



**Trade &
Investment**

GUIDELINES

MDG 3002

SSAI No 3

Fatal accident Newstan Colliery

26 June 1991

June 1993

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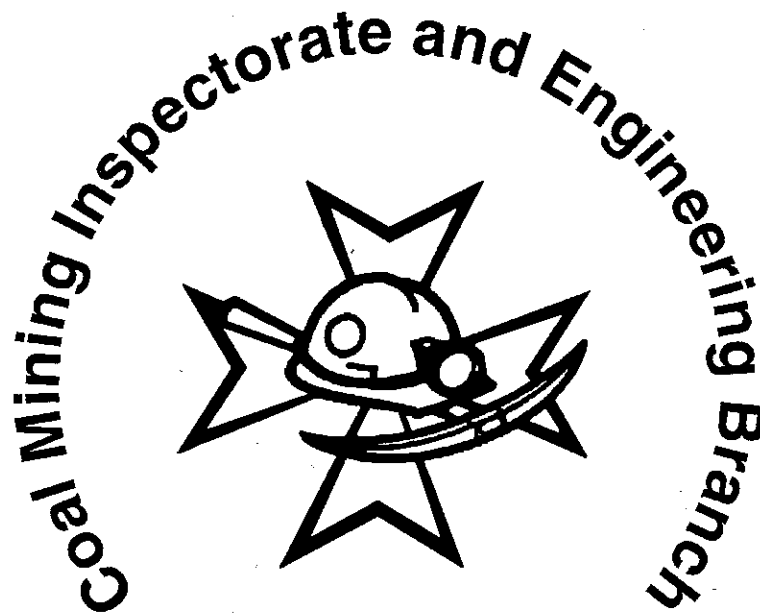
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Department of Mineral Resources
New South Wales



**SYSTEM SAFETY ACCIDENT INVESTIGATION
SUMMARY**

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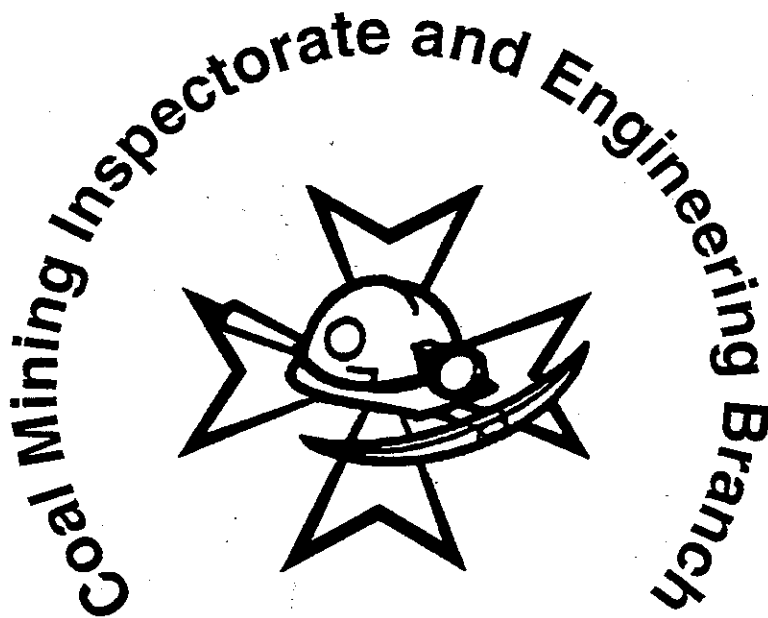
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Foreword

In 1991 the Coal Mining Inspectorate of the New South Wales Department of Mineral Resources adopted a methodology for accident investigation known as System Safety Accident Investigation (SSAI). This has been employed since that time to form the basis for the investigation of fatalities and more serious accidents occurring in the coal mining industry in New South Wales.

The SSAI methodology looks not only at direct cause(s) of an accident but also surrounding systems which may have contributed to the accident environment. The exact circumstances of any individual accident probably will never occur again, so preoccupation with those exact circumstances is likely to be of limited benefit in future prevention. Broader examination of systems which may have failed, or been less than adequate to ensure safety, in the accident environment are therefore brought within the ambit of the investigation.

The methodology looks not only an accident itself but also covers the period of time until a stable situation exists. The investigation may, therefore, also cover situations where rescuers may be put at risk.

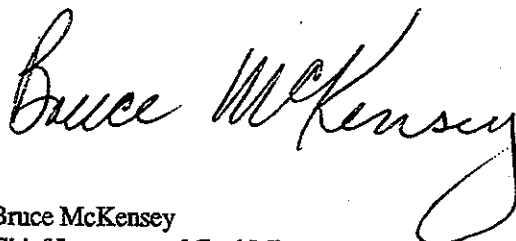
The structured nature of information arising from SSAI processes makes it a potentially very valuable tool for others to use in assessing systems which may be similar to those examined in an investigation. In order that some positive outcome may result from what are otherwise distressing incidents, the Coal Mining Inspectorate is distributing summaries resulting from SSAI's which it has conducted. This is being done as an information transfer to industry of lessons learned in the course of investigations.

These summaries are being distributed pursuant to Clause 39(4) Coal Mines Regulation (General Welfare and First Aid - Underground Mines) Regulation 1984 or Clause 36(4) Coal Mines Regulation (General Welfare and First Aid - Open Cut Mines) Regulation 1984.

It is important to recognise distinctions between a system based investigation (such as SSAI) and what is commonly recognised as the type of investigation traditionally undertaken by bodies such as the Inspectorate - a legal investigation. System investigations are conducted on a 'no fault', 'no blame' basis - that is to say the potential culpability of individuals, or liability of organisations, are not taken into account. This contrasts with legal investigations where individual culpability, or organisational liability, are a preoccupation.

In addition, material presented in an SSAI report may be based on the collective opinion of the investigating team and formed from best available knowledge. This is particularly the case in situations in which there are no witnesses to an accident. An investigating team's opinions may be formed on considering the balance of material available to the team and so are unlikely to constitute 'matters of fact' in a legal sense.

It is also important to recognise that the SSAI process stops short of solutions. The 'Judgements of Needs' produced by SSAI are only intended to highlight areas of concern in which application of management or technical expertise may be warranted in order to prevent further accidents.



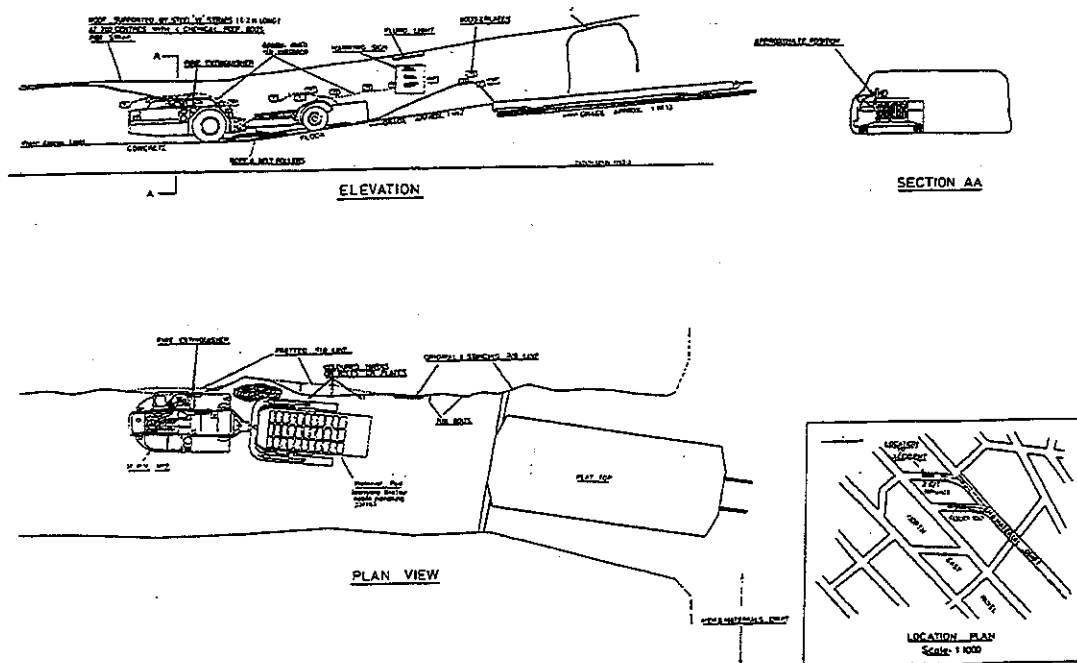
Bruce McKensy
Chief Inspector of Coal Mines
June 1993

OVERVIEW

On Wednesday, 26 June, 1991, at approximately 3.50 pm. in an angled material shunt at the bottom of the men & material drift, Young Wallsend seam, Newstan colliery, a machineman sustained fatal injuries when crushed between the rib and the steering wheel of a dual drive Mark I MPV. The victim was apparently moving the MPV forward off the ramp while seated in the driving seat that faced opposite the direction of travel of the vehicle. The rib had been undercut over time. This allowed the driver's compartment to enter the undercut, and resulted in trapping the driver.

Areas of concern identified by the investigation included: instruction given to the driver regarding how to drive this type of machine: the driver's awareness of potential problems in not facing the direction of travel; and an apparent lack of protection afforded a driver from protruding objects entering the driver's compartment of the machine.

The diagram below shows the layout of the accident scene.



INVESTIGATION

An investigation by the Department of Mineral Resources, Coal Mining Inspectorate was conducted as a System Safety Accident Investigation (SSAI). This method of investigation was originally developed by the United States Department of Energy and makes use of a number of 'tools' to examine events and conditions related to an accident, management systems in place at the time of the accident, and the adequacy or otherwise of barriers (possible or in place) to prevent unwanted energy flows in the accident situation.

Findings (or inferences) from each of these tools are then grouped by related subject matter and these groups of findings form a basis for the drafting of 'Judgements of Needs'. Judgements of Needs are a means used to identify areas for development of engineering controls or management systems to mitigate personal injury or damage in operations similar to those of the accident situation. Judgements of Needs are intended to identify but not replace the development of such controls or systems.

The investigation team consisted of:-

G COWAN - District Inspector of Coal Mines (Team Leader)
F VAN DIJK - Acting Senior Inspector of Coal Mines
G JERVIS - Inspector of Mechanical Engineering
A. RECZEK- Senior Inspector of Electrical Engineering (Facilitator)

INVESTIGATION OUTCOMES

The investigation resulted in a number of Judgements of Needs and these are reproduced below. In addition, the team prepared a number of guidelines with the intention of identifying hazards associated with the type of operation involved in the accident to provide other mines with a means to assess similar operations.

Initial drafts of this SSAI summary were supplied to mine management and the manufacturer of the machine involved in order to seek agreement for publication. Some concerns were raised by both parties. Following subsequent meetings the draft was amended to address concerns raised at those meetings regarding the content of the overview summary and an amended foreword prepared. The Judgements of Needs, as drafted by the investigating team, were not altered.

This amended summary was supplied to each of the parties and an opportunity provided for them to provide material for publication which addressed residual concerns or differences of opinion with the content of the summary. The equipment manufacturer responded to this invitation, within the generous time frame allowed, and the material supplied is appended to this document.

JUDGEMENT OF NEED # 1

GENERAL ISSUES:-

SAFE WORKING SYSTEMS FOR THE OPERATION OF MPV's WHILE WORKING IN U/G ROADWAYS

AREAS OF IMPLICATION:- MINE & MINING INDUSTRY GENERALLY

JUDGEMENT OF NEED:

There is a need to review the existence and adequacy of Management Systems for the operation of MPV's and similar vehicles in Mine Drift or Pit Bottom Shunt Areas. A Hazard Analysis, followed by a Risk Assessment, to establish a safe working system at Newstan, should be carried out and this should also be considered an industry problem.

RELATED FINDINGS:

- a documented safe working system should be available and was not.
- vehicle pick-up checks prior to use should be instituted and were in place.
- pod load carrying and load arrangements in pod were in place but less than adequate.
- procedures for connecting and disconnecting of pods under varying circumstances ie: varying grades, floor conditions were in place but less than adequate.
- procedures for loading of pods onto flat-tops for transporting in the drift were available by means of tie - down instructions which were posted.
- design and arrangement of shunt was inadequate ie: orientation of track to shunt, shunt grade and ramp / shunt level, etc.

DISCUSSION OF FINDINGS:

The absence of a documented and detailed safe working system for the operation of MPV's in the Drift Area at Newstan, indicated that a detailed analysis of the various hazards associated with the Newstan Drift Bottom Environment, had not been carried out. The team considered that Newstan was probably one of the better installations, but that the operational considerations were less than adequate; the team felt that this aspect was left very much to the MPV. operators and that is very indicative of an industry wide problem in relation to operational readiness of drift installations.

JUDGEMENT OF NEED # 2

GENERAL ISSUES:-

MPV OPERATOR PROTECTION / MACHINE DESIGN / FAIL TO SAFETY BRAKING ON MPV ENGINE SHUT-DOWN

AREAS OF IMPLICATION:- MINE & MPV TYPE MANUFACTURERS GENERALLY

JUDGEMENT OF NEED:

There is a need to consider the risks associated with the design of the MPV. when interacting in its intended environment. It was felt that this will be accomplished by a Hazard Analysis followed by a Risk Assessment to establish safe operation of the MPV. in its intended environment.

RELATED FINDINGS:

- location and protection of the operator was not considered to be adequate.
- the brakes did not activate nor were they fail to safety on the MPV. engine shut-down.
- general vision and ergonomic issues with respect to the operator were not adequately addressed.
- the MPV. design did not adequately take into account the environment in which it was meant to operate.

DISCUSSION OF FINDINGS:

The apparent absence of an MPV. design risk analysis, which addressed issues of operator protection, engine shut-down, vision and ergonomics, indicates that the manufacturer's attention to these matters was less than adequate. An evaluation of the environment in which the vehicle was intended to operate has not been adequately carried out. The team felt that an increased interaction between Manufacturers and the User with respect to design and environment of the operation would have reduced the risks associated with this accident.

JUDGEMENT OF NEED # 3

<u>GENERAL ISSUES:-</u>	TRAINING OF OPERATORS, TRAINING SYSTEMS AND DOCUMENTATION GENERALLY
<u>AREAS OF IMPLICATION:-</u>	MINE
<u>JUDGEMENT OF NEED:</u>	<p>There is a need for the mine to have a properly integrated training scheme which incorporates manufacturer's guide-lines, hazard identification and risk analysis into the training scheme. The team felt that the mine's training scheme was orientated more towards statutory needs rather than training / management needs.</p>
<u>RELATED FINDINGS:</u>	<ul style="list-style-type: none">- operator sitting in incorrect position whilst driving the machine.- differences between machines of similar types were not highlighted- operator training system does not cater for feedback of operational problems by driver for evaluation and possible inclusion in training scheme.- supervisors do not have ready access to individuals training records whilst underground.- the need to train specifically for dual seat MPV's was not recognised by management.
<u>DISCUSSION OF FINDINGS:</u>	<p>The team felt that the training scheme at Newstan, either did not recognise or failed to address the issues identified above. It was felt that the training scheme could have had better feedback of operational experience and could have been more comprehensive had all the hazards been properly identified.</p>

JUDGEMENT OF NEED # 4

<u>GENERAL ISSUES:-</u> MANAGEMENT PROCEDURES FOR MPV OPERATIONS AND ACCIDENTS
<u>AREAS OF IMPLICATION:-</u> MINE
<u>JUDGEMENT OF NEED:</u> There is a need for the mine to consider reviewing all emergency procedures and training schemes. In addition, MPV operator training should incorporate operational experience in subsequent training or re-training for operators.
<u>RELATED FINDINGS:</u> <ul style="list-style-type: none">- non - compliance with accident / incident procedure- people working / travelling in the vicinity of operating MPV's- first response at time of accident.- failure to secure MPV. before attempting rescue.- documented accident / incident procedure.
<u>DISCUSSION OF FINDINGS:</u> The team felt that although the accident / incident procedure was not complied with, it had little effect in this incident. However, it was felt that this had serious implications in relation to the ability to the mine to respond in similar emergencies. The team felt that the documentation was less than adequate to deal with the readiness of mine personnel either in emergency situations or for routine situations of working in proximity of operating MPV's. The failure of the Undermanager to properly secure the vehicle before attempting the rescue demonstrated a lack of awareness of correct first response in emergency circumstances.

GUIDELINES

The following recommendations are made by the investigation team as guidelines to assist collieries assess underground loading/unloading facilities.

1. All mines using track equipment should undergo a review or risk assessment of their loading / unloading facilities underground to include the following points:-

- a) Design of shunts - straight not curved;
- b) Orientation of flat-tops to shunt - straight & level;
- c) Grade of shunt - level if possible;
- d) Width of shunt - at least 600mm clearance over width of flat-top;
- e) Height of shunt - in excess of normal maximum load height;
- f) Support of roof & ribs - adequate to withstand damage by vehicles to prevent fall or rib undercut;
- g) Ribs - no protruding objects which could enter driver's compartment if machine strikes rib;
- h) Lighting of area - sufficient to allow operator to observe operations without aid of cap lamp;
- i) Housekeeping standards need to be defined;
- j) Construction of ramp - should be concreted;
- k) Enclosing of ramp on sides - prevent machines falling off flat-top;
- l) Access limitations to ramp area when using machinery; and
- m) Suitability of flat-top to ramp - same height & size.

2. All mines using flat-tops should have management procedures which are compatible for the unloading / loading of flat-tops both on the surface and underground to include the following:-

- a) Placement of loads on the flat-top;
- b) Tie down procedures;
- c) Suitability of height & width of load to the roadway/drift and means of checking;
- d) Type of vehicles to be used in loading / unloading equipment off flat-tops and any restrictions applicable;

- e) Determination of weights to be carried on flat-top under all circumstances;
 - f) The correct unloading / loading procedures to be utilised at each ramp for each type of vehicle; and
 - f) Proper supervised training in these procedures by an official not by another workman who might have different ideas.
3. All mines should ensure that all drivers of machinery are retrained when any vehicle is modified or a new type of an existing vehicle is used at the mine, highlighting the modifications and any new problems that this vehicle could create.
4. Management should set up a review system to determine any problems with the machinery or the operating procedures which should include interviewing all drivers to discuss any problems and also regular inspections of the drivers whilst carrying out these operations.
5. All machinery before use at the mine should undergo a risk assessment by the manufacturer to determine any problems which cannot be manufactured out but which need to be highlighted to the operators.
6. All mines should carry out a risk assessment of the suitability of vehicles to their mining conditions, preferably as part of vehicle purchase procedures, and certainly before allowing the vehicles to proceed underground.