3. Operation of ***Rollingstock***;
4. Signalling and Operations Systems;
5. Telecommunications;
6. Electric Traction Systems;
7. Train Operations and Control Systems;
8. Other systems or processes; and
9. Workplace Health and Safety.

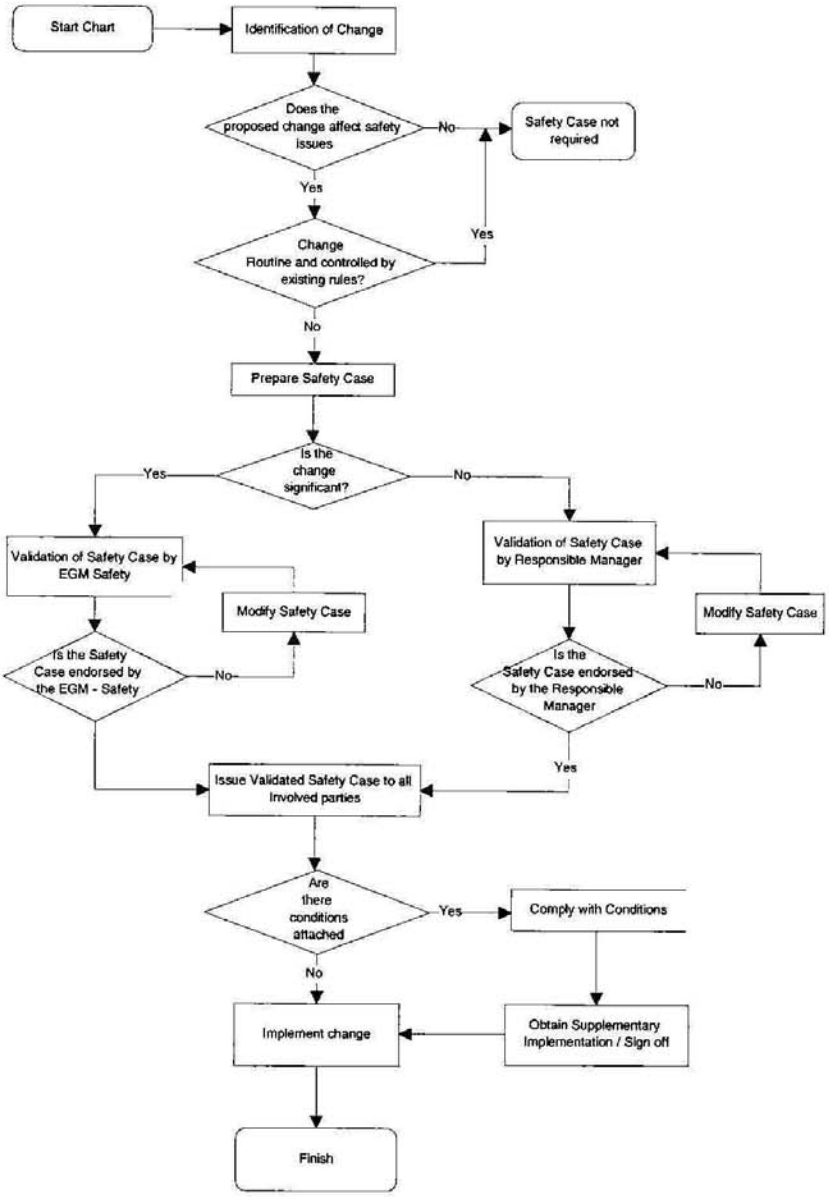
8. Appendices

8.1 Examples for which a Safety Case must be Prepared

A ***safety case shall*** be prepared for any change which affects ***safety related work*** or infrastructure including:

1. Driving and operations of ***trains***;
2. Control of the movement of ***trains***;
3. ***Civil infrastructure*** and ***track*** infrastructure;
4. Operation of the ***rollingstock***;
5. Signalling, operational systems and telecommunication infrastructure;
6. Electric traction infrastructure;
7. Interface with other engineering and operating systems and equipment;
8. Personal workplace safety;
9. Other safety related activities eg. reorganisation of a Business Groups Structure with the view to eliminating certain positions; and
10. Where the ***risk*** associated with the change is determined by the responsible Manager to be such that the preparation of a ***safety case*** provides benefit by enabling valuation, or assists in managing interfaces, or provides justifiable documentary records.

8.2 Safety Validation Flowchart



8.3 Sample Format of a Safety Case

For a completed example of a ***safety case***, contact the Executive General Manager Safety or the QR Intranet Site.

ANNEXURE G

SAFEWORKING UNIT 245

Safeworking systems on track-circuited double lines SWU **245**

Passing an automatic signal at stop - Automatic and Track Control (Bi-directional)

procedures for signallers, handsignallers, drivers

[a]

■ Automatic signals at stop must only be passed:

either when the signal has failed and the driver has the verbal authority of the signaller or the authority of a green **caution** handsignal displayed by a handsignaller positioned at the signal and working under the instructions of the signaller

or when the driver is instructed by the signaller to assist a disabled train

or if the signal is fitted with a train stop and the train is fitted with a trip valve,

when the driver can see that the line ahead is unoccupied

or if the signal is **not** fitted with a train stop **or if** the train is **not** fitted with a trip valve,

when the signaller cannot be contacted by telephone and the driver has waited one minute and can see that the line ahead is unoccupied.

To authorise a train to pass an automatic signal at stop [b]

■ When a signaller becomes aware that an automatic signal has failed and it is considered necessary for train working purposes to position a handsignaller at the signal, every effort must be made by the signaller and the controlling station master to provide a handsignaller as soon as possible.

signaller at B

When contacted on the signal telephone by the driver of a train at an automatic signal at stop or by a handsignaller positioned at an automatic signal:

1 Ask for the identification number of the signal.

2 Establish whether the line ahead is occupied or whether the signal has failed:

by checking the track indicator diagram, where provided, to establish whether a train is occupying the line between the signal where the train is standing and the next signal

and by checking the train register book or other recording system to establish if a train is still in the section

and by contacting the signaller at A to confirm the number of the last train which departed from A ahead of the train standing at the signal.

If the line ahead is occupied:

3 Inform the driver or handsignaller of the reason for the delay.

4 Give the driver, or instruct the handsignaller to give the driver, one of the following instructions:

either to wait at the signal until the signal displays a proceed indication

or to wait at the signal for further instructions

or to pass the signal at stop, proceed with extreme caution and assist the disabled train.

If the signal has failed:

3 When you are satisfied that:

the section in advance is unoccupied

and that sufficient time has elapsed to permit the previous train to have passed completely beyond the signal ahead of the failed signal

and that it is safe for the train to proceed

advise the driver or handsignaller that the signal has failed.

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4 **Either** authorise the driver to pass the signal at stop **or** authorise the handsignaller to display a green **caution** handsignal as the authority for the driver to pass the signal at stop.

5 Advise the drivers of all following trains, if possible before they enter the section, of the identification number of the failed signal(s).

handsignaller

1 Display a red handsignal to any approaching train until you are instructed otherwise by the signaller.

2 When a train arrives at the signal, advise the driver why the signal is at stop.

3 When authorised by the signaller, display a green **caution** handsignal to the driver as authority for the driver to proceed.

To pass an automatic signal at stop [c]

■ A signal at stop may have failed to clear as a result of a train on the line ahead, a broken rail or some other factor(s) affecting the track circuit and signal(s). For this reason, a driver must exercise extreme caution when passing a signal at stop.

■ When a train passes an automatic signal at stop, the driver must proceed with extreme caution to the first signal ahead of the signal at stop, prepared to stop short of any obstruction, and obey the indication of that signal. If it is displaying a proceed indication, the driver must proceed with extreme caution to the second signal ahead of the signal at stop and obey the indication of that signal.

If there is a handsignaller positioned at the signal:

driver

1 Stop at the signal.

2 If necessary, find out from the handsignaller why the signal is at stop.

3 When the handsignaller displays a green **caution** handsignal, pass the signal at stop.

If there is no handsignaller positioned at the signal and the signal is fitted with a train stop and the train is fitted with a trip valve:

driver 1 Stop at the signal.

2 **either**
If you can see that the line ahead is unoccupied, trip past the signal at stop.

■ Drivers of electric trains must inform the guard, by bell code, that the train will trip past the signal.

or
If you can see a train occupying the line between the signal at which your train is standing and the next signal ahead, contact the signaller by signal telephone:

If contact can be made with the signaller:	**If** contact **cannot** be made with the signaller:
give the signaller the identification number of the signal at which your train is standing	**either** wait until the signal displays a proceed indication
then establish the cause of the delay	**or** when you can see that the train ahead has proceeded, wait until sufficient time has elapsed for it to have passed completely beyond the signal ahead of the signal at which you are standing and, if the signal fails to clear, pass the signal at stop.
then act as instructed by the signaller	

If there is no handsignaller positioned at the signal and either the signal does not have a train stop or the train is not fitted with a trip valve:

driver 1 Stop at the signal.

2 Contact the signaller by signal telephone.

3 **If** contact can be made with the signaller:	3 **If** contact **cannot** be made with the signaller:
give the signaller the identification number of the signal at which your train is standing	wait one minute and then, provided you can see that the line ahead is unoccupied, pass the signal at stop.
then establish the cause of the delay	
then act as instructed by the signaller	

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ANNEXURE H

SAFEWORKING UNITS 900, 910, 912, 913, 914, 920 AND 922

General safety precautions

Introduction [a]

■ This manual sets out the procedures which must be adopted when any type of engineering work is to be carried out on or about railway infrastructure. This work may relate to the repair, maintenance or upgrading of railway tracks, rolling stock, or associated works or equipment.

■ For the purpose of this manual, where there are procedures shown for an employee, this will mean a State Rail employee, a private company employee, or a contractor.

■ An employee must only perform the duties as shown in these procedures when they have obtained the level of State Rail certification necessary to carry out these duties.

■ Each worksite supervisor, track vehicle operator and traffic officer must have an up-to-date copy of this manual and the relevant supplements for their particular discipline readily available for the information of employees.

Vision, colour sense and hearing [b]

■ All employees who work on or about the line must comply with the vision, colour sense and hearing requirements as shown in the State Rail Medical Practices and Procedures manual.

■ Employees who have been on continuous leave for more than 6 months or contractors who have not been employed by State Rail for 6 months must pass the tests defined in the State Rail Medical Practices and Procedures manual before they are permitted to be on or about the line.

■ Emergency Service organisations are responsible for ensuring that their personnel comply with their organisations' vision, colour sense and hearing requirements.

Safety clothing [c]

State Rail employees, private company employees, and contractors working on or about State Rail lines must wear highly visible safety clothing which has been approved by Occupational Health & Safety.

The approved colour for the safety clothing for work on or about State Rail lines is (AS 1743) **orange** and the approved colour for wet weather clothing is (AS 151) **yellow** or AS 1743) **orange**.

■ Bright red or bright green clothing must not be worn as it could be mistaken by a driver for a stop signal or a clear signal.

The only exceptions to this policy are State and Federal emergency services when called to assist in an emergency which requires them to work on or about State Rail lines. These officers wear the approved clothing appropriate for their occupations.

Safety clearances for engineering work [d]

For the purpose of the procedures in this manual, "work on or about the line" refers to any work situation where employees, contractors, plant, equipment or material are located within, or are likely to be within, the following distances:

non-electrified areas	2.5 metres horizontally from the nearest rail of any running line or siding
	6 metres vertically above rail level
	0.3 metres vertically below rail level
electrified areas	2.5 metres horizontally from the nearest rail of any running line or siding
	a specified clearance from the electrical equipment, as governed by electrical safety requirements
	0.3 metres vertically below rail level
at platforms	Between the yellow safety line and the platform edge or, where there is no yellow safety line, within 0.5 metres of the platform edge

■ Where work does not come within, or is not likely to come within, these safety clearances, no protection is necessary and the procedures in this manual DO NOT apply. However, when any work is being performed close to the minimum safety distances, **extreme care must be exercised.**

Exception:

■ Before any work which may affect the stability of the line or structures (e.g. work on a bridge or excavating under the line) is carried out **outside** these defined safety clearances, details of the work must be referred to the local civil engineering manager or local qualified representative to determine whether trains need to slow down or stop. Where trains need to slow down or stop, the procedures as shown in SWUs 913 to 918 in this manual must be carried out to protect the worksite.

Safety clearances for engineering work near electrical equipment [e]

The specified safety clearances for working near electrical equipment are shown in SWU 931 and the specified safety clearances for using cranes and plant near electrical equipment are shown in SWU 932.

■ Before any work is carried out within the specified safety clearances as shown in SWUs 931 and 932, details of the work must be referred to the District Electrical Engineer.

Using barriers within the safety clearances [f]

Barriers may be provided within the safety clearances as shown at [d] in this unit to protect work adjacent to or above the line. The barriers must be of solid construction to prevent any possibility of employees or their equipment from coming into contact with passing trains or the overhead wiring.

When the barriers have been erected, no protection is necessary and the procedures in this manual DO NOT apply.

When a barrier is used to prevent access to the electrical equipment, a "Permit to Work" is not required.

The minimum distance which barriers can be erected from the nearest rail is determined by the local District Structures Officer.

The minimum distance which barriers can be erected from the overhead wiring or electrical equipment is determined by the District Electrical Engineer.

■ The approval of the relevant officer must be obtained before barriers are erected, and the officer approving the use of barriers must arrange for all details of their use to be recorded.

Using fencing or boundary tape to define a work area [g]

High visibility demarcation fencing or boundary tape may be used to define a work area.

■ Because this fencing or boundary tape cannot prevent persons or equipment from coming into contact with trains or the overhead wiring, normal protection must be provided. The level of protection will depend on the type of work being carried out.

Certifications not required in track possessions [h]

When a line is closed for engineering work **and** work trains or track vehicles will **not** operate in a possession area, or train services or track vehicles will **not** operate on an adjacent line, then uncertified employees can work on or about the possession line without a handsignaller to supervise them.

However, when a line is closed for engineering work and work trains or track vehicles will operate on the closed line or train services or track vehicles will operate on an adjacent line, or it is necessary for uncertified employees to cross a live line, then the certification requirements as shown at [c] in SWU 901 will apply.

Use of contractors [i]

Contractors may be used to carry out engineering work on State Rail property at any time, but they must comply with State Rail's protection requirements at all times.

■ When a worksite supervisor is provided to supervise contractors, the worksite supervisor must:

ensure that all contractors at the worksite are wearing approved safety clothing or wet weather clothing

ensure that any contractors who have not been certified in Track Safety Awareness are supervised as shown at [c] in SWU 901

ensure that any contractors who have not been certified in Electrical Awareness for Non-Electrical Persons are supervised as shown at [g] in SWU 931

instruct the contractors in the requirements necessary before commencing work as shown at [d] in SWU 910.

The employee who arranges for the contractors to do the work must determine the level of protection and supervision required. If the employee arranging for the contractors is uncertified to determine the level of protection, this employee must arrange for an employee who is certified to determine the level of protection required.

When contractors are certified to State Rail requirements, they may provide their own employees to protect and supervise worksites as follows:

When the work is inside or likely to come inside the defined safety clearances:

■ When the work to be carried out is **inside or likely to come inside** the defined safety clearances as shown at [d] in this unit **and inside** the area bounded by Maitland, Wallerawang West, Goulburn and Nowra, contractors may provide their own employees to protect the worksite **but** a State Rail worksite supervisor must be provided to ensure that all of State Rail's requirements for being on or about the line are carried out.

■ ■ ■ Warning:

A contractor or a State Rail employee employed in a "Temporary Extra Position" must not be permitted to be certified to carry out worksite supervision duties **inside** the area bounded by Maitland, Wallerawang West, Goulburn and Nowra unless specially authorised by the General Manager, Safeworking.

■ When the work to be carried out is **inside or likely to come inside** the defined safety clearances as shown at [d] in this unit **and outside** the area bounded by Maitland, Wallerawang West, Goulburn and Nowra, contractors may provide their own employees to protect and supervise the worksite.

■ Before allowing contractors to provide their own employees to protect and/or supervise a worksite, the employee who arranges for the contractors to do the work must sight the safeworking certificates of all of the contracting employees involved in the protection and/or supervision of the work.

When the work is outside the defined safety clearances:

■ When the work to be carried out is **outside** the defined safety clearances as shown at [d] in this unit, the contractors may provide their own employees to supervise the work, **but** it will not be necessary for the work to be protected or for the supervisor to have safeworking certification. However, the employee who arranges for the contractors to do the work must warn the contractors not to go on or about the line or to allow their equipment to go on or about the line and, if required, must arrange for supervision by a State Rail employee.

This employee must also arrange for the contractors to be instructed about safe areas, live areas and any other restrictions applying to the work before the work is commenced.

Work requiring a traffic officer [j]

Certain types of work require a traffic officer to be present. A traffic officer is an employee from either an operations or an engineering discipline who is certified to the level of either Engineering Safeworking Class 1 or Class 2.

Work which requires a traffic officer includes:

transferring a track vehicle which is treated as a train

any work advertised in a safeworking circular which states that a traffic officer must be provided.

When the worksite supervisor is certified to the level of either Engineering Safeworking Class 1 or Class 2, that employee may carry out the duties of the traffic officer as well as being in charge of the worksite, **provided** that it is possible to carry out all the duties properly.

Reporting an unsafe situation [k]

■ Any unsafe situation noticed by an employee must, if possible, be made safe and then promptly reported to either the employee's supervisor, the signaller or the train controller.

■ Any employee on or about the line who notices any problem on a train passing their location must immediately report the situation to the train crew by two-way radio (if available) and to the nearest signaller or train controller by telephone or any other means of communication available.

Examples of situations which employees must report are:

vehicles on fire

sticking brakes

hot or noisy axle boxes

air brake hoses dragging on the line

wheels with flat spots on them

unusually noisy wheels

loose or flapping ropes or tarpaulins

unsecured or swinging doors

shifting loads

dragging chains or dragging brake gear

damaged pantographs.

■ Any employee reporting a problem on a train must provide the signaller or the train controller with the following information:

a description of the train and (if known) a locomotive number, a set number, or a car number

the time the train passed the location where the situation was noticed

the direction in which the train was travelling

and the nature of the problem.

■ When an employee detects a broken electrical connection to the line, that employee must **immediately** report the circumstances to either the local signal electrician, the signaller, the train controller or the electrical systems operator.

■ When an employee detects or becomes aware of a safeworking breach, that employee must promptly report the circumstances to their controlling officer who must report the circumstances to the signaller or train controller.

The train controller must then take the appropriate action for the circumstances, arrange for the matter to be investigated, and for the investigating officer, signaller or other safeworking employee to compile and transmit a GENL telegram covering all details.

Changing shifts [l]

■ Engineering employees engaged in work on or about the line must inform the employee relieving them of all aspects of the work, including protection arrangements and any special working.

Any employee who is in possession of safeworking forms or other documentation regarding the work must ensure that the incoming employee countersigns all safeworking forms and other documents and shows the time and date.

Maintenance and security of assets [m]

■ Employees must take all reasonable steps to care for and safeguard all assets belonging to State Rail.

■ All assets must be kept in a condition which does not endanger the safety of any person.

■ Any unsafe asset noticed by an employee must be either made safe or promptly reported to the employee's controlling officer.

Security of State Rail property [n]

■ In order to deter entry of unauthorised persons and livestock onto State Rail property on fenced lines, the local engineering manager must ensure that boundary fences are maintained in good condition in accordance with State Rail standards.

■ All gates which allow access to State Rail property must be closed and secured by the locks or fasteners provided when they are not being used by authorised persons to gain access. Any employee who notices an open gate must either close and secure it or arrange for this to be done.

■ Unauthorised persons on State Rail property must be directed to leave immediately. If the unauthorised persons refuse to obey the direction, the employee in charge must arrange for the persons to be removed from State Rail property and must then submit a full report to their controlling officer before ceasing duty.

■ An employee who detects or is informed of any vandalism must immediately notify their controlling officer, the train controller and the local police. Before ceasing duty, the employee must submit a full report to their controlling officer.

Livestock on the line [o]

■ Any employee who notices livestock wandering on or near the running line within a fenced line must report the location of the livestock (in kilometres to the nearest 100 metres) to the nearest signaller or train controller.

The signaller or train controller must inform the engineering supervisor in charge of the area.

■ Engineering staff receiving a report of livestock wandering on or near the running line within a fenced line must:

ensure that the livestock are removed as soon as possible

determine how the livestock gained access to the line

make any necessary repairs to the fences, or close and secure the gates, to ensure that the livestock cannot return

and advise the signaller or train controller when the livestock are clear of the line.

■ When advised that there are livestock within a fenced line, the signaller or, at an unattended location, the train controller must warn the driver of each train to enter the affected section on an "SWF.W5.300 Warning to driver - condition affecting line" form.

■ When any employee becomes aware that livestock are injured on any line, that employee must report the circumstances to the nearest signaller or train controller. The signaller or train controller must inform:

the police in order to have the animals treated or destroyed

and the local engineering supervisor in order to have the animals removed.

Blasting operations [p]

■ Whenever blasting operations are to be carried out near the line, the worksite supervisor must obtain the train running information, and then inform the signaller or train controller of the location and the time the work will commence and finish.

■ If there is any danger of the blasting obstructing the line, the worksite must be protected in accordance with the procedures in SWUs 913 to 918, depending on the location of the worksite.

■ ■ ■ Warning:

If using electrical detonating devices, these devices must not be connected while any train is within a radius of 1500 metres of the blasting site.

General protection requirements

Introduction [a]

- When employees are working on or about the line and can safely look out for themselves, no other protection is necessary.
- When employees cannot look out for themselves, protection will be required. The level of protection must be determined by a worksite supervisor.
- When employees working on or about the line become aware of the approach of a train, they must move with any equipment to a safe place.
- A safe place is any location where employees and equipment will not be struck by passing trains.
- If, for any reason, employees cannot move to a safe place before a train arrives, they must lie down in the six foot.
- For the purpose of this manual, a worksite is a location which requires protection. A worksite may be a single work location or a number of separate work locations where the worksite protection can be effectively supervised by the worksite supervisor.
- Employees protecting a worksite must have with them sufficient safety equipment in good condition to enable them to carry out their duties. Depending on the type of work and the circumstances, the equipment may include flags, detonators, lights, telephones, two-way radios, hooters and whistles.

Location and operational factors [b]

The method of protection to be used will depend on:

the type of work to be done

the location and operational factors

and the system of safeworking used on the section of line.

Examples of factors which affect the protection required are:

whether the work is emergency or planned

the location of the worksite (e.g. in a blind cutting, in a tunnel, on a bridge, or within or next to an interlocking)

whether single or double lines are involved

whether the worksite is in an electrified or non-electrified area

whether the line is track-circuited

whether signalboxes are controlled by a signaller

whether drivers can be given adequate warning

whether visibility is reduced (e.g. by fog, overcast or stormy conditions, heavy rain, bush fires or dust storms).

Safeworking systems [c]

Safeworking systems are designed to safely control the movement of trains.

The safeworking system in use at the location where the work is being carried out may affect the method of protection provided, e.g. using fixed signals or safeguarding the staff for the section.

normal systems

The safeworking systems in use are:

Track Block	On double and single lines
Track Control	"
Block Telegraph	On double lines only
Automatic	"
Electric Staff	On single lines only
Staff and Ticket	"

special working

Under certain conditions, when equipment fails or an obstruction to the line occurs, the following special methods of working trains can be introduced:

Special Authority Order working - which may be introduced when a train or signalling or safeworking equipment fails (see SWUs 800 to 819 in the "Safeworking procedures for emergencies and special working of trains" manual).

Pilot Staff working - which may be introduced during planned work or when a line is obstructed for a long time (see SWUs 830 to 843 in the "Safeworking procedures for emergencies and special working of trains" manual).

850 working - which is only introduced **either** under exceptional conditions when other methods would cause serious delays, **or** where a situation arises which is not covered by the safeworking procedures (see SWU 850 in the "Safeworking procedures for emergencies and special working of trains" manual).

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Protection of worksites [d]

Engineering work requiring protection may be carried out on or about the line, **provided** that:

there is an engineering employee, referred to as the **worksite supervisor**, in charge of each worksite

the worksite supervisor is certified, as shown in SWU 901

the protection needed is in place before the work is started

all employees involved in the protection of the work are certified, as shown in SWU 901, and understand their duties

and the procedures and requirements as set out in this manual are followed.

■ Before commencing work at a worksite, the worksite supervisor must:

ensure that the line is unoccupied between the worksite and the location(s) where the handsignaller(s) is positioned

and instruct all employees:

which lines are protected and the boundaries of the protection

which lines are not protected

when the protection is in place and when it will be removed

where to move to when a train approaches

what type of warning or signal will be given to indicate that a train is approaching.

These instructions must be given before the work commences each day, and whenever the work or protection arrangements change.

protection to be provided in both directions

■ The worksite supervisor must arrange for the worksite to be protected in both directions:

on single line sections

on double line sections when Pilot Staff working is in operation

on Bi-directional sections **unless** an X, Y or Z key has been obtained.

protection not required

■ Protection will **not** be required between the worksite and the end of a terminal line when the worksite supervisor has received an assurance from the train controller or signaller that there is no train or track vehicle between the worksite and the end of the terminal line.

removing handsignallers

When two or more handsignallers are provided to protect a worksite, the worksite supervisor must arrange for:

either all handsignallers to be removed at the same time

or the inner handsignaller to be removed before the outer handsignaller is removed.

Special instructions for protecting worksites on single lines and on double lines where Bi-directional signalling is in use [e]

■ On single lines or on Bi-directional sections when an X, Y or Z key is not obtained, the worksite supervisor must arrange for the worksite to be protected in both directions. The placement of the handsignallers will depend on the location of the worksites.

■ On single lines or on Bi-directional sections when an X, Y or Z key is not obtained, the inner handsignaller (and the outer handsignaller, if communication is available) on the departure side of the worksite must remove the detonator protection before allowing the train to pass the inner handsignaller on the approach side of the worksite. The detonators must be replaced after the passage of the train.

Note: If sufficient time is not available to remove the detonators, the handsignallers must stand clear and display an **all clear** handsignal to the driver.

Supervision of worksites [f]

■ The worksite supervisor must ensure that all necessary employees and material are available to commence and complete the work on time and that all methods of communication are in working order before the work commences.

■ When the worksite supervisor cannot supervise both the engineering and protection aspects of the work, the assistance of another employee must be obtained to protect the worksite and to carry out any other duties allocated by the worksite supervisor. The assisting employee must be certified to the level of worksite supervisor or traffic officer. However, the assisting employee must report to the worksite supervisor who remains responsible for the overall safety of the site.

■ Before receiving a "Permit to Work" to allow work to be carried out near the 1500 volt overhead wiring, the worksite supervisor must have been shown the electrical safe working area by an electrical employee known as an "Authorised person Mains". Work near other types of electrical equipment requires the safety clearances as shown in SWUs 931 and 932 to be followed.

■ When Pilot Staff working or Bi-directional working is to operate over one line of a double line section, the worksite supervisor must ensure that work train crews, track vehicle operators and all other employees at the worksite are advised that trains will be travelling in both directions over the adjacent line.

Additional requirements when protecting a worksite where more than one engineering discipline is involved in the worksite [g]

When there is more than one engineering discipline involved in the same worksite, the representatives from each discipline must confer and appoint a worksite supervisor to protect the worksite.

Certifying the line or other equipment [h]

Before certifying that the line is safe for traffic, a worksite supervisor not certified in all aspects of the engineering work must confer with the representatives in charge of each discipline involved and receive an assurance that every aspect of the work is safe.

When the work has caused changes to the infrastructure arrangements, the representative must be a person nominated by the manager responsible for routine maintenance.

Protecting employees working on or about the line when trains are not required to slow down or stop

Introduction [a]

There are two methods of protection where employees can work on or about the line when trains are not required to slow down or stop:

the first method of protection is where employees are responsible for their own protection by looking out for trains themselves

and the second method is where a handsignaller(s) provides protection as determined by a worksite supervisor.

- When either of these methods is used:

  all employees must ensure that they move to a safe place with their equipment and acknowledge the driver's locomotive whistle in sufficient time so that the driver does not need to reduce the speed of the train

  and there will be no need to obtain train running information.

To determine how employees will be protected depends on a number of factors, including:

the location

the reason for being on or about the line

the equipment being used.

- Employees may use light equipment or light machinery if required. However, the equipment or machinery must be light enough to be physically removed clear of the line by the employee(s) present.

When employees are responsible for their own protection [b]

■ When employees working or about the line can safely look out for themselves and move to a safe place with their equipment without trains being required to slow down or stop, no other protection is necessary.

■ ■ ■ Warning:

When employees consider that they cannot safely look out for themselves, they must request a worksite supervisor to determine the level of protection required.

To keep a safe lookout [c]

employees looking out for themselves

1 Where possible, look or walk towards approaching trains so that you can see a train approaching.

2 Keep a frequent lookout for trains.

3 When you see a train approaching, move to a safe place.

4 If the driver sounds the locomotive whistle before you are in a safe place, DO NOT give the **all clear** handsignal until you are in a safe place.

5 When you are in a safe place, face the driver of the approaching train and display an **all clear** handsignal.

6 If the driver has not sounded the locomotive whistle, continue to display the **all clear** handsignal until the driver has sounded the locomotive whistle.

7 Remain in the safe place and maintain observation of the train, if possible until the train has passed.

8 If the safe place is within 2.5 metres of the nearest rail, cease all activity and discussion until the train has passed.

9 When the train has passed, check that no more trains are approaching before resuming work.

When protection is provided by a handsignaller [d]

■ When employees working on or about the line cannot safely look out for themselves, a handsignaller must be provided to act as a lookout.

The handsignaller acting as a lookout must warn all employees in the working party when a train is approaching. The warning may be given verbally or by a hooter, a whistle, or other approved warning device.

- When one handsignaller acting as a lookout cannot safely provide the protection owing to the location, weather conditions, difficulty in seeing trains approaching, or other reasons, the worksite supervisor may instruct the lookout to place one detonator on the line or obtain an additional handsignaller to provide an **earlier** warning.
- Handsignallers must not leave their position unless authorised by the worksite supervisor or unless they have been relieved.
- After the worksite supervisor has determined the level of protection, **it will not be necessary** for the worksite supervisor to remain continuously at the worksite.

To protect the worksite [e]

worksite supervisor

1. Before work commences, ensure that the handsignaller(s) understands what is required and has the equipment necessary to carry out their duties.
2. Arrange for the handsignaller to be positioned as a lookout in a place where the handsignaller can clearly see approaching trains and the handsignaller's warning will be clearly heard or seen.
3. When necessary, instruct the handsignaller to place one detonator on the line and to replace the detonator after the passage of each train.
4. If necessary, arrange for an additional handsignaller to act as a lookout if one is insufficient.
5. Inform all employees what type of warning will be given.
6. When work is completed, withdraw the handsignaller(s) acting as a lookout.

handsignaller acting as a lookout

1. Stand in a place where you can clearly see trains approaching and your warning can be clearly heard or seen at the worksite.
2. If instructed by the worksite supervisor, place one detonator on the line and then replace the detonator after the passage of each train.

3 When a train approaches, warn all employees in the working party, including any additional handsignaller(s) protecting uncertified persons.

4 When you and the other employees are in a safe place, face the driver of the approaching train and display an **all clear** handsignal.

5 Remain in the safe place and maintain observation of the train, if possible until the train has passed.

6 If the safe place is within 2.5 metres of the nearest rail, cease all activity and discussion until the train has passed.

7 When the train has passed, check that no more trains are approaching before work is resumed.

8 DO NOT do any other type of work.

additional handsignaller

1 Take up a position as instructed by the worksite supervisor.

2 If instructed by the worksite supervisor, place one detonator on the line and then replace the detonator after the passage of each train.

3 Maintain a view of the inner handsignaller at all times.

4 When a train approaches, warn the handsignaller protecting the employees by using a hooter, a whistle or an agreed handsignal.

5 When you are in a safe place, acknowledge the whistle from an approaching train by facing the driver and displaying an **all clear** handsignal.

6 DO NOT do any other type of work.

■ ■ ■ **Warning:**

An additional handsignaller is prohibited from using a **two-way radio** to warn the handsignaller protecting employees when a train approaches.

employees being protected

1 When warned of the approaching train by the handsignaller, move with any equipment to a safe place.

2 Remain in the safe place and maintain observation of the train, if possible until the train has passed.

3 If the safe place is within 2.5 metres of the nearest rail, cease all activity and discussion until the train has passed.

4 When the train has passed, check that the handsignaller is giving no other warning before resuming work.

General requirements for protecting engineering work which requires trains to slow down or stop

General requirements [a]

■ When engineering work is being carried out **and**:

either all employees in a **working party cannot be satisfactorily warned** about approaching trains

or approaching trains will need to slow down or stop in order to ensure the safety of people or equipment on or about the line or to allow trains to travel safely over track which has been disturbed during repairs,

the worksite must be protected:

either by positioning handsignallers

or by erecting temporary track protection boards.

■ The worksite supervisor must determine which method of protection is to be used to protect the worksite by calculating the distance of the worksite from the nearest interlocking:

when the worksite is within an interlocking or less than 1000 metres past the starting or home/starting signal and the worksite will be protected using handsignallers, the procedures as shown in SWU 914 must be carried out

when the worksite is more than 1000 metres but less than 2500 metres past the starting or home/starting signal and the worksite will be protected using handsignallers, the procedures as shown in SWU 915 must be carried out

when the worksite is more than 2500 metres past the starting or home/starting signal and the worksite will be protected using handsignallers, the procedures as shown in SWU 916 must be carried out

when there are multiple worksites and the normal protection arrangements would overlap, the procedures as shown in SWU 917 must be carried out

when a worksite is being protected using temporary track protection boards, the procedures as shown in SWU 918 must be carried out.

■ When trains can approach from more than one direction, the worksite supervisor may use more than one method of protection.

■ Before the work is commenced, the worksite supervisor must:

obtain train running information, where required

and arrange for the protection to be in position.

Note: The general requirements in this unit apply to all engineering work which requires trains to slow down or stop.

Examples of work which requires trains to slow down or stop [b]

Listed below are some examples of the work that can be carried out under this procedure:

- the use of noisy machinery which makes it difficult to hear audible warnings
- work in tunnels or beside retaining walls where employees cannot get clear of the line
- working track vehicles in a defined worksite
- the use of machines on or about the line to widen cuttings or clear drains
- manual maintenance work which obstructs the line or severely alters the line geometry
- removal of multiple sleepers or fastenings, making the line unsafe for normal speed
- certain types of building construction or bridge maintenance near the line which is likely to foul structure gauge
- certain types of signalling maintenance work
- overhead wiring maintenance work.

Note: This is not a complete list. It is only a guide to assist employees in determining the level of protection required.

Advising employees about worksites where trains are required to slow down or stop [c]

■ Before work begins at a worksite where trains are required to slow down or stop, the worksite supervisor must advise details of the work to the signaller or, at an unattended location, the train controller. Some of the reasons this must be done are:

- so that a track vehicle not connected with a worksite will not be placed on the line within a protected worksite without the operator being aware of the worksite

- so that train controllers and signallers will be aware of worksites if trains are required to run in the wrong running direction in an emergency (in these circumstances, arrangements should be made to warn engineering employees so that protection can be provided in both directions)
- so that train controllers and signallers can advise worksite supervisors of the details of other worksites in a section to avoid overlapping protection or the possibility of an accident
- so that engineering employees can be contacted quickly to render assistance if required in an emergency.

To ensure that employees are aware of worksites where trains are required to slow down or stop [d]

worksite supervisor 1 Before starting work, contact the signaller controlling the entry of trains into the section or, at an unattended location, the train controller, and provide the following information:

the line on which the worksite is located

the locations (in kilometres) where a worksite begins and ends

the method of protection to be used

the type of work and whether any track vehicles are involved

when the work will start

when the work will be finished

the worksite supervisor's name or, when multiple worksites are involved, the worksite co-ordinator's name.

signaller 1 Record all information about the engineering work supplied by the worksite supervisor in the train register book or other recording system provided.

2 Inform the train controller of all details of the work.

train controller Record all information about engineering worksites on the train control diagram or other recording system provided.

Worksite supervisors' duties to be carried out before allowing trains to pass the inner handsignaller [e]

■ Before authorising an inner handsignaller to allow a train to approach the worksite, the worksite supervisor must at all times:

advise all employees in the work party that a train is approaching and to move with any equipment to a safe place

and ensure that the line is clear and safe for the passage of the train through the worksite.

■ When authorising the train to proceed, the worksite supervisor must advise the inner handsignaller of the speed at which the train is to proceed through the worksite.

■ As the train approaches, the worksite supervisor must ensure that all employees and equipment are still in a safe place, and then display an **all clear** handsignal.

■ When the train has passed, the worksite supervisor must:

where possible, advise the driver that the train is clear of the worksite

and advise the employees at the worksite whether or not they can resume work.

Table of duties for the inner handsignaller when authorising trains to proceed towards a worksite [f]

■ An employee carrying out the duties of an inner handsignaller must not allow a train to pass their location until authorised by the worksite supervisor.

■ When authorised by the worksite supervisor to allow trains to proceed, the inner handsignaller must carry out one of the following procedures according to:

where the inner handsignaller is located

and the speed at which the train must proceed.

	Inner handsignaller at 500 metres (no stop board):
normal speed	• remove any unexploded detonators • display an all right handsignal.
caution	• remove any unexploded detonators • display a **caution** handsignal.
less than 25 km/h	• do not remove detonators • continue to display a **stop** handsignal • when the train stops, inform the driver of the speed at which to travel through the worksite • display a **caution** handsignal
	Inner handsignaller at a staff hut (no starting signal provided):
normal speed	• remove any unexploded detonators • display an **all right** handsignal.
caution	• remove any unexploded detonators • display a **caution** handsignal.
less than 25 km/h	• do not remove detonators • continue to display a **stop** handsignal • when the train stops, inform the driver of the speed at which to travel through the worksite • display a **caution** handsignal
	Inner handsignaller at a fixed signal:
normal speed	• remove any unexploded detonators • ask the signaller to clear the signal • when the signal clears, display an **all right** handsignal.
caution	• continue to display a **stop** handsignal • when the train stops, inform the driver of the location of the worksite • remove any unexploded detonators • ask the signaller to clear the signal • when the signal clears, display a **caution** handsignal.
less than 25 km/h	• display a **stop** handsignal • when the train stops, inform the driver of the location of the worksite and of the speed at which to travel through the worksite • remove any unexploded detonators • ask the signaller to clear the signal • when the signal clears, display a **caution** handsignal.

Additional procedures
when a tunnel or other location restricts visibility [g]

■ When a tunnel or other location does not allow drivers a clear view of handsignallers, the following procedures must be carried out **before the work commences:**

worksite supervisor

	If a tunnel is located at the distances where either handsignaller is to be positioned:		**When** some other location obstructs the driver's view of either handsignaller:
1	Depending on the location of the tunnel, instruct either the inner or the outer handsignaller to proceed beyond the tunnel.	1	Depending on which handsignaller is affected, instruct either the inner or the outer handsignaller to proceed to a location where they can be clearly seen by the driver.
2	If the inner handsignaller is to proceed beyond the tunnel, position an additional handsignaller on the worksite side of the tunnel, where required..	2	Instruct the affected handsignaller not to proceed **more than 500 metres** beyond the required minimum distance for protecting worksites.
3	Instruct the inner handsignaller to inform the driver of the location of the additional handsignaller protecting the worksite. ■ The inner handsignaller and the additional handsignaller must not allow a train to proceed until authorised by the worksite supervisor.	3	Instruct the inner handsignaller not to proceed **more than 1000 metres, or** the outer handsignaller not to proceed **more than 3000 metres,** from the worksite.

■ ■ ■ Warning:

The **minimum** distance between the inner handsignaller and the outer handsignaller **must not** be less than 2000 metres.

Employees' duties at worksites [h]

■ Whenever the worksite supervisor advises that a train is approaching, all employees at a worksite must:

move with any equipment to a safe place

and remain in the safe place.

■ To prevent accidents and misunderstandings, if the safe place is within 2.5 metres of the nearest rail, employees must cease all activity and discussion until the train has passed.

■ All employees must obtain permission from the worksite supervisor before resuming work.

Protecting an engineering worksite which is within an interlocking or less than 1000 metres past the starting or home/starting signal

Protecting a worksite at an attended interlocking [a]

■ The procedures in this unit must not be used for distant signals which cannot display a stop indication.

■ When any work (including the operation of track vehicles within a worksite) is being carried out within an attended interlocking or less than 1000 metres past the starting or home/starting signal and the work will require trains to slow down or stop, the worksite supervisor and the signaller must confer and arrange to protect the worksite using the controlled signal on the approach side of the worksite.

■ When this method is used:

either a handsignaller

or, if the worksite is in an area where temporary worksite protection boards can be used, a stop board

must be positioned at the signal being maintained at stop to protect the worksite.

■ The signaller must not clear the signal protecting the worksite until authorised by the handsignaller.

■ The handsignaller must not authorise the signaller to clear the signal until:

the driver has been advised of the location of the worksite

and the worksite supervisor has authorised the train to proceed.

■ The handsignaller must regularly check the signal to ensure that the signal is displaying a stop indication and, if the signal is cleared without being authorised, the handsignaller must immediately request the signaller to return the signal to stop and report the incident to the worksite supervisor.

■ Where there is more than one signal which can allow a train to approach the worksite as there is more than one line involved, a handsignaller must be positioned at each signal. However, if there is a signal which will give access to the worksite from a dead-end siding and the siding is empty, it will not be necessary to position a handsignaller at that signal.

■ When a starting or home/starting signal is not provided, the worksite supervisor must contact the signaller and establish where to place the handsignaller. The signaller must inform the drivers of all trains travelling towards the handsignaller of the handsignaller's location, and that the drivers must stop their trains at that location. The handsignaller must carry out the duties as shown at [f] in SWU 913.

■ ■ ■ **Warning:**

In signalboxes which are provided with Automatic signal operation buttons (or "A" buttons), the signaller must ensure that:

the automatic signal operation button (or "A" button) is cancelled

the signal is returned to the stop position

and a blocking facility is applied to the lever controlling the signal

before authorising the work to commence.

In areas where Emergency signal replacement buttons (or "E" buttons) are provided to control semi-automatic signals, these signals may also be used to protect a worksite. The locations where emergency signal replacement buttons are provided are shown in the Local Appendix.

In signalboxes which are provided with Emergency signal replacement buttons (or "E" buttons), the signaller must ensure that:

the emergency signal replacement button (or "E button) is cancelled

the signal is returned to the stop position

and a blocking facility is applied to the lever controlling the signal

before authorising the work to commence.

To protect the worksite [b]

worksite supervisor

When work is to be carried out within an interlocking or less than 1000 metres past the starting or home/starting signal:

1 Confer with the signaller and establish which signal will be used to protect the worksite. (This will depend on the location of the worksite.)

2 Position a handsignaller at the signal which will be used to protect the worksite.

3 Inform the signaller when the handsignaller is in position and arrange for the signal to be kept at stop with blocking facilities applied to the lever controlling that signal.

signaller

When advised that work is to be carried out within your interlocking or less than 1000 metres past the starting or home/starting signal:

1 Discuss and confirm the working to be adopted and establish the exact location of the worksite and decide at which signal the handsignaller is to be positioned.

2 Assure the worksite supervisor that, when you are advised that the handsignaller is at the signal, you will keep the signal at stop with blocking facilities applied.

3 Record all details (including the name of the handsignaller, and the number of the signal at which the handsignaller is positioned) in the train register book or other recording system provided.

4 When advised that the handsignaller is in position:

establish that the handsignaller is at the correct signal

place the signal at stop

and apply blocking facilities.

handsignaller

1 Contact the signaller and confirm the arrangements made by the worksite supervisor.

2 Establish that you are at the correct signal and check the signal to ensure that it is at stop.

3 Obtain an assurance that the signal protecting the worksite will be kept at stop with blocking facilities applied.

4 Fix 3 detonators to the line on the worksite side of the signal. If the worksite is too close to the signal, place the detonators on the approach side of the signal.

5 Stand at the signal and display a stop handsignal.

To work trains through the worksite [c]

signaller

1 When requested by the handsignaller to allow the train to proceed, clear the signal.

2 When the train has passed the signal, return the signal to stop and re-apply blocking facilities.

handsignaller

1 When the train stops at the signal, advise the driver of:

the location of the worksite

and the speed at which the train can travel over the worksite.

2 If a train arrives at the signal and the worksite supervisor has not authorised the train to proceed, DO NOT allow the train to pass your location until authorised.

3 When you are authorised by the worksite supervisor to allow the train to proceed, carry out the appropriate procedure as shown in the table at [f] in SWU 913.

4 When the train has passed, contact the signaller and obtain an assurance that the signal protecting the worksite has been returned to stop and will be kept at stop.

5 Repeat steps 1 to 4 for each train.

Additional requirements when there are two worksites on different lines protected by the same signal [d]

- When there are two lines and each line has a worksite which is being protected by the same signal, the worksite supervisors in charge of each worksite must confer and appoint one handsignaller to protect both worksites.
- When a train is required to travel over one of the lines, the handsignaller must contact the signaller and establish over which line the train is to travel.
- After establishing over which line the train will travel, the handsignaller must contact the worksite supervisor for that worksite and obtain permission to allow the train to proceed.

Additional requirements when the worksite is less than 200 metres past the signal protecting the worksite [e]

- When the worksite is less than 200 metres past the controlled signal protecting the worksite, the worksite supervisor must arrange for the handsignaller to be positioned at the signal before the signal immediately protecting the worksite.

If a controlled signal in the rear is not provided, the handsignaller is to place the detonator protection on the approach side of the signal immediately protecting the worksite.

Special requirements to be carried out between Maitland and Casino and between Muswellbrook and Werris Creek South [f]

■ When the worksite is within an interlocking or less than 1000 metres past the starting or home/starting signal between Maitland and Casino and between Muswellbrook and Werris Creek South, the local control panel at the location where the work will be carried out must be switched to "local control".

■ The signaller at the local control panel must ensure that blocking facilities are applied to prevent the signals protecting the work from being cleared.

Protecting a worksite at an unattended interlocking where the Electric Staff or Staff and Ticket system is in use [g]

■ When the signalbox or staff station is unattended in areas where the Electric Staff or Staff and Ticket system of safeworking is in use:

either possession of the interlocking may be obtained as shown in the track possession section of this manual

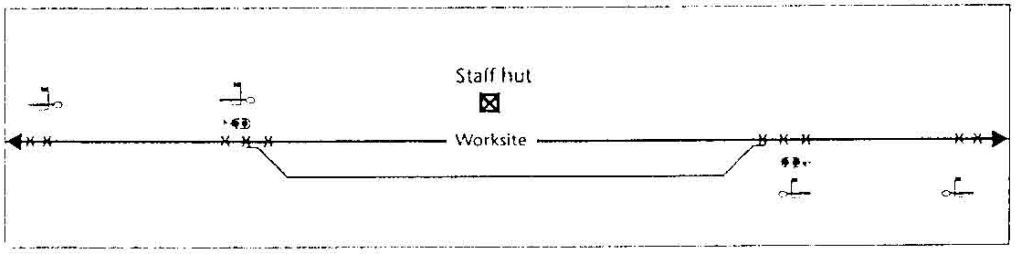
or the worksite may be protected by handsignallers.

When handsignallers are used to protect the worksite, the worksite supervisor must position:

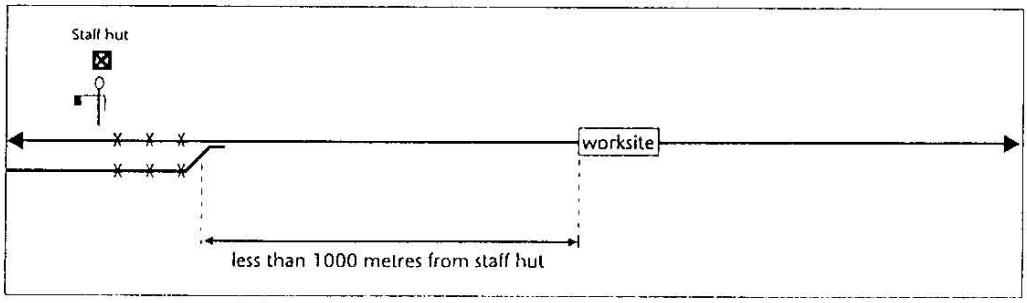
an inner handsignaller at the home signals at each end of the interlocking, or at 500 metres from the worksite(whichever is the greater)

and an outer handsignaller 2000 metres from each inner handsignaller

as shown in the following diagram:



or If the worksite is located outside the home signal but less than 1000 metres from the staff hut or signalbox, arrange for a handsignaller to be positioned at the staff hut or signalbox as shown in the following diagram, and for the opposite side of the worksite to be protected as shown in SWU 916.



handsignaller at the staff hut or signalbox

When instructed by the worksite supervisor:

1 Take up a position next to the staff hut or signalbox.

2 Fix 3 detonators to the main and loop lines on the worksite side of the staff hut or signalbox.

3 Stand at the staff hut or signalbox and display a stop handsignal.

To work trains through the worksite [h]

handsignaller

1 When the train stops, advise the driver of:

the location of the worksite

and the speed at which the train can travel over the worksite.

2 If a train arrives and the worksite supervisor has not authorised the train to proceed, DO NOT allow the train to pass your location until authorised **unless** the train is not obtaining a staff for the section ahead.

3 When you are authorised by the worksite supervisor to allow the train to proceed, carry out the appropriate procedure as shown in the table at [f] in SWU 913.

4 When the train has passed, replace the detonators and display a stop handsignal.

5 Repeat steps 1 to 4 for each train.

To resume normal working [i]

worksite supervisor

When all aspects of each discipline's work have been completed and the line is safe for normal traffic:

1 Arrange for the handsignallers to stop protecting the worksite.

2 Inform the signaller or, at an unattended location, the train controller:

that the work has been completed

that the line is safe for normal traffic

and of any other special conditions (e.g. speed restrictions, etc.).

handsignaller(s)

When you are advised that the work has been completed, remove any unexploded detonators from the line and cease handsignalling duties.

Engineering work which affects track circuits

Effect of engineering work upon track circuits [a]

A track circuit is an electrical circuit which uses the rails as a conductor to carry the electrical current.

The track circuits are used to:

detect the presence of a train on the tracks

and control the operation of signals, points and automatic road and pedestrian level crossings.

■ ■ ■ Warning:

When the line is cut or a mechanical rail joint is broken in a track-circuited area for any reason, such as:

the installation of mechanical rail joints

the installation or repairs to insulated rail joints

the replacement of a length of rail

thermit welding

rail adjustment,

the operation of the track circuits will be affected and this will affect the signalling system.

areas where track-circuiting is provided

In some safeworking systems, the running lines are track-circuited throughout. However, in other safeworking systems, only small portions of the running line may be track-circuited.

The safeworking systems in which the running lines are track-circuited throughout are:

Double Line Track Block

Double Line Automatic

Double Line Track Control

Single Line Track Block

Single Line Track Control (where axle counters are not provided).

The safeworking systems in which small portions of the running line may be track-circuited are:

Single Line Track Control (where axle counters are provided)

Block Telegraph (some interlockings may be partially track-circuited)

Electric Staff and Staff and Ticket sections where automatic crossing loops are provided (the line is track-circuited between the landmark or distant signals which are located at each end of the interlocking).

Some Electric Staff locations may also be track-circuited between the landmark or distant signal and the home signal. This is to prevent a staff being withdrawn from the staff instrument in the rear while a train is occupying the line between the landmark or distant signal and the home signal at the staff location in advance.

automatic level crossings

In all systems, "F" type automatic road and pedestrian level crossings with warning equipment are controlled by track circuits.

■ When any work is carried out which will affect the operation of an automatic road or pedestrian level crossing, the crossing must be protected as shown in the level crossing section of the "Emergencies and special working of trains" manual.

Effect of engineering work upon the traction return current [b]

In electrified areas, the traction return current is the electric train current which is carried through the rails back to the substations.

When a rail joint is broken or the line is cut **in an electrified area**, in addition to the track circuits being affected, the traction return current path may also be affected.

If special precautions are not carried out to provide an alternative path for the traction return current, **a dangerous voltage may occur across the rail gaps.**

Where non track-circuited electrified lines or sidings are involved, possession of the line should be obtained and the normal bonding and planning arrangements must apply.

■ ■ ■ Warning:

Electrical cables which connect rails to a substation or sectioning hut must not be disconnected until the matter has been referred to the District Electrical Engineer to ensure that safe procedures are followed. In addition, sections of rail connected to these cables must not be separated from other rail lines. If they are disconnected, they could develop a dangerous voltage by still being connected to the substation or sectioning hut.

■ Broken or disconnected electrical cables which connect rails to a substation or sectioning hut must be reported to the Electrical Systems Operator.

Using permanent rail bonds to provide a path for the traction return current [c]

A permanent rail bond is an electrical cable permanently connected to the rails around a mechanical joint in order to provide continuity of the track circuit. In the electrified area, permanent rail bonds also provide a low resistance path for the traction return current through the rails to the substations.

■ When it is not possible for a signals engineering employee to fix a permanent rail bond around a mechanical joint at the time of installation or repair, a temporary rail bond may be used.

■ When a temporary rail bond is installed, the employee who installed it must promptly notify the District Signals Engineer who must then arrange for a permanent rail bond to be installed.

Using temporary rail bonds to provide an alternative path for the traction return current [d]

Temporary rail bonds are electrical cables with a clamp fitted to each end. They can only be used:

to provide an alternative path for the traction current to return to the substation in order to prevent a dangerous voltage occurring across the rail ends after they have been cut

and, in electrified areas, to place the signals protecting the worksite at stop

or, in non-electrified areas, to ensure that the signals keep operating after the rail is cut.

■ ■ ■ **Warning:**

When, in electrified areas:

the line is to be cut

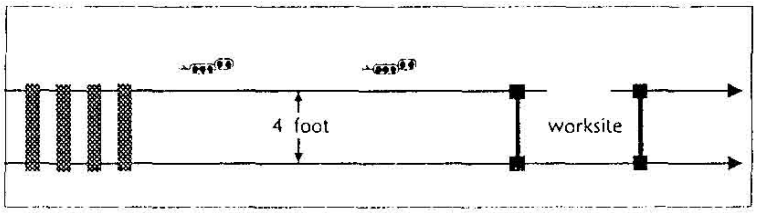
or a permanent rail bond at a mechanical joint is to be removed,

an alternative path for the traction return current must be provided, where required, before the work commences.

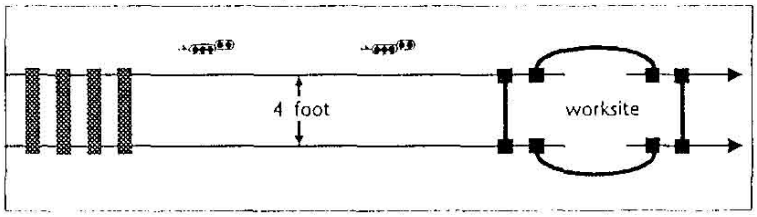
Temporary rail bonds are supplied by the District Signals Engineer and can only be used when authorised by the District Signals Engineer or an authorised representative of the District Signals Engineer.

■ Temporary rail bonds must only be used by employees certified in the use of temporary rail bonds.

If only one rail is to be cut or broken, the bonds must be attached, bridging the rails across the four foot on each side of the break, as shown in the following diagram:



If both rails of one line of multiple lines are to be cut owing to a misalignment and the opening is less than 1 metre, or fishplates with traction bonds on both rails of one line are to be removed, the bonds must be attached around the break and across the four foot, as shown in the following diagram:



Work which requires a signal electrician [e]

A signal electrician must be provided when:

- a length of rail which is more than 6 metres in length is being replaced

  or the traction return bonding is beyond the skill level of the civil engineering staff

  or the work involves insulated rail joints

  or work is being carried out where temporary rail bonds will not maintain shunting signals at stop

  or new mechanical joints are being installed (unless the use of temporary rail bonds has been approved)

  or any electrical connections to the line are affected

  or rail bonds around a mechanical joint are affected (unless the use of temporary rail bonds has been approved)

- or for any type of work which will affect the track circuits in Single Line Track Block and Single Line Track Control areas which are electrified

- or for any type of work which will affect the controlled or automatic signals within a track-circuited interlocking, regardless of whether the interlocking is attended or unattended, unless otherwise directed by the District Signals Engineer.

Planning requirements [f]

advice of work

■ Before any work is carried out which will affect the track circuits, the local Civil Engineering Manager must arrange for written advice to be given to the District Signals Engineer in time to enable the District Signals Engineer to decide whether or not a signal electrician will be required to attend the worksite. This advice must state the type of work to be carried out, the exact location (in kilometres), and the line and section.

■ When the written advice provided by the District Signals Engineer to the local civil engineer states that a signal electrician will be provided, the signal electrician must disconnect the signals which would normally be placed at stop if the track was occupied by a train, or any other signal which may give access to the worksite.

work arrangements

- When advised that the work will affect the track circuits, the District Signals Engineer (or delegated representative) must supply written advice to the local Civil Engineering Manager stating:

  either that a signal electrician will be provided to make alternative traction return current arrangements, and to place the signal(s) that protects the worksite at stop

  or that temporary rail bonds can be fixed.

- In all areas, the advice must include:

  the signal identification numbers and locations which will be affected

  whether the signals are controlled or automatic signals

  whether any tonneage signals, semi-automatic signals or signals which protect slip sites are affected by the work

  and whether any automatic level or pedestrian crossing will be affected.

- If a tonneage signal is affected, the advice must also state which signal controls the full clear indication of the tonneage signal.

- When the worksite is 500 metres or less past an automatic signal and only one signal would be placed at stop by the normal bonding arrangements, this written advice must also state where additional bonds are to be fixed to ensure that 2 signals are placed at stop.

- If signals are being maintained at stop to protect the worksite and the signal telephones are not working correctly or are not provided, the worksite supervisor must arrange for an alternative communication system to be provided, e.g. two-way radios or mobile telephones.

- Possession of the line must be obtained to carry out the work if the signal telephones are not operating correctly and an alternative communication system cannot be provided.

emergency work

- When, owing to an emergency, it is necessary to carry out any type of work which would affect the normal operation of the track circuits (such as a piece of rail broken from the head of a rail or a misalignment which would require both rails to be cut), the planning requirements may be dispensed with.

■ ■ ■ Warning:

Regardless of the urgency of repairs, in electrified areas it is vital that the worksite supervisor contacts either the District Signals Engineer, the signal electrician, the Signal System Controller or the District Electrical Engineer to obtain advice on temporary rail bonding so that an alternative path for the traction return current can be provided before the work commences.

Compiling an SWF.SA.4.300 "Civil or signalling equipment booked out of use or restored to use" form [g]

■ An SWF.SA.4.300 "Civil or signalling equipment booked out of use or restored to use" form must be compiled as shown in SWU 118 in the "Basic safeworking" manual **when:**

either any type of signal is affected and an electrician is provided to book out the affected signal(s)

or when a controlled signal is affected and no signal electrician is provided.

Work which affects tonneage signals [h]

■ When a tonneage signal is either placed at stop or caution by the work, in addition to any other handsignallers required, a handsignaller must be placed at the tonneage signal, and a clearance handsignaller must also be provided at the signal which controls the full clear indication of the tonneage signal.

Depending on the location of the tonneage signal, the signal which controls the clear indication of the tonneage signal may be up to 3 signals ahead of the tonneage signal.

■ If a train over the prescribed load stops at a tonneage signal, the handsignaller must advise the worksite supervisor of the circumstances.

■ Before allowing the train to proceed, the worksite supervisor must ensure that:

the line is unoccupied to the clearance handsignaller

the worksite is safe for the train to proceed

all other handsignallers have removed their detonators

and that all employees are in a safe place.

Additional instructions if the work affects a semi-automatic signal [i]

- When any signal being used to protect the work is fitted with an illuminated letter "A" and the "A" light goes out while the work is in progress, the handsignaller must immediately inform the worksite supervisor who must contact the controlling signaller.
- If a signalbox has been switched in, the signal will become a controlled signal and the handsignaller must also obtain permission from the signaller before allowing the train to proceed.
- If a signalbox has not been switched in or the signal is protecting an intermediate siding, the worksite supervisor must arrange for the handsignaller to have any facing points secured with a point clip and SL lock and then contact the signaller before allowing a train to pass the signal.

Work which affects signals that protect a slip site [j]

- When any signal being used to protect the work is fitted with an instruction plate stating that the signal protects a slip site, the handsignaller must also contact the signaller and obtain permission before allowing a train to pass the signal.

Work which affects automatic signals in electrified areas - Double lines only

General requirements [a]

■ In Double Line Automatic and Double Line Track Control sections, before carrying out any work as shown at [a] in SWU 920, an alternative path for the traction return current must be provided and the signal(s) protecting the worksite must be kept at stop until the work has been completed.

■ If a controlled signal will also be placed at stop by the work, the procedures as shown in SWU 921 must be followed for the controlled signal only.

use of signal electrician

■ If the work to be carried out requires a signal electrician, the worksite supervisor must not break the joint or cut the rail until the signals engineering representative has provided an alternative path for the traction return current and has disconnected the affected signal(s).

use of temporary rail bonds

■ If the work to be carried out does not require a signal electrician to be in attendance and the worksite supervisor has been issued an advice which states that temporary rail bonds can be fixed, the worksite supervisor must apply temporary rail bonds:

to provide an alternative path for the traction return current

to place the signal(s) immediately protecting the worksite at stop

and, where the worksite is within 500 metres of a signal and only one signal would be placed at stop by the normal bonding arrangements, to ensure that two signals are placed at stop by applying additional rail bonds.

■ The worksite supervisor must not allow the rail joint to be broken or the line to be cut until the temporary rail bonds have been fixed to the rail.

■ The temporary rail bonds must not be removed until the work is completed.

use of handsignallers

Depending on the location of the worksite, 1, 2 or even 3 signals may be placed at stop when the temporary rail bonds are applied.

■ A handsignaller(s) must be positioned at each affected signal(s) in order to advance trains through the worksite.

■ If the worksite is more than 500 metres past the signal which is immediately protecting the worksite, an inner handsignaller must be located not less than 500 metres from the worksite.

■ If the worksite supervisor cannot see that the line is unoccupied to the first signal beyond the worksite, a handsignaller must be positioned at that signal in order to report the clearance of trains past the signal.

■ When a length of rail over 6 metres in length has been installed and no trains are scheduled to run for an extended period of time after the work is completed, the handsignallers may be removed from the affected signals.

■ When the handsignallers are to be removed from the affected signals, the worksite supervisor must:

inform the signaller that the handsignallers are being removed, but the signals are not yet certified in working order

and that block working is to be introduced.

■ The signaller must maintain block working (as shown in SWU 215 in the "Safeworking systems on track-circuited lines" manual) for each train to travel through the section **until** the signal electrician has certified that the signals are in working order.

warning drivers

■ The signaller controlling the entrance to the affected section must give verbal advice about which signal(s) is affected to the driver of each train to travel through the section.

train running information

■ When working as train margins permit, the worksite supervisor must regularly check the train running information so that each stage of the work can be carried out without causing delays to the train service.

To protect the worksite [b]

worksite supervisor

1 Inform the signallers at both ends of the section about all details of the work.

2 If a signal electrician is provided, or if the use of temporary rail bonds has been approved, establish which signal(s) will be affected. (If the use of temporary rail bonds has been approved, do this by checking the advice from the District Signals Engineer or delegated representative.)

3 Advise the signaller controlling the entrance to the section which signals will be affected.

p 2

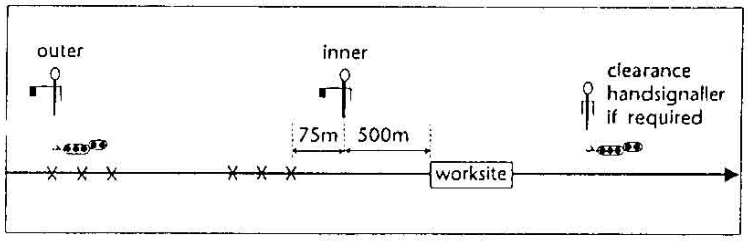
4 **If only 1 signal** will be placed at stop by the work:

position an inner handsignaller 500 metres from the worksite

and position an outer handsignaller at the affected signal

and, if required, position a clearance handsignaller at the first signal beyond the worksite

as shown in the following diagram:



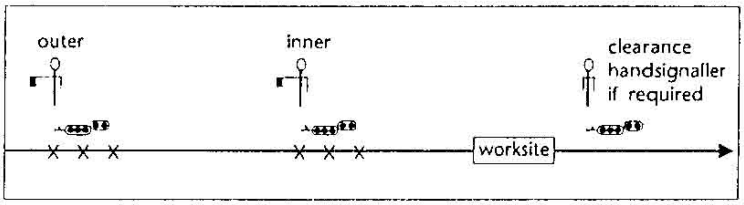
or **If 2 or more signals** will be placed at stop by the work:

position an inner handsignaller at the signal which is directly protecting the worksite

and position an outer handsignaller at each other affected signal

and, if required, position a clearance handsignaller at the first signal beyond the worksite

as shown in the following diagram:



5 Ensure that telephone or two-way radio communications are working correctly between all handsignallers and yourself. If the communication is not working correctly, DO NOT commence work.

To place the affected signal(s) to stop [c]

worksite supervisor

1 Establish that there is no train closely approaching the worksite and that there is time to complete the first stage of the work before the next train arrives.

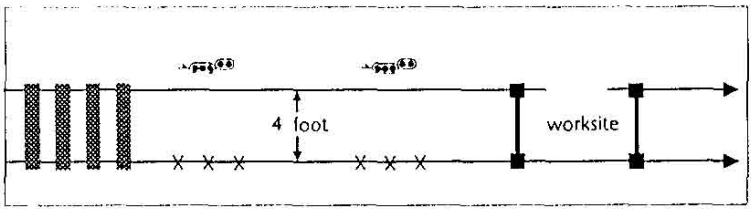
2 If a signal electrician is provided, ask the signal electrician:

to place the signal(s) protecting the worksite to stop

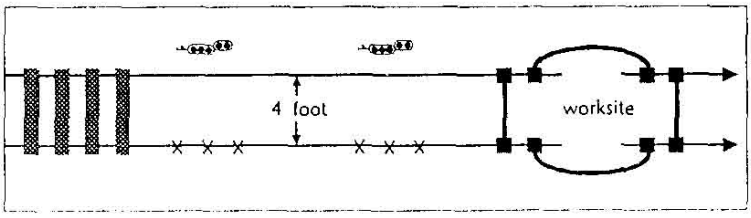
and to provide an alternative path for the traction return current

or If a signal electrician is **not** provided and the use of temporary rail bonds has been authorised, arrange for the temporary rail bonds to be attached as follows:

if only one rail is to be cut or broken, attach the bonds bridging the rails **across** the four foot on each side of the break, as shown in the following diagram:



if both rails of one line of multiple lines are to be cut due to a misalignment and the opening is less than 1 metre, or fishplates with traction bonds on both rails of one line are to be removed, the bonds must be attached **around** the break and **across** the four foot, as shown in the following diagram:



3 Contact the handsignaller(s) and ensure that the signal(s) protecting the worksite is at stop.

signal electrician

1 Provide an alternative path for the traction return current and disconnect the affected signal(s).

2 Inform the signaller which signal(s) has been placed at stop.

signaller

When informed by the worksite supervisor or signal electrician of the work to be done and which signal(s) has been placed at stop:

1 Record all details of the work in the train register book or other recording system provided.

2 Advise the train controller of all details.

To authorise a train to travel through the worksite [d]

worksite supervisor

When a train approaches the inner handsignaller:

1 Ensure that all employees in the work party have moved to a safe place. If a safe place is within 2.5 metres of the line, cease all activity and discussion.

2 Ensure that it is safe for the train to proceed through the worksite.

3 Establish that the line is unoccupied from the inner handsignaller to the first signal beyond the worksite and authorise the inner handsignaller to advance the train at the required speed.

When the train has passed:

4 Continue with the work as train running permits, repeating steps 1 to 3 as each train approaches.

5 Make regular checks to ensure that the signal(s) protecting the worksite remains at stop.

outer handsignaller

1 When directed by the worksite supervisor, proceed to the affected signal.

2 When you arrive, check that communication is working with the inner handsignaller.

When the signal is placed at stop:

3 Notify the worksite supervisor, place 3 detonators on the worksite side of the signal, and display a **stop** handsignal to approaching trains from the base of the signal.

When a train arrives:

4 Contact the inner handsignaller and establish that the line is unoccupied to that location.

5 **If** the line is **occupied**:

continue displaying a **stop** handsignal to the driver

or **If** the line is **unoccupied**:

advise the driver of the location of the inner handsignaller

remove all detonators

and display a **green caution** handsignal to the driver as the authority to proceed to the inner handsignaller.

6 Check that the signal remains at stop for the duration of the work.

inner handsignaller

1 When instructed by the worksite supervisor, proceed to either the signal directly protecting the worksite **or** the 500 metres location, as directed by the worksite supervisor.

2 When you arrive at your location, check that communication is working with the outer handsignaller and with the worksite supervisor.

3 **If** you are located at a signal:

notify the worksite supervisor as soon as the signal is placed at stop

fix 3 detonators to the line on the worksite side of the signal with the first detonator next to the signal

and display a **stop** handsignal to approaching trains from the base of the signal

or **If** you are located at the 500 metres location:

fix 3 detonators to the line

and display a **stop** handsignal to approaching trains.

4 Ensure that the line is unoccupied between the outer handsignaller and your location before authorising the train to approach.

5 DO NOT allow any train to pass your location until the worksite supervisor advises:

that the worksite has been made safe for the passage of the train at the required speed

and that the line is unoccupied to the first signal past the worksite.

When authorised by the worksite supervisor to allow the train to proceed:

6 Advise the driver of the location of the worksite and of the speed at which the train must travel through the worksite.

7 Remove any unexploded detonators and authorise the driver to proceed by displaying a **caution** handsignal.

8 When the train has passed, replace the 3 detonators and continue to display a **stop** handsignal.

9 Check that the signal remains at stop for the duration of the work.

clearance handsignaller

1 When instructed by the worksite supervisor, proceed to the first signal beyond the worksite.

2 When you arrive, check that communication with the worksite supervisor is working.

3 Inform the worksite supervisor after each train has passed your signal.

Additional procedures to be carried out if a protecting signal clears during the work [e]

inner and outer handsignallers

If the signal **clears** and you have not been advised that the work has been completed:

notify the worksite supervisor immediately

continue to display a **stop** signal

and continue to monitor the signal.

worksite supervisor

When your are informed that a protecting signal has cleared before the work is finished:

1 Immediately check and ensure that the handsignallers are displaying a stop handsignal.

2 Re-apply the temporary rail bonds and, if available, apply an additional temporary rail bond.

3 Check with the handsignallers and establish that the signal(s) has returned to stop.

4 If the signal(s) has returned to stop, continue the work.

5 If the signal(s) has NOT returned to stop, immediately arrange to protect the worksite as shown in SWU 911 and inform the nearest signaller.

■ ■ ■ **Warning:**

DO NOT allow any train to pass over the worksite until the signal electrician certifies that it is safe to do so **because a dangerous voltage may occur across the rail gaps.**

signaller 1 Try to stop all trains entering the section or any train that may be in the section from travelling over the affected portion of line.

2 Inform the train controller of the circumstances, and then arrange for the signal electrician to attend.

To restore the affected signal(s) to normal [f]

worksite supervisor

When the work is completed:

1 If a signal electrician is provided:

advise the signal electrician that the work has been completed **and** ask the signal electrician to re-connect the affected signal(s)

or If you applied temporary rail bonds:

remove the temporary rail bonds.

2 Contact the handsignaller(s) positioned at the affected signal(s) to establish whether the signal(s) is displaying a clear indication.

3 If the signal(s) is displaying a clear indication:

instruct the handsignaller(s) to pick up any unexploded detonators and return to the worksite

or If the signal(s) is not displaying a clear indication:

instruct the handsignaller(s) to stay at the affected signal(s)

and notify the signal electrician.

4 When the signal(s) is in working order, inform the signaller controlling the entrance to the section:

of your name

that the work has been completed

that the line is safe for traffic

and that the signalling equipment is working correctly.

signal electrician When informed by the worksite supervisor that the work has been completed, test the track circuits and re-connect the affected signal(s).

signaller When you are informed by the worksite supervisor that the work is completed and the signal(s) is in working order, inform the train controller and record all details in the train register book or other recording system provided.