RAIL SAFETY INVESTIGATION REPORT

TRACK WORKER INJURED BY HI-RAIL EXCAVATOR SANDGATE RAIL FLYOVER PROJECT

7 NOVEMBER 2006
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Established on 1 January 2004 by the Transport Administration Act 1988, and confirmed by amending legislation as an independent statutory office on 1 July 2005, OTSI is responsible for determining the causes and contributing factors of accidents and to make recommendations for the implementation of remedial safety action to prevent recurrence. Importantly, however, OTSI does not confine itself to the consideration of just those matters that caused or contributed to a particular accident; it also seeks to identify any transport safety matters which, if left unaddressed, might contribute to other accidents.

OTSI's investigations are conducted under powers conferred by the Rail Safety Act 2008 and the Passenger Transport Act 1990. OTSI investigators normally seek to obtain information cooperatively when conducting an accident investigation. However, where it is necessary to do so, OTSI investigators may exercise statutory powers to interview persons, enter premises and examine and retain physical and documentary evidence.

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Once OTSI has completed an investigation, its report is provided to the NSW Minister for Transport for tabling in Parliament. The Minister is required to table the report in both Houses of the NSW Parliament within seven days of receiving it. Following tabling, the report is published on OTSI's website at www.otsi.nsw.gov.au.

OTSI cannot compel any party to implement its recommendations and its investigative responsibilities do not extend to overseeing the implementation of recommendations it makes in its investigation reports. However, OTSI takes a close interest in the extent to which its recommendations have been accepted and acted upon. In addition, a mechanism exists through which OTSI is provided with formal advice by the Independent Transport Safety and Reliability Regulator (ITSRR) in relation to the status of actions taken by those parties to whom its recommendations are directed.
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EXECUTIVE SUMMARY

Incident Overview

At approximately 1:10pm on Tuesday 7 November 2006, a 24 year-old male track worker was preparing to weld a newly-laid section of rail in an area where new track was being commissioned when he was struck by a reversing Hi-rail excavator operated on behalf of John Holland Rail. The track worker was severely injured, requiring hospitalisation and emergency surgery.

Emergency Response

Witnesses and other workers in the area attended to the injured welder and he was subsequently conveyed by ambulance to Newcastle’s John Hunter Hospital where he underwent emergency surgery.

OTSI was notified of the occurrence and deployed an investigator to the site.

Findings

In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. Causation

The accident occurred because the welder and excavator operator were oblivious to each other’s presence on the track.

b. Contributory Factors

i. The welder was engaged in a task which required him to focus his entire attention on the track immediately to his front. His ability to see the approaching excavator was further restricted by the safety goggles he was required to wear, which limit peripheral vision.

ii. The welder’s ability to hear the approaching excavator would have been affected by the noise associated with the cutting and welding tasks he was performing, and the operation of trains on the adjacent lines.

The term “Hi-rail” describes vehicles which, in addition to being able to be operated on roads or cross-country, have been modified to allow them to operate on railway track.
iii. The nature of the task in which the excavator operator was engaged required him to focus in the opposite direction to that which the excavator was travelling and the angle of the cab, relative to the track, rendered the excavator’s rear vision mirror ineffective.

iv. The excavator operator was being assisted by a ‘spotter’ but the spotter’s attention was focussed on protecting rail traffic on an adjacent track, not on workers around the excavator.

v. The excavator was fitted with a warning beacon but it was ineffective because it was inoperable.

c. **Adequacy of Risk Planning**

The risks associated with the day’s tasking had been identified but the controls that had been specified to mitigate them were imprecise and therefore inadequate.

d. **Provision for and Adequacy of Safety Defences**

i. WorkCover NSW’s *Code of Practice for Moving Plant on Construction Sites, 2004* identifies that where heavy machinery and plant cannot be separated by time or space, particular controls or defences need to be in place to limit the prospect of injury; had such defences been in place, the excavator and welders would not have been permitted to operate in close proximity to each other.

ii. The excavator operator was late for work and consequently did not attend the safety briefing. However, even if he had, the safety controls that were identified during the briefing were imprecise and therefore inadequate, and as such, they did not constitute any form of barrier or defence.

e. **Emergency Actions and Response**

The actions of the welder’s co-workers were timely and effective, as were those of the attending ambulance officers.
Recommendations

The following recommendations apply to John Holland Rail and are designed to enhance rail safety in NSW:

a. Ensure that its construction activities in NSW comply fully with the requirements of WorkCover NSW’s *Moving Plant on Construction Sites - Code of Practice 2004*.

b. Audit worksite risk plans to ensure that proper risk assessments are being undertaken and that meaningful risk controls are being identified and applied.

c. Ensure that all heavy equipment that is employed on its worksites, or that it operates on worksites controlled by another entity, is fitted with appropriate warning devices and that these are operable.

d. Require that in every instance where its employees or its subcontractors are engaged in cutting or welding rail, and there is heavy machinery including rolling stock in proximity, that a spotter is tasked to support the welder or welding crew.
PART 1  FACTUAL INFORMATION

Accident Overview

1.1 At approximately 1:10pm on 7 November 2006, a 24 year-old male track worker was preparing to weld a newly-laid section of rail in an area where new track was being commissioned when he was struck and seriously injured by the Hi-rail excavator depicted in Photo 1. The excavator was being operated on behalf of John Holland Rail.

![Excavator Direction of Travel](image)

Photo 1: Hi-rail excavator

Before the Accident

1.2 The welder and the excavator driver were engaged in separate tasks associated with the construction of an additional flyover to provide improved rail traffic flow at Sandgate near Newcastle NSW. The excavator operator was filling the shoulders of newly-laid track with ballast and the welder was one of a crew of four engaged in cutting the rail in preparation for welding track panels together.
The Accident

1.3 The welding crew completed three welds without incident and were working on their fourth when the excavator approached. Although the welding crew was aware that an excavator was operating in the general area, they were unaware of its close proximity to them. The operator of the excavator was being assisted by a spotter but neither saw the welding crew and only became aware of its presence when other workers nearby shouted to alert them to the fact that the excavator had struck one of the welders.

1.4 The relative positions of the welder and the excavator immediately before the collision are depicted in Photo 2. One of the excavator’s wheels subsequently ran over the welder’s left arm forcing it into a 25mm gap which the welder had cut in preparation for joining the rail (refer to Photo 3). Although his arm was severely crushed in the process, had this gap not existed, the welder’s arm would most likely have been severed.

Photo 2: Relative positions of the excavator and the welder
Emergency Response

1.5 As soon as the excavator operator was alerted to the accident, he ceased reversing and drove forwards to free the welder. The welder was immediately attended to by his colleagues, including the excavator operator, and was subsequently transferred to Newcastle's John Hunter Hospital where he underwent surgery.
PART 2  ANALYSIS

Causal and Contributory Factors

2.1 Oxy cutting and welding tasks are associated with high temperatures and require those performing them to focus their attention entirely on what is immediately before them. In addition, welders are required to wear safety goggles to protect their eyes, but these restrict peripheral vision. Oxy cutting and welding tasks are also noisy which can further limit a welder’s situational awareness. In this instance, the noise generated by passing trains on adjacent lines would have further reduced the prospect of the welder hearing the excavator as it approached. OTSI also noted that the excavator was far quieter when it was operating in the wheeled, rather than the tracked, mode.

2.2 As indicated in Photo 1, the excavator was being operated in a forward direction, but with its cabin and bucket reversed so that the operator could in effect back-fill the ballast as he moved along the newly laid track. This method of operation meant that the excavator operator’s attention was focused in the opposite direction to that which he was travelling and Photo 4 depicts his field of view. While the operator was being assisted by a spotter, the spotter’s role was to protect rail traffic on an adjacent line. As the excavator neared the welding crew, the spotter’s attention was focused in the same direction as the operator’s.

2.3 Given that it was the day of the Melbourne Cup, OTSI gave consideration as to whether or not this event might have served to distract any of those involved in the accident. However, no special arrangements were in place at the worksite on the day and it was a case of ‘business as usual’. OTSI did note that work was marginally behind schedule at the time but found no evidence to suggest that any of the involved workers were under undue pressure, or had taken it upon themselves to make up for lost time.
There was nothing inherently wrong with the manner in which the welder and excavator operator performed their specific tasks, but the fact that they were unaware of each other’s presence as they did so was a clear indication to OTSI that the safety arrangements that should have ensured their separation had either not been in place, or had failed. OTSI therefore focused on establishing whether the risks associated with the day’s tasking had been identified and if so, what safety defences had been put in place to mitigate them.

Adequacy of Risk Planning

The welding team, but not the excavator operator who was late for work, attended a pre-work safety briefing prior to the commencement of work where six hazards relating to their work were identified. These were the risk of being struck by train, of slipping and tripping, and those associated with manual handling, noise on site, the operation of heavy plant and access to the site. The specified controls were identified as being to “give way”, “stay in sight” and to “stay out of the way”. These controls could be described as perfunctory at best.
2.6 WorkCover NSW's *Code of Practice for Moving Plant on Construction Sites, 2004* identifies that where heavy machinery and plant cannot be separated by time or space, particular controls or ‘defences’ need to be in place to limit the prospect of injury, and makes particular reference to the need for spotters. Other possible controls include the imposition of speed or operating limits, reductions to the range or tempo of activities and the use of proximity warning alarms. The controls themselves do not necessarily have to be sophisticated but they do need to be specific to the circumstance, widely communicated and properly implemented. In this instance, none of these requirements were met. In the absence of the identification of proper controls, OTSI concluded that even if the excavator operator had attended the safety briefing that preceded the day’s work, he would have received information of limited value.

**Provision for and Adequacy of Safety Defences**

2.7 Initially, two Protection Officers had been assigned to the worksite and their primary responsibility was to ensure that work was carried out in a safe manner and to separate those working in the danger zone from passing rail traffic. However, on the day of the accident, one of the Protection Officers had to be reassigned to another task.

2.8 The limitations of the risk planning that preceded the day’s work reduced the prospect of adequate safety defences being in place on the day of the accident and OTSI noted in particular that:

a. no provision was made to separate, either in time or space, the operation of the welders and the excavator;

b. the spotter supporting the operator of the excavator had not been made aware that the excavator would be working on the same track as the welders and had not been assigned any responsibility for ensuring their safety;

c. no provision was made for a spotter to support the welding crew; and
d. the excavator’s rotating beacon, which might have alerted the welding crew to its presence, was inoperable.

Adequacy of the Emergency Response

2.9 There were no issues of concern identified in the emergency management of this incident.

Remedial Actions and Other Safety Matters

2.10 On 21 March 2007, the Independent Transport Safety and Reliability Regulator (ITSRR) published a Rail Industry Safety Notice, RISN15, to remind accredited rail operators and railway infrastructure workers of their responsibility to appropriately control the risks associated with the operation of moving plant in the vicinity of people, and to draw their attention to the related legislation and regulations.

2.11 OTSI did not identify any other safety matters that warranted inclusion in this report.
PART 3 FINDINGS

3.1 In relation to those matters prescribed by the Terms of Reference as the principal lines of inquiry, OTSI finds as follows:

a. Causation

The accident occurred because the welder and excavator operator were oblivious to each other’s presence on the track.

b. Contributory Factors

i. The welder was engaged in a task which required him to focus his entire attention on the track immediately to his front. His ability to see the approaching excavator was further restricted by the safety goggles he was required to wear, which limit peripheral vision.

ii. The welder’s ability to hear the approaching excavator would have been affected by the noise associated with the cutting and welding processes he was performing, and the operation of trains on the adjacent lines.

iii. The nature of the task in which the excavator operator was engaged required him to focus in the opposite direction to that which the excavator was travelling and the angle of the cab, relative to the track frame, rendered the excavator’s rear vision mirror ineffective.

iv. The excavator operator was being assisted by a ‘spotter’ but the spotter’s attention was focussed on protecting rail traffic on an adjacent track, not on workers around the excavator.

v. The excavator was fitted with a warning beacon but it ineffective because it was inoperable.

c. Adequacy of Risk Planning

The risks associated with the day’s tasking had been identified but the controls that were specified to mitigate them were imprecise and therefore inadequate.
d. Provision for and Adequacy of Safety Defences

i. WorkCover NSW’s *Code of Practice for Moving Plant on Construction Sites*, 2004 identifies that where heavy machinery and plant cannot be separated by time or space, particular controls or defences need to be in place to limit the prospect of injury; had such defences been in place, the excavator and welders would not have been permitted to operate in close proximity to each other.

ii. The excavator operator was late for work and consequently did not attend the safety briefing. However, even if he had, the safety controls that were identified during the briefing were imprecise and therefore inadequate, and as such, they did not constitute any form of barrier or defence.

e. Emergency Actions and Response

The actions of the welder's co-workers were timely and effective, as were those of the attending ambulance officers.
PART 4  RECOMMENDATIONS

4.1 The following recommendations apply to John Holland Rail and are designed to enhance rail safety in NSW:

a. Ensure that its construction activities in NSW comply fully with the requirements of WorkCover NSW’s *Moving Plant on Construction Sites - Code of Practice 2004*.

b. Audit worksite risk plans to ensure that proper risk assessments are being undertaken and that meaningful risk controls are being identified and applied.

c. Ensure that all heavy equipment that is employed on its worksites, or that it operates on worksites controlled by another entity, is fitted with appropriate warning devices and that these are operable.

d. Require that in every instance where its employees or its subcontractors are engaged in cutting or welding rail, and there is heavy machinery including rolling stock in proximity, that a spotter is tasked to support the welder or welding crew.
Appendix 1: ITSRR Rail Industry Safety Notice No.15

Rail Industry Safety Notice

RISN No. 15

Moving Plant Within Rail Maintenance and Construction Sites

Background

On 7 November 2006 a track worker received serious injuries after being struck by a reversing hi rail excavator on a railway construction site at Sandgate.

The Independent Transport Safety and Reliability Regulator’s (ITSRR) initial investigation into the incident has identified several concerns related to the protection of people around moving plant at the time of the incident.

This notice serves to remind Accredited Operators and railway infrastructure contractors of their responsibilities to appropriately control the risks associated with the operation of moving plant in the vicinity of people. All railway construction work and maintenance within the rail corridor must comply with applicable Safeworking Network Rules, Network Procedures and Operator Specific Procedures relating to the movement of rail mounted plant and moving plant on rail worksites.

This type of work must also comply with the relevant OHS Act, Regulation and Code of Practice requirements relating to the movement and use of moving plant.

Action

Accredited Operators should review their current Operator Specific Procedures to ensure they comply with both rail safety and OHS requirements applicable to the use of rail mounted plant and moving plant. Appropriate controls should also be employed by the Accredited Operator to ensure companies who are contracted to perform railway construction and maintenance work on their behalf, employ adequate systems for the use of rail mounted and moving plant.

In particular, Accredited Operators should review the OHS Code of Practice titled “Moving Plant on Construction Sites Code of Practice 2004”. This industry code of practice provides practical guidance to achieving the standard of safety required by the Occupational Health and Safety Act 2000 and Occupational Health and Safety Regulation 2001 for the use of mobile plant on construction sites.

Date: 21 March 2007
For further information contact: David Pearson, Senior Compliance Investigator
Phone: (02) 8263 7135
Operators should note that the Code of Practice’s definition of construction work includes the repair and maintenance of railways. The Code defines moving plant to include plant that:

a) moves either under its own power, or is pulled or pushed by other moving plant
b) moves on or around the construction site, enters or leaves the site, or moves past the site
c) includes road vehicles.

Guidance on the identification of hazards, assessment of risks and control of risks associated with moving plant is provided within the Code of Practice which can be downloaded from the WorkCover website at:

As stated in the Code of Practice (section 3.2), the use of specific measures to eliminate or control identified risks associated with moving plant should be based on a risk assessment. A summary of items that should be considered includes:

- isolating vehicles and plant used in or around the site and work area from persons on the site or work area
- using fencing, barriers, barricades, temporary warning or control signs, or a combination of these to secure the area where moving plant is used
- planning the direction that plant moves so the visibility of operators is not restricted
- using spotters/safety observers to control traffic movement
- implementing safe working distances
- using audible reversing alarms and/or other technologies or other safe work practices. (Note: reversing alarms may not be appropriate where multiple plant are using the same area or where work is to be carried out at night near residential areas)
- minimising the amount of moving plant working at one time.

The Code of Practice (section 3.3) also provides guidance on controls for the safe operation of plant. Systems of work must ensure that moving plant is operated safely.
A summary of the minimum items that should be considered includes the following:

- competence of persons working with plant
- capability of operators
- vehicle movement procedures for positioning and re-positioning of plant
- suitability and condition (state of maintenance and repair) of the plant to perform the intended task
- instruction and information about hazards – all persons who perform work using (or on) powered mobile plant must be adequately instructed in the hazards associated with the plant and carrying out the work on site and in the control measures for safe work. Safe operating procedures covering the use and maintenance of powered mobile plant should be available
- available information – ensure that all available manufacturer’s information on the safe operation of the plant is provided, and that essential operating information is displayed
- special requirements
- site conditions
- appropriate staffing – the number of personnel required to perform the tasks safely.

ITSRR expects Accredited Operators to consider the Code of Practice guidance when reviewing their Operator Specific Procedures covering rail mounted plant and moving plant. Accredited Operators should also consult with their relevant contractors on the necessary controls to safely manage rail mounted plant and moving plant on their construction and maintenance sites, in accordance with the Code of Practice requirements.

Carolyn Walsh
Chief Executive

Date: 21 March 2007
For further information contact: David Pearson, Senior Compliance Investigator
Phone: (02) 8263 7135
Appendix 2: Sources and Submissions

References

- Rail Safety Act 2008 (NSW)
- Passenger Transport Act 1990 (NSW)

Submissions

The Chief investigator forwarded a copy of the Draft Report to Directly Involved Parties (DIP) to provide them with the opportunity to contribute to the compilation of the Final Report by verifying the factual information, scrutinising the analysis, findings and recommendations, and to submit recommendations for amendments to the Draft Report that they believed would enhance the accuracy, logic, integrity and resilience of the Investigation Report. The following DIPs were invited to make submissions on the Draft Report:

- ARTC
- ITSRR
- John Holland

Submissions were received from the following Directly Involved Parties:

- ARTC
- ITSRR
- John Holland

The Chief Investigator considered all representations made by DIPs and responded to the author of each of the submissions advising which of their recommended amendments would be incorporated in the Final Report, and those that would not. Where any recommended amendment was excluded, the reasons for doing so were explained.