ROLE OF CEO WITH INTRODUCTION OF NEW TECHNOLOGY

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INTRODUCTION OF NEW TECHNOLOGY

The introduction of new technology is a continuing process within the coal industry. In the main, this process goes relatively unnoticed, so you have to stop and look back at where we were a few years ago to realise how much change has occurred.

10 years ago, 85 tonne capacity overburden trucks were the average, today we are looking at something closer to 180 tonnes. Similarly 10 years ago most underground mines in Queensland operated continuous miners as their main stay production unit, today high production longwalls are the norm. Running along side by side with these changes in productive capacity are ever increasing levels of engineering sophistication in equipment design and control, and in operating requirements. We are evolving from relay control logic to PLC control, and on top of this, there is an ever increasing demand for more and more monitoring of equipment and environment.

In the recent past the first longwall to use a single 4.5mVA transformer substation has gone into production, I am aware of at least two other organisations considering this option. Also in the recent past, the first continuous highwall mining system went into production with a second to follow shortly. In the immediate future the first of a new to Australia coal haulage truck manufactured by Kress will be introduced into an opencut mine.

So the introduction of new technology continues. I have no doubt that methane drainage of underground mines will become more widely adopted, and in opencut mines, continuous highwall mining systems will become more common, to quote but two examples.

It is the role of the Company Executive Officer to ensure that the introduction of this new technology is done in a planned, safe and well managed way. To do this, he/she will need to be sure that appropriate management tools are adopted and that qualified and experienced personnel are available to utilise these tools effectively. One such tool is that of risk management.

THE RISK MANAGEMENT PROCESS

So what do we mean by risk management? As its heart is the risk assessment study which in simple terms is a means of assessing the risks associated with work tasks, processes, equipment, tools and their work environment. This however, does not become risk or safety management until decisions are made and implemented to control or provide barriers to the hazards. The various stages in the risk management process can be seen in Appendix 1.

The risk assessment study can be broken into two parts, in simple terms, these being:- the design of the technology and its use as part of a system. Different processes are usually used for each of these two parts which I will briefly outline.

RISK ASSESSMENT STUDY PROCESS: DESIGN OF TECHNOLOGY

Design risk assessment studies are intended to identify the major contributors to risk and the significant factors involved. They also provide input to the design process. One method of achieving this is to use a process of failure modes, effects and critical analysis.

The first step is to break the new technology into component parts and for each of these to list the failure modes that could occur. The effects that this failure can have on the whole is then determined, rated as to their severity and probability, and finally controls barriers decided. A typical format for presenting this information is shown in Appendix 2.

Where possible, the risk assessment team should consist of appropriate representatives from

- Manufacturer or Supplier
- Company Technical Engineers
- Specialist Technical Engineer (engineering Inspectors, Consultants etc)

RISK ASSESSMENT STUDY PROCESS: USE OF TECHNOLOGY

All of the risk assessment studies that I have been asked to attend were activity based by which I mean that the first step was to identify the various stages involved in using the new technology. This is usually presented as a flow chart with numbered job steps. An example of such a flow chart covering the recovery of a highwall miner can be seen in Appendix 4.

The next step is to then identify what could possibly go wrong at each stage. The various scenarios are then rated as to their probability and consequences, and where necessary existing controls strengthened or new controls/barriers introduced. A typical format for presenting this is shown in Appendix 5.

Where possible, the risk assessment study team should consist of appropriate representatives from

- The manufacturers or suppliers.
- Personnel who have undertaken operations elsewhere if no experience exists at the mine.
- Personnel that will be involved in operations.
- Safety professionals.

THE USE OF RISK MANAGEMENT TECHNIQUES

It is fair to say that since I joined the DME in 1990 that increasing use has been made of risk assessment studies to cover the use of new technology. This type of risk assessment is usually activities based, which most of us would feel comfortable with. In the Northern Division of the DME, I am aware that risk assessment studies have been undertaken on the drift drivages for a new mine, the introduction of a highwall mining system, the introduction of Kress trucks, the use of a raise borer and the installation of a shaft lining.

On the other hand, I have not seen risk assessment studies used extensively as a safety management tool on the design of new technology and this is of concern. In the same time period, I am aware of only one such study, this being the introduction of a new generation diesel engine for use underground. I am advised that in New South Wales a design risk assessment study has to be undertaken as part of the approval process for new technology where that technology is not built to an appropriate available Standard. In addition, it is considered good practice in New South Wales for design risk assessment studies to be undertaken on all new technology. I also would consider this to be good practice. I understand that as a consequence of the New South Wales requirement that some manufacturers of mining equipment are able to provide design risk assessment studies with new equipment to mines in Queensland, but this is by no means every manufacturer and their provision is not generally industry driven. In the electrical area there are some hazards which I feel may have been identified and addressed much sooner if design assessment studies had been undertaken on a routine basis over the past few years. Some examples of these are as follows.

<u>Example 1</u>: On 3.3kV underground substations feeding high powered longwall equipment, some mines are experiencing short circuit failures thought to be associated with voltage transients due to modern switching devices and the type of impedance we use to restrict earth fault currents. While research is currently being undertaken on this problem by SIMTARS to determine its precise nature, the effect has been known for some time. In fact, investigations were done on this problem in the early 80's.

<u>Example 2</u>: As the power requirements of underground machinery has risen so has the energy that has to be dissipated when an electrical short circuit occurs. We usually refer to this as the fault level. Fault levels have in fact risen as shown in Appendix 6 and are expected to continue to rise. They are now at a level where if a short circuit fault occurs inside some of the smaller volume FLP chambers, there is a risk that the integrity of the FLP design could fail.

<u>Example 3</u>: In some opencut mines, substation electrical protection is powered by a battery and relies upon a trip coil being energised to open the circuit breakers. This arrangement is shown in Appendix 7 and represents a hazard as both the battery supply and the trip coil can fail to danger rendering the protection inoperative. This problem has been found on a number of occasions in Queensland, fortunately without major incident, but a New South Wales mine recently destroyed the mine 66kV and 11kV substations when the protection failed to clear a short circuit fault because the battery was faulty.

Example 4: Industrial electrical cubicles should be designed to prevent contact with live parts and contain the energy of a short circuit fault should this occur. The need to protect against a short circuit is often forgotten. I see a lot of electrical cubicles, particularly on imported machines, with areas of open mesh. I also find electrical cubicles with lots of bolts and other type fasteners missing, weakening there resistance to internal fault pressure.

I would suspect that there is likely to be similar examples of this type of hazard in other disciplines, and for this reason I believe that risk management techniques can and should be used to a greater degree than at present on new technology, This is particularly so in the area of equipment design. I would also encourage the application of applying risk management techniques to some of the technology already in use.

SAFETY MANAGEMENT PLAN

From the risk assessment study, a Safety Management Plan can be prepared. There is no set menu for such a document as this can vary with the extent of the application, but we can get a clearer picture of what we mean by a Safety Management Plan if we again look at the example of a continuous highwall mining.

Just as a brief background, highwall mining uses a launch vehicle with a conveyor in its base from which a continuous miner attached to short conveyor sections pinned together is launched. The continuous miner is operated remotely from a control centre using video cameras and penetrates the coal seam from the highwall for up to 300 metres.

In this particular case a new set of rules was devised to cover this type of mining, and these were generally designed to fit in with the way the new Coal Mines Act was going. They where considered to be additional to the Opencut Rules.

If we look at what these Rules said, we can get some insight into a pattern for the future management of safety risks emerging. Relevant sections of these rules are shown in Appendix 8.

The main points I want to make about these rules are that they specified that:

1. A Safety Management Plan must be produced before any mining could take place.

2. This required that a risk assessment study of the mining operations be done.

3. The Safety Management Plan must include (a to g)

It must be remembered that all of the General Rules for opencut mining also apply in this situation so things like training, traffic rules etc were automatically covered elsewhere in the Rules.

If we now look at the content page of an actual Safety Management Plan which is shown in Appendix 9, you will note that this addresses all of the items listed in the Highwall Mining Regulations plus other associated issues.

OUT-COMES OF THE SAFETY MANAGEMENT PLAN

In general the major outcome of the safety management plan is the management of hazards to acceptable risk levels, and this, if done effectively, will go a long way towards adequately discharging the duty of care requirements of the CEO in the new Coal Mining Act. In achieving this, we can also impact upon other aspects of the new Coal Mining Act. Examples are:

1. Modification and design changes, these can be of value in meeting acceptable community standards.

2. Condition of use can be established which can contribute to meeting the Duty of Care requirements of manufacturers.

3. The need for specific Safe Operating Procedures.

4. The need for specific competency and hence training requirements.

NEED FOR ADEQUATELY QUALIFIED AND EXPERIENCED PERSONNEL:

Having chosen the use of risk management techniques as an effective tool for the control of hazards, the CEO will need to be sure that appropriately qualified and experienced personnel are available to utilise this tool. In todays expanding industry, particularly the underground mine area, this may not be as simple as it sounds. It would seem to me that in Queensland we are spreading the total knowledge and experience base over an increasing number of mines. The effect of this being that each mine on average has less.

There also appears to have been a general move to flatter organisational structures with increased individual responsibility for day to day operation. In addition, some mines no longer employ, or have reduced, the level of technically qualified engineers in their organisations.

CEO's must be mindful of the changes occurring within the industry and make adequate provision within their organisations, by recruitment and training of appropriately qualified personnel or by company support of individuals to obtain appropriate qualifications to ensure an adequate level of knowledge and experience and to provide for succession planning. In addition the CEO must ensure that the personnel within the organisation are not so involved with todays problem that they do not have the capacity to effectively utilise the risk management tool.

ROLE OF THE DME

Finally, I would like to say that we in the DME have an objective to keep mines operating safely. We don't want to hinder or cost money. If you intend to introduce new technology, let us become involved at the early stages so that the issues can be discussed and mutually acceptable approaches arrived at before things develop into major problems.

Inspectors generally have no objection to being members of risk assessment teams provided that is is understood that as any decisions made are the team decisions, they do not necessarily represent the view of the individual Inspector or the Department of Minerals and Energy.

APPENDIX 1

ROLE OF CEO WITH INTRODUCTION OF NEW TECHNOLOGY

STEPS 1 - 6	STAGE 1 HAZARD ANALYSIS	STAGE 2 RISK ANALYSIS	STAGE 3 RISK ASSESSMENT	STAGE 4 RISK MANAGEMENT
1. Identification of sources of hazard and their causes	↓	↓	↓	↓
2. Analysis of the mechanisms by which the hazards could occur	↓	↓	↓	↓
3. Analysis of the consequence of the hazard	↓	↓	↓	↓
4. Consideration of likelihood of the hazard and estimation of the risk		↓	↓	↓
5. Judgement of the acceptability of the risk			↓	↓
6. Making and implementing decisions on action to be taken				↓

STAGES IN THE RISK MANAGEMENT PROCESS

(Hawksley 1985)

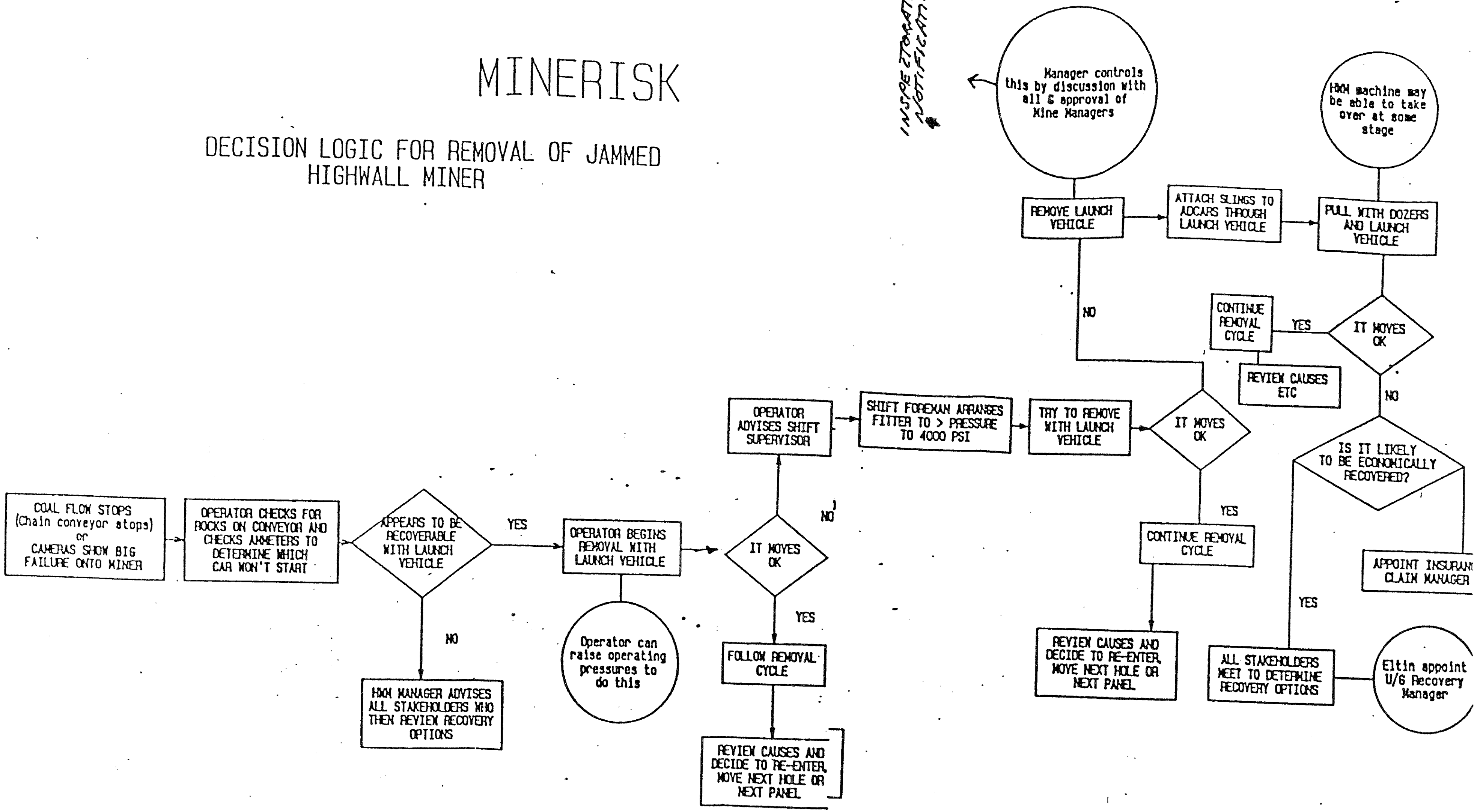
FAILURE MODES, EFFECTS AND CRITICALITY ANALYSIS TABLE

SYSTEM ITEM DESCRIPTION Failure mode	Effects on other system items and the total system (Loss scenariios descriptions)	Rankings S	 P	 Risk	Controls/Barriers/Actions UNRESOLVED QUESTIONS AND ISSUES

APPENDIX 4

MINERISK

DECISION LOGIC FOR REMOVAL OF JAMMED HIGHWALL MINER



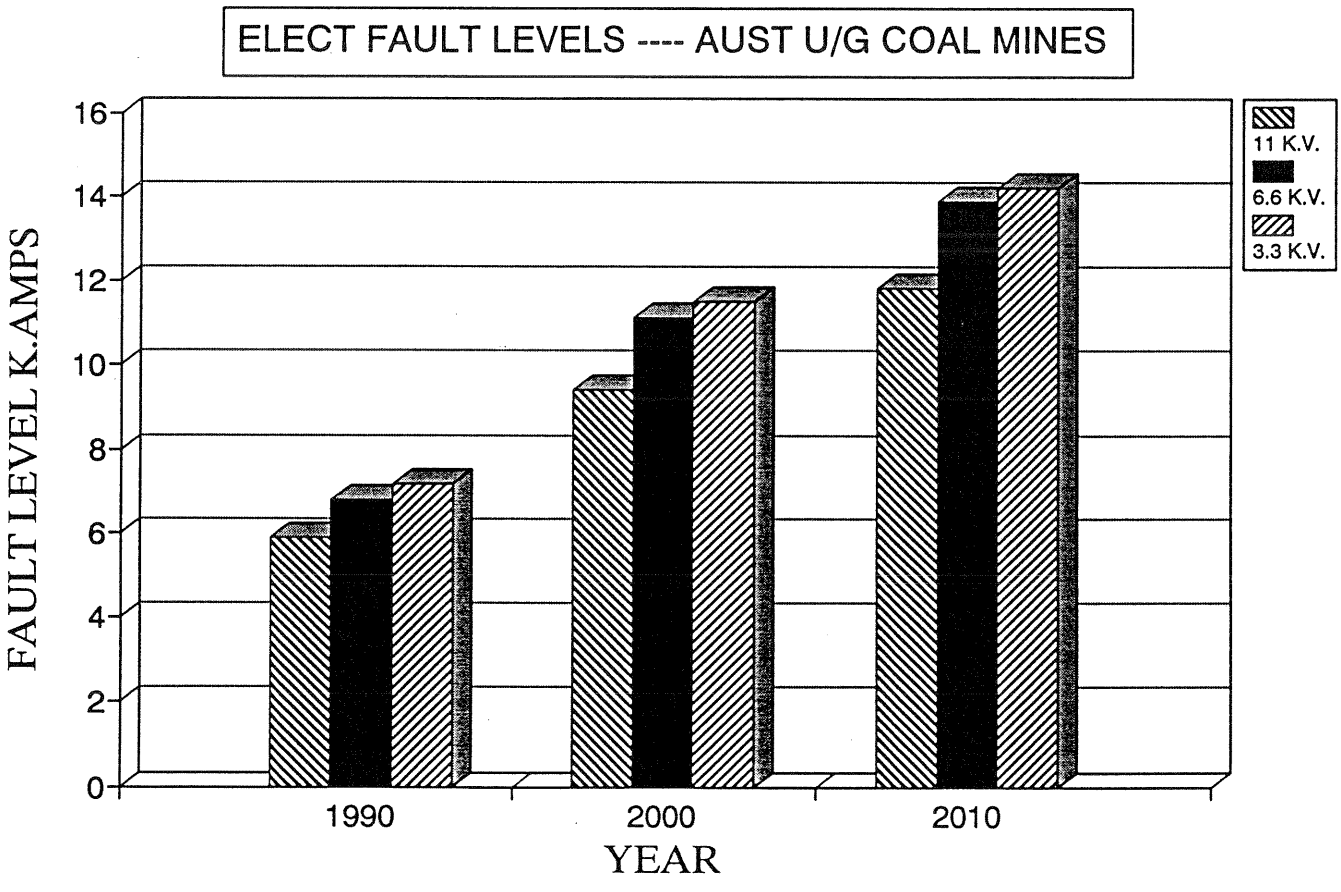
APPENDIX 5

ROLE OF CEO WITH INTRODUCTION OF NEW TECHNOLOGY

JOB STEP	Loss Scenario	Risk Prob	people	property	production	Risk Score	Existing Controls	New Controls Actions

APPENDIX 6

ROLE- CEO WITH INTRO OF NEW TECHNOLOGY

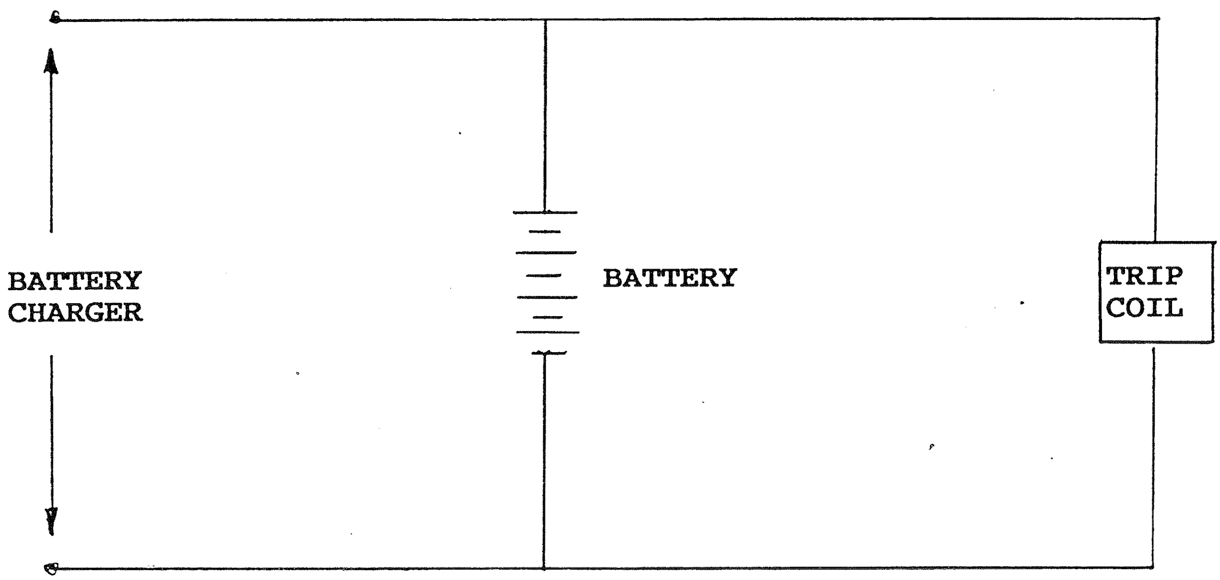


APPENDIX 7

ROLE OF CEO WITH INTRODUCTION OF NEW TECHNOLOGY

ELECTRICAL HAZARD

EXAMPLE 3: BATTERY PROTECTION SUPPLY WITH SHUNT TRIP COIL



APPENDIX 8

ROLE OF CEO WITH INTRODUCTION OF NEW TECHNOLOGY

PART 9 - HIGHWALL MINING

'Highwall mining to be undertaken only in accordance with this Part

'9.1 Highwall mining operations must not be started until section 9.2 has been complied with.

Maximum penalty - 4 penalty units.

'Study to be undertaken before starting highwall mining

9.2(1) The manager of an open-cut coal mine at which it is proposed to start highwall mining operations in a coal seam must -

(a) undertake a risk assessment study of mining operations in the seam; and

(b) prepare -

(i) a safety management plan in relation to the operations; and
(ii) a scheme for the safe entry of persons into the highwall mining excavation for equipment recovery or any other purpose.

'(2) The safety management plan must include -

(a) procedures to control hazards identified in the risk assessment study; and

(b) particulars of geotechnical studies for underground and surface mine design that ensure adequate excavation and highwall stability; and

(c) details of methods to be used to prevent unauthorised persons entering the excavation; and

(d) ventilation arrangements for the control of gas and dust in the excavation; and

(e) procedures to prevent the inrush of gas, water and other substances from old workings or other sources into the excavation or other workings or proposed workings; and

(f) a scheme to ensure that old workings are not subject to spontaneous combustion; and

(g) a description and the specifications of mining machinery to be used in the excavation.

'(3) The scheme mentioned in subsection (1)(b)(ii) must include -

(a) minimum qualifications of persons supervising employees in the excavation; and

(b) attendance requirements for persons supervising employees in the excavation; and

(c) training requirements for employees who are to enter the excavation; and

(d) details of the equipment that may be used by employees and other persons entering the excavation; and

(e) the procedures to be followed by employees and other persons before entering and while in the excavation, including, for example, the procedures for keeping records and making inspection reports.

Maximum penalty - 4 penalty units.

APPENDIX 9

ROLE OF CEO WITH INTRODUCTION OF NEW TECHNOLOGY

SAFETY MANAGEMENT PLAN