



**Trade &
Investment**

GUIDELINES

MDG 3002

SSAI No 4

**Fatal accident Metropolitan
Colliery, 2 April 1992**

September 1993

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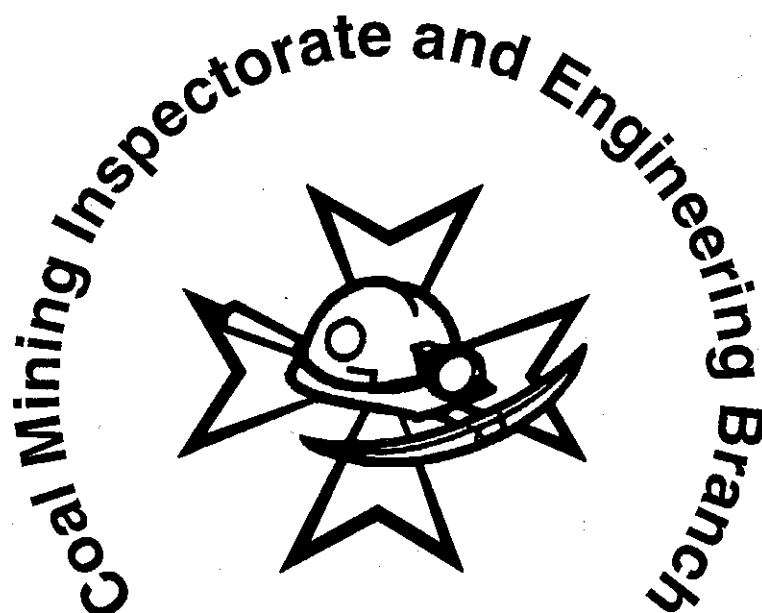
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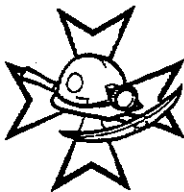


**SYSTEM SAFETY ACCIDENT INVESTIGATION
SUMMARY**

**FATAL ACCIDENT
METROPOLITAN COLLIERY
2 APRIL 1992**

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SSAI SUMMARY No. 4



**DEPARTMENT OF MINERAL RESOURCES
NEW SOUTH WALES
COAL MINING INSPECTORATE**

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**FATAL ACCIDENT
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2 APRIL 1992**

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 at 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.

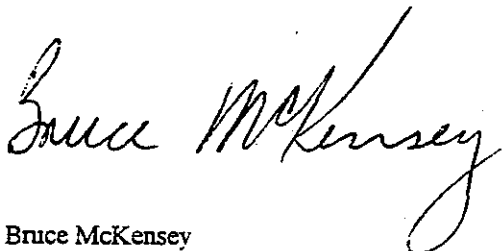
The structured nature of information arising from SSAI processes makes it a potentially very valuable tool for others to use in assessing systems which may be similar to those examined in an investigation. In order that some positive outcome may result from what are otherwise distressing incidents, the 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 McKenney
Chief Inspector of Coal Mines
June 1993

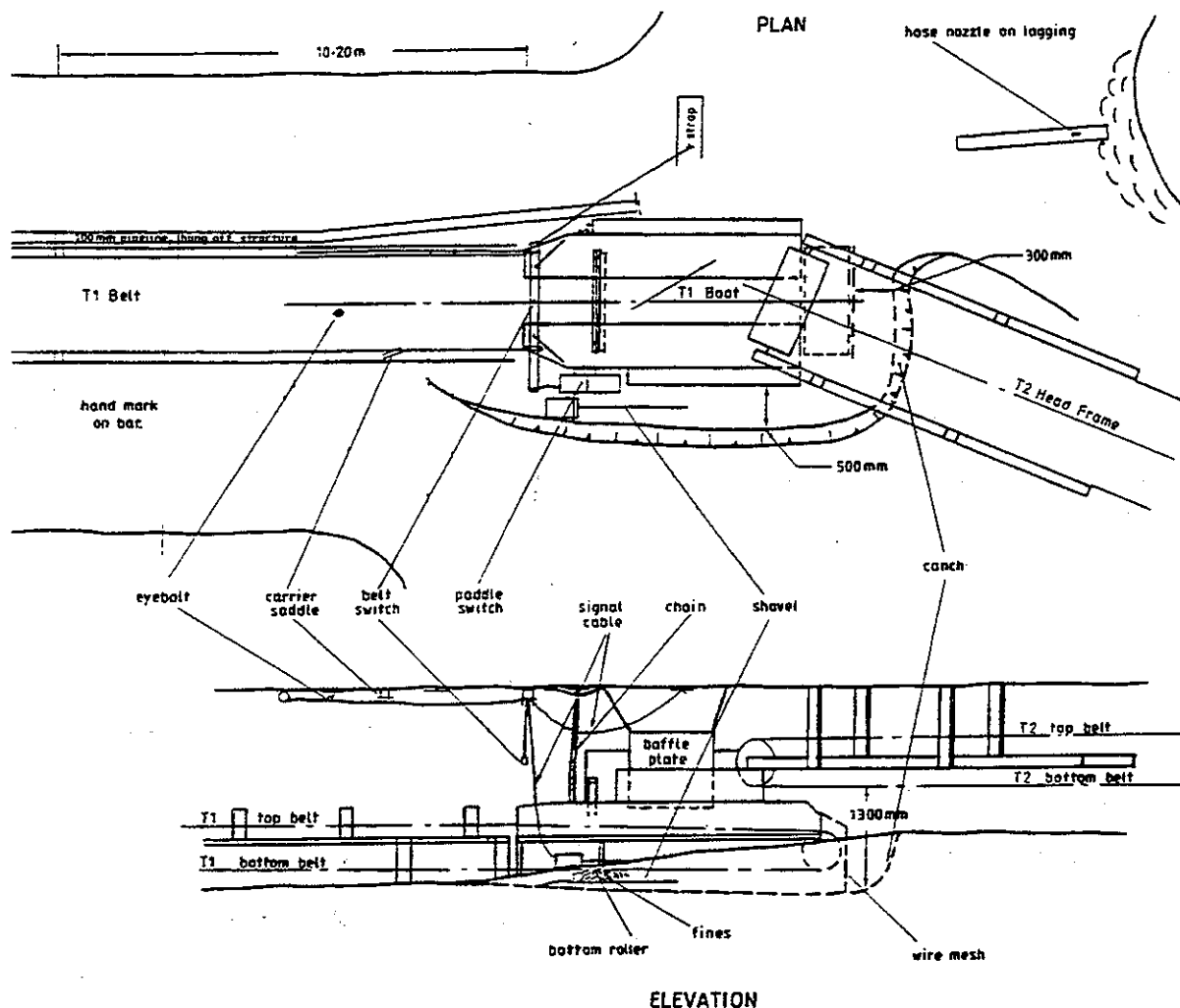
OVERVIEW

On 9 April 1992 a workman who had not reported in at end of shift was found 1½ to 2 hours later lying on the bottom belt with his boot between belt and return hold down roller. He had been working alone and the conveyor belt had been operating prior to him being found.

The workman had been employed on his usual task of belt cleaner on T2 conveyor belt which is immediately inbye T1 belt. He had worked evening shift which commenced at 1830 8 April 1992 and finished at 0130 9 April 1992. The deceased had been reported missing from his usual end of shift position where he boarded transport for conveyance to the mine shaft exit. This report was made to an Undermanager on the surface.

The Undermanager had a crew of workmen who were travelling out of the mine at the end of their shift stop and make a search of T2 belt and adjacent roadways. This search revealed no sign of the deceased. The Undermanager went underground to organise a more thorough and wider search.

The workman's body was discovered on the bottom belt of T1 trapped by his right ankle under a hold down roller approximately 600 metres outbye of his allocated belt cleaning duty area. Evidence indicated that he had been carrying out belt cleaning duties at the belt transfer point, shown below.



It appeared that the workman was transported on the top side of the T1 belt from a location adjacent to the inbye transfer point feeding the belt. It was not determined how he was dislodged from the top belt to the bottom belt at place of discovery.

It was also not possible to fully determine how the workman came to be on the conveyor belt. Inspection of the area found that access was available to both sides of the transfer point via the rear of the boot-end pulley. A belt isolation switch was also located in this area albeit there was no prestart warning signalling system installed.

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 nature of the investigation was such that several inspections had to be made underground by various persons over several days. As no witnesses were available to assist, a detailed physical examination of the conveyor system was made over the entire area of the deceased's designated cleaning zone.

The results of findings of the individual inspections were systematically recorded on a geographical reference base and studied. This resulted in a "most likely" scenario being extrapolated and a photographic simulation prepared. A human causal factors assessment was also carried out.

The investigation team consisted of:

Mr John Bout, Inspector of Mechanical Engineering, Team Leader
Mr Michael Carr, Inspector of Coal Mines
Mr Cyril Piper, Inspector of Coal Mines
Mr Tony Mildon, Inspector of Coal Mines
Mr Paul DeGruchy, Senior Technical Officer

SSAI OUTCOMES

The investigation resulted in a number of Judgement of Needs with those of relevance for all the mining industry reproduced below. Also a summary of the teams assessment of likely human causal factors which may have influenced the actions of the deceased is included.

Due to the circumstantial nature of the evidence found and the possibility of multiple scenarios it is impossible to target a specific root cause of the fatality.

However the Judgement of Needs clearly identify a broad range of concerns which each mine should evaluate for their own operations and assess the inherent risk in current conveyor operations at their mine.

JUDGEMENT OF NEED # 1

ACCIDENT INVESTIGATION RESULTS		Date: 9 April 1992
Location: METROPOLITAN COLLIERY	Type of Accident/Incident:	FATALITY
General Issues: IDENTIFICATION OF RISKS RELATED TO THE OPERATION OF UNDERGROUND CONVEYOR BELTS.	Areas of Implication:	MINE AND MINING INDUSTRY
JUDGEMENT OF NEED: THERE IS A NEED TO CONDUCT A RISK ASSESSMENT OF THE HAZARDS OF WORKMEN MAINTAINING BELTS UNDERGROUND IN COAL MINES.		
RELATED FINDINGS: 1. NO COMPREHENSIVE RISK ASSESSMENT OF THE CONVEYOR EQUIPMENT WAS UNDERTAKEN. 2. THE EQUIPMENT WAS SOURCED FROM "AUCTIONS" AND AS SUCH NO SINGLE MANUFACTURER IS INVOLVED. 3. THE DECEASED MAY NOT HAVE RECOGNISED THE "RISKS" INVOLVED. 4. BELT CLEANING IS NOT CULTURALLY RECOGNISED AS MAINTENANCE. 5. BELTS ARE NORMALLY CLEANED WITH THE BELT RUNNING EXCEPT IN PLACES WHERE GUARDS NEED TO BE REMOVED. 6. THE LACK OF PRESTART WARNING MAY HAVE CONTRIBUTED TO THE DECEASED'S DEMISE. 7. LACK OF ACCESS TO EQUIPMENT INCREASES RISK TO PERSONS. 8. AS A RESULT OF REDUCED CLEARANCES THE RISK OF EXPOSURE TO THE MOVING CONVEYOR IS INCREASED. 9. THE BASIC NATURE OF THE EXISTING MONITORING SYSTEM DOES NOT APPEAR TO HAVE CONTRIBUTED TO THE ACCIDENT. UNDER DIFFERENT CIRCUMSTANCES HOWEVER THE LACK OF INFORMATION PROVIDED BY THE SYSTEM MAY HAVE DELAYED THE RESPONSE TO A CRITICAL SITUATION. 10. BY FAILING TO HAVE ENVIRONMENTAL MONITORING OCCURRENCES SUCH AS FIRES ON CONVEYOR BELTS WOULD NOT RECEIVE EARLY DETECTION. 11. OLD DISUSED BELTING LYING AROUND AND POOR STATE OF THE FLOOR AREA ON THE OFF WALKSIDE AND REAR OF T2 / T1 TRANSFER MAY HAVE CONTRIBUTED TO THE DECEASED'S DEMISE BY PROMPTING HIM TO CROSS OVER THE T1 BELT RATHER THAN AROUND IT VIA THE SAFE PASSAGE. 12. THE ABSENCE OF A SAFE DESIGNATED CROSSING POINT MAY HAVE CONTRIBUTED TO THE ACCIDENT.		
DISCUSSION OF FINDINGS: THE TEAM CONSIDERED THAT CUSTOM AND PRACTICES REGARDING BELT MAINTENANCE AND CLEANING MAY NOT ADEQUATELY DEAL WITH THE HAZARDS ASSOCIATED WITH THIS TYPE OF REMOTELY DRIVEN MOVING MACHINERY.		

JUDGEMENT OF NEED # 2

ACCIDENT INVESTIGATION RESULTS		Date: 9 April 1992
Location: METROPOLITAN COLLIERY	Type of Accident/Incident:	FATALITY
General Issues: PERSONS WORKING ALONE UNDERGROUND.	Areas of Implication:	MINE AND MINING INDUSTRY
JUDGEMENT OF NEED: THERE IS A NEED FOR DEPUTIES TO ENSURE THAT THE FACE TO FACE CONTACT IS MADE WITH ALL EMPLOYEES IN THEIR DISTRICT AT LEAST ONCE PER SHIFT.		
RELATED FINDINGS: 1. THE DEPUTY DID NOT MAKE CONTACT WITH THE DECEASED DURING HIS INSPECTION AND CONSIDERED THIS ACCEPTABLE. 2. DEPUTIES ARE IN CHARGE OF ALL WORKERS IN THEIR DISTRICT BY REGULATION. 3. THE NEED TO "CONFER" WITH WORKMAN IS OPEN TO LOOSE INTERPRETATION. 4. THE DEPUTY DID NOT CONSIDER IT A PROBLEM THAT THE DECEASED WAS NOT SEEN DURING THE INSPECTION OF HIS PATROL AREA. 5. THE DEPUTY INDICATED THAT THE DECEASED WAS SOMETIMES NOT ACTUALLY ON THE JOB, BUT AWAY GETTING GEAR. 6. PERSONAL COMMUNICATION MAY HAVE ALLOWED THE DECEASED TO MAKE CONTACT WITH OTHERS DURING HIS TRAUMA. 7. THE LENGTH OF TIME TO LOCATE THE DECEASED WAS EXACERBATED BY THE DECEASED BEING OUTSIDE HIS ALLOCATED WORK AREA. 8. HAD PERSONAL COMMUNICATION BEEN AVAILABLE THE DECEASED MAY BEEN ABLE TO MAKE CONTACT TO VOID THE FATAL RESULT OF THE INCIDENT.		
DISCUSSION OF FINDINGS: THE TEAM CONSIDERED THAT SUPERVISORS WHO HAVE CHARGE AND CONTROL OF PERSONS AND OPERATIONS CANNOT COMPLY WITH THE INTENT OF THE REGULATIONS UNLESS THEY MAKE FACE TO FACE CONTACT WITH THOSE PERSONS AND OPERATIONS.		

JUDGEMENT OF NEED # 3

ACCIDENT INVESTIGATION RESULTS		Date: 9 April 1992
Location: METROPOLITAN COLLIERY	Type of Accident/Incident:	FATALITY
General Issues: INSPECTION OF CONVEYOR BELTS.	Areas of Implication:	MINE AND MINING INDUSTRY
JUDGEMENT OF NEED: THERE IS A NEED FOR STANDARD INSPECTION AND REPORTING CRITERIA TO BE IMPLEMENTED ON CONVEYOR BELTS TO ENSURE APPROPRIATE REMEDIAL ACTION IS TAKEN.		
RELATED FINDINGS: 1. SOME DEPUTIES DID NOT RECOGNISE THE SIGNIFICANCE OF FIVE MISSING ROLLER SETS, IN SOME CASES NOT EVEN NOTICING THEIR ABSENCES. 2. EVEN WHEN ROLLER SETS WERE REPLACED THEY WERE ONCE AGAIN DISPLACED AND NO PERMANENT REMEDIAL ACTION TAKEN. 3. THE FAILURE OF DEPUTIES IN THIS CASE TO PROPERLY IDENTIFY, REPORT UPON AND RECTIFY DEFECTS FOUND DURING INSPECTIONS ALLOWED EQUIPMENT TO REMAIN IN OPERATION WHEN IMMEDIATE REMEDIAL ACTION SHOULD HAVE BEEN PURSUED. 4. INDIVIDUALS HAVE VARIED TOLERANCE OF DEFECTS AND INSPECTIONS ARE TOO SUBJECTIVE. 5. THE RELEVANCE AND QUALITY OF THE INSPECTIONS ARE IN DOUBT AND MAY HAVE ALLOWED POTENTIAL ISSUES TO DEVELOP INTO OCCURRENCES. 6. THE AGE AND HISTORY OF THE MINE'S PREVIOUS POOR CONTROL OF STANDARDS REQUIRES CURRENT MANAGEMENT TO MAINTAIN A HIGH EMPHASIS ON IMPROVING THE STANDARDS.		
DISCUSSION OF FINDINGS: THE TEAM CONSIDERS THAT THERE SHOULD BE AN EFFECTIVE SYSTEM IN PLACE TO ENSURE THAT REPORTED DEFECTS HAVE IN FACT BEEN REMEDIED WITH APPROPRIATE PRIORITY.		

JUDGEMENT OF NEED # 4

ACCIDENT INVESTIGATION RESULTS		Date: 9 April 1992
Location: METROPOLITAN COLLIERY	Type of Accident/Incident:	FATALITY
General Issues: CONVEYOR BELT STOP SWITCHES.	Areas of Implication:	MINE AND MINING INDUSTRY
JUDGEMENT OF NEED: THERE IS A NEED FOR CONVEYOR BELTS TO BE ABLE TO BE STOPPED AT ANY POINT ALONG THEIR LENGTH DESPITE THE LOCATION OF THE WORKMAN IN RELATION TO THE CONVEYOR WHILST ABOUT THE CONVEYOR.		
RELATED FINDINGS: 1. THE STYLE OF SWITCHES WERE NOT CONDUCTIVE TO READY ACTUATION IN AN EMERGENCY. 2. ACCESS TO SWITCHES FROM BOTH SIDES OF CONVEYOR WAS NOT SAFELY PROVIDED. 3. THE REGULATIONS ONLY PROVIDE FOR SWITCHES AT 20 METRES INTERVALS ALONG THE CONVEYOR. 4. THE POSSIBILITY DOES EXIST FOR PEOPLE TO BE INADVERTENTLY CONVEYED ON A CONVEYOR BELT WITHOUT EMERGENCY STOP ACCESS. 5. THE LACK OF THE DESCRIBED EMERGENCY SYSTEM MAY HAVE CONTRIBUTED TO THE DECEASED'S INABILITY TO STOP THE BELT. THE STOP / START SWITCHES CURRENTLY IN USE ARE ALSO DEEMED TO ACT AS EMERGENCY SWITCHES, BUT DO NOT SATISFACTORILY ADDRESS ALL EMERGENCY SITUATIONS AS THEY DO NOT ISOLATE POWER TO THE DRIVE MOTOR. 6. THE DECEASED'S INABILITY TO STOP THE BELT IN THE MOST PROBABLE SCENARIO OF THE ACCIDENT RESULTED IN HIS FATAL INJURIES.		
DISCUSSION OF FINDINGS: THE TEAM CONSIDERS THAT PERSONS ABOUT CONVEYOR BELTS MUST BE ABLE TO STOP THE BELT AT ANY PLACE AT ANY TIME IN AN EMERGENCY. THERE IS ALSO A NEED TO CONSIDER HAVING A SECONDARY CONVEYOR BELT ISOLATION SYSTEM WHICH ISOLATES POWER TO THE DRIVE UNIT.		

JUDGEMENT OF NEED # 5

ACCIDENT INVESTIGATION RESULTS		Date: 9 April 1992
Location: METROPOLITAN COLLIERY	Type of Accident/Incident:	FATALITY
General Issues: STANDARDS OF GUARDING.	Areas of Implication:	MINE AND MINING INDUSTRY
JUDGEMENT OF NEED: THERE IS A NEED FOR INDUSTRY TO DEFINE WHAT "EXPOSED AND DANGEROUS PARTS OF MACHINERY" ARE AND TO QUALIFY THE TERM "ADEQUATE" WITH RESPECT TO GUARDING.		
RELATED FINDINGS: 1. "ADEQUACY" OF GUARDING IS LEFT TO LOCAL INTERPRETATION. 2. NO DESIGN GUIDELINES OR AUSTRALIAN STANDARDS IS CURRENTLY APPLIED. 3. INDUSTRY PRACTICE IS TO GUARD PRIMARY APPARATUS ONLY ALONG CONVEYOR AND NOT THE GENERAL STRUCTURE. 4. GUARDING AS OBSERVED WAS TO THE TRADITIONALLY ACCEPTED INDUSTRY STANDARD. THAT IS, AT POINTS WHERE PERSONS WOULD PASS UNDER THE BELT ON FOOT, TRACK UNDERPASSES, DRIVEHEADS, LOOP TAKE-UPS, RETURN ROLLERS AND JIB ROLLERS. THE INTENT OF THIS REGULATION MAY NOT HAVE BEEN MET. 5. THE LACK OF AN APPLIED AUSTRALIAN STANDARD FOR UNDERGROUND CONVEYORS AND THE GENERALITY OF THE C.M.R.A. LEADS TO INCONSISTENT INTERPRETATION OF THE GUARDING REQUIREMENTS.		
DISCUSSION OF FINDINGS: THE TEAM CONSIDERS THAT A VARIABLE AND SOMETIMES LOOSE INTERPRETATION OF WHAT CONSTITUENTS "EXPOSED AND DANGEROUS" AND "ADEQUATE" HAS CURRENCY WITHIN THE INDUSTRY. BY OBJECTIVE ANALYSIS THERE MAY BE MORE EXPOSED AND DANGEROUS PARTS THAN ARE CURRENTLY SUBJECT TO GUARDING. THE AUSTRALIAN STANDARD FOR SURFACE CONVEYORS IMPOSES A HIGHER STANDARD FOR GUARDING THAN IS CURRENTLY THE CASE FOR UNDERGROUND CONVEYORS.		

JUDGEMENT OF NEED # 6

ACCIDENT INVESTIGATION RESULTS		Date: 9 April 1992
Location: METROPOLITAN COLLIERY	Type of Accident/Incident:	FATALITY
General Issues: CONVEYOR BELT DESIGN.	Areas of Implication:	MINE AND MINING INDUSTRY
JUDGEMENT OF NEED: THERE IS A NEED FOR THE DESIGN OF CONVEYOR BELTS TO BETTER CONTROL COAL FLOW AND MINIMISE SPILLAGE AND DUST.		
RELATED FINDINGS: 1. FINES WERE ACCUMULATING UNDER TRANSFER POINT; BOOTENDS DO NOT PROVIDE READY ACCESS FOR CLEANING AND NO CHUTE WAS UTILISED. 2. LABOUR WAS REQUIRED TO BE DEPLOYED TO THE BELTS TO ADDRESS THE ACCUMULATIONS OCCURRING. 3. THERE WAS A NECESSITY TO DEPLOY LABOUR AT THE T2 / T1 TRANSFER BECAUSE OF THE POOR DESIGN INSTALLATION OF THE TRANSFER. 4. ABSENCE OF GUIDELINES AND AUSTRALIAN STANDARDS ALLOWS FOR VARIABLE STANDARDS ON CONVEYOR BELTS OPERATED UNDERGROUND. 5. THE NEED FOR BELT CLEANING IS RELATED TO THE STANDARD OF ENGINEERING DESIGN OF THE TRANSFER POINTS AND SCRAPERS.		
DISCUSSION OF FINDINGS: THE ADHOC NATURE (STILL PREVALENT WITHIN SOME MINES) OF CONVEYOR TRANSFER POINT AND VENTILATION DESIGN CONTRIBUTES TO A GREATER LABOUR DEPLOYMENT THAN SHOULD BE THE CASE. THUS INCREASING THE RISK OF OCCURRENCES AND ACCIDENTS.		

JUDGEMENT OF NEED # 7

ACCIDENT INVESTIGATION RESULTS		Date: 9 April 1992
Location: METROPOLITAN COLLIERY	Type of Accident/Incident:	FATALITY
General Issues: LIGHTING	Areas of Implication:	MINE AND MINING INDUSTRY
JUDGEMENT OF NEED: THERE IS A NEED TO PROVIDE LIGHTING IN ALL AREAS ALONG CONVEYOR BELTS.		
RELATED FINDINGS: 1. LIGHTING WAS NOT PROVIDED AT T2 / T1 TRANSFER. 2. LIGHTING WAS NOT PROVIDED AT DEFINED BELT CROSSING POINTS. 3. LACK OF ILLUMINATION MAY HAVE INCREASED THE RISK OF COMING IN CONTACT WITH THE CONVEYOR WHILST WORKING IN THE VICINITY OF T2 / T1. ILLUMINATION OF THE DEATH SITE MAY HAVE PREVENTED THE DECEASED FROM ATTEMPTING TO ROLL OFF AT THAT POINT IF HE DID DO SO VOLUNTARILY.		
DISCUSSION OF FINDINGS: THE TEAM CONSIDERS PROVISION OF MORE LIGHTING IN UNDERGROUND CONVEYOR HEADINGS WOULD ENHANCE SAFETY. PERSONS WORKING ALONE ALONG BELTS ARE MOST DISADVANTAGED SHOULD THEY HAVE FAILURE OF CAP LIGHTS.		

JUDGEMENT OF NEED # 8

ACCIDENT INVESTIGATION RESULTS		Date: 9 April 1992
Location: METROPOLITAN COLLIERY	Type of Accident/Incident:	FATALITY
General Issues: HUMAN FACTORS ANALYSIS	Areas of Implication:	MINING INDUSTRY
JUDGEMENT OF NEED: THERE IS A NEED FOR A PROFESSIONAL 'INVESTIGATION' INTO THE HUMAN CAUSAL FACTORS OF ACCIDENTS WHERE WORKERS APPEAR TO HAVE DELIBERATELY PURSUED UNSAFE WORK PRACTICES.		
RELATED FINDINGS: 1. IT IS LIKELY THAT THE DECEASED DELIBERATELY PURSUED A COURSE OF ACTION WHICH PUT HIM AT GREAT PERSONAL RISK DESPITE BEING QUALIFIED, TRAINED, EXPERIENCED AND A REPUTEDLY CONSCIENTIOUS WORKER. 2. THE NON SPECIFIC NATURE OF THE TRAINING MAY HAVE FAILED TO ENLIGHTEN THE DECEASED OF ALL THE POTENTIAL HAZARDS WHEN WORKING ON CONVEYOR BELTS. 3. THE DECEASED MAY HAVE BEEN AVOIDING GETTING WET FROM SPRAY MIST BY NOT USING THE ACCEPTED WALKWAY.		
DISCUSSION OF FINDINGS: THE TEAM CONSIDERS THAT THIS AND OTHER ACCIDENTS AND FATALITIES OF RECENT TIMES WARRANT THE PURSUIT OF THE ANALYSIS OF THE CAUSES THAT PROMPT TRAINED, EXPERIENCED WORKMEN TO ADOPT PRACTICES WHICH PLACE THEIR SAFETY IN JEOPARDY.		