

EXECUTIVE SUMMARY

Background

In 1986 the Moura No.4 Underground Coal Mine Explosion cost the lives of 12 men. The Warden's Inquiry (1987) found that the flame safety lamp was the most probable cause of the explosion. In 1989 the Queensland Government decided to carry out further investigation into the incident after new interpretations of the blast and forensic evidence were formally reported to the Chief Inspector of Coal Mines.

A multidisciplinary research team concentrated on forensic and blast evidence and consulted widely with experts in Australia, New Zealand, the United States, the United Kingdom and the Federal Republic of Germany.

It was planned to produce an integrated report with contributions by the members of the project team.

Qualifying Notes

This report consists of work by researchers attempting to use skills and concepts not available to the Warden's Inquiry of 1986. Expert opinions in the three countries visited, without exception, acknowledge that it is very difficult if not impossible to determine the path or paths which the explosion took. The presence of so many 4-way junctions and the unpredictability of the behaviour of explosions when passing along such junctions present a task of major magnitude in attempting to model any explosion, or indeed in trying to decide in which direction the explosion passed through the Moura No.4 Mine roadways.

Recognising the reaction of skilled experienced investigators of coal mine explosions in other countries, it is not surprising that there were difficulties in assembling this report. It is emphasised that individual authors do not necessarily agree with the views of other authors. That will become abundantly evident to the reader and serves to highlight the complexity attached to analysing the available evidence in the network of roadways affected by the explosion. The contributions by various authors have been incorporated in their entirety into this report to give full expression of their views. The only exception to this is modification of the information supplied by the authors to achieve clarity and consistency in the description of various locations at Moura No.4 Mine.

The Re-Analysis

The network of roadways involved in the explosion and consisting of five headings and a number of cut-throughs (c/t) presented a difficult task to researchers trying to trace the direction of explosion airflows. The explosion was initiated in the goaf area or near to it. The void in the goaf necessarily presented another complication in the research into the path(s) of the explosion.

In addition to these factors there is the matter of the caving of the goaf which may have occurred either immediately before or after the initiation of the explosion. Evidence from personnel who were in the Main Dips Section immediately prior to

the disaster indicates that the production crew had no apprehension of immediate danger and the ventilation of the working area was good. The disposition of the face equipment suggests that the crew had made an orderly withdrawal from the working face in anticipation of a substantial goaf fall, immediately prior to the explosion.

The emission of methane was a considerable problem at Moura No.4 Mine and in the Main Dips Section in particular. Methane layering in the goaf area would be normal in these circumstances. In the event of the fall occurring pre-explosion an explosive mixture of methane/air/coal dust could have been created in the vicinity of the goaf as well as within the goaf area.

Various hypotheses have been thoroughly examined in the course of this project in the belief that conclusions drawn from the research would be of benefit to the mining industry in the future. Specifically the work could assist in improving mine design and operation. Should such a disaster occur in the future engineers and scientists would be able to ensure a thorough investigation so that the cause of such an event could be determined beyond doubt.

Whilst the flame safety lamp was considered the probable source of ignition there remained concern that the impact of rock on rock or rock on steel may have provided the ignition source. Because of this concern reports of earlier disasters overseas have been examined and are discussed in Chapter 4. It has to be borne in mind that in these reports, frictional ignition from rock impact was stated to be the likely or probable cause. There is no clear evidence that it was the cause of ignition in any of those explosions. It is also noteworthy that in the past thirty years ignition from the impact of rock on any material has not been viewed as a likely or probable cause by inquiries into coal mine explosions. During this period techniques for investigating mine explosions have been improved and this may have enabled conclusions to be drawn regarding the source of ignition.

Precis of Findings

1. Forensic Pathology and Modelling

These have potential for assistance in determining the path of an explosion and therefore its origin. Modelling has not yet been developed to the degree where it can replace full scale gallery testing. This is certainly true of the Moura No.4 Mine incident. The hypotheses on which re-analysis was attempted in this project have not been sustained.

2. Source of Ignition

The work carried out has not resulted in any better understanding of this. It is still not possible to confirm or deny that the safety lamp was the source. However it can be stated that testing at SIMTARS has shown that the damage to the Moura No.4 Mine safety lamp gauzes could not have been caused by heat from a source external to the lamp. This project has not produced any evidence to challenge the Findings of the Mining Warden's Inquiry.

3. Structuring of Future Investigations

There is a need for more thorough investigation involving experienced mining/electrical/mechanical engineers together with scientists with experience in blast/flame/dust and air sampling and analysis/forensic science and pathology. Laboratory services need to be immediately available. The results of the investigation should be assembled by the Chief Inspector of Coal Mines for provision to the Mining Warden's Inquiry.

4. Liaison

The Chief Inspector of Coal Mines should establish liaison with Police and Health Departments as well as SIMTARS. Personnel in those organisations together with the Coal Mines Inspectorate should be prepared for any future mine explosion investigation. The role of mining companies and union representatives is of course already defined in practice but these parties must be made aware of liaison established by the Chief Inspector of Coal Mines.

5. Facilities for Forensic Pathology

These are required either at regional centres or in Brisbane.

6. Protection of Life

The hazard of ignition/explosion can be eliminated by the removal of one of the conditions requisite to such an event. This can be achieved by inertisation or preventing ignition. The work described in the report has again highlighted the need for preventive measures to be adopted and priority needs to be given to these. Ongoing research priorities are goaf inertisation and the elimination of frictional ignition by machines.