



PHOTO. COURTESY , KALGOORLIE MINIER.

PIT WALL SAFETY

Over the last year at least 20 separate major wall failures have occurred in Western Australian open pit gold mines. Recently publicised examples have included the Paddington, Horseshoe Lights, Telfer, Eureka, Lady Robinson and Try Again pits.

Apart from the major safety hazard to personnel working in the pits associated with pit wall failures, substantial financial losses from lost production are incurred by these mines. To date no one has been seriously injured by collapse, although a number of near misses have occurred, and several instances are on record of machinery being buried.

Over the past twelve months the Mines Department has been thoroughly examining the question of pit stability especially as it relates to operating safety. Joint studies have been formulated by the Mining Engineering and Geological Survey Divisions to ensure that the issue has received maximum attention.

Specialist geotechnical advice is provided to the Mines Inspectorate by the Engineering Geology sub-section of the Geological Survey, headed by Dr Chris Swindells. Both Chris and Chris Orr, another engineering geologist with the Geological Survey, have been able to use this specialist advice in assessing open pit and underground mine designs and studying the factors that control pit slope stability.

The results of these studies have shown that many of the failures have resulted from inadequate recognition of geotechnical factors in pit design.

Statistics obtained from a random sample of 54 operating gold pits in the Murchison, Yilgarn and Eastern Goldfields areas have shown that:

- * only 20% of the pits had performed geotechnical investigations prior to mining
- * of the remaining 80 per cent that had no geotechnical work carried out, half had suffered major wall failures during their mining life.

Simply speaking, the statistics show that there is a 50/50 chance of a pit experiencing a major wall failure when the geotechnical factors influencing wall stability are ignored.

Poor stability conditions during the operation of a pit wall also affect the long term behaviour and the safety of the pit in the future, once mining has ceased. This

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The Kalgoorlie Inspectorate: May 1990

L-R (Standing) F Strauss, M Golinski, D McGowan, R Leggerini, R Stracham, M Cannon, D King, P Wade

L-R (Seated) D Hall, K Biegaj, L Mahajan, J Boucaut, P McGushin, P Charman

Absent: D Ennor, M Sakowski

There is a big job to do in the Kalgoorlie Inspectorate, and doing it well is the goal of Regional Mining Engineer, Jim Boucaut and his team.

The Inspectorate stretches from Wiluna in the north to Esperance on the southern coast, and from east of Southern Cross to Loongana on the transline. This massive area, dotted with mines, is the responsibility of just eighteen people. It is difficult for anyone not directly involved to appreciate the scale of the task and the diversity of the work assigned to these Inspectors.

At the present time, there is a heavy concentration of mining activity within 100 kms of Kalgoorlie, but outlying mines can be located many hundreds of kilometres away. For that reason each district engineer has remote mines assigned to his district so that the extended week long inspection trips are shared among all the engineers.

The Inspectorate is managed by dividing the area into four districts each under the jurisdiction of a district mining engineer. For the purposes of allocating the work of the remaining inspectors, the districts are paired, and a ventilation officer and Machinery Inspector is assigned to each pair. Specialist personnel such as the Mechanical Engineer and environmental officer and two Workman's Inspectors cover the whole Inspectorate.

Earlier this year the Yilgarn field was transferred to the Perth Inspectorate to balance the work load more evenly. The underground mines in the Eastern Goldfields require proportionally more inspection time than the numerically greater open cut sites, and the transfer has assisted in ensuring that the necessary attention can be spent on underground inspections.

Technical assistance is available to the Kalgoorlie office from Perth based specialists, many of who are also statutorily appointed inspectors in specialised fields. The Chemistry Centre of (WA) which is a Division of the Department of Mines in Perth also has a laboratory in Kalgoorlie which services the Inspectorate and Industry.

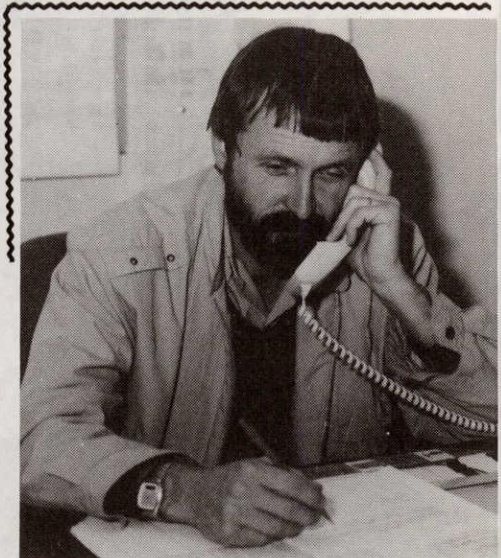
The Kalgoorlie inspectors like being where they are. Life at the sharp end is challenging, and most are not keen to move on to St George's Terrace - at least not yet.

Like all Inspectorates Kalgoorlie is more concerned with prevention rather than reaction and consequently, do not welcome the uninformed perception of their roles as "Policemen". As educators and trainers they can make positive and long term contributions to solving the problems of mine safety.

All agree that maintaining the delicate balance between Advisor and Government Official is not easy - particularly in a close knit mining community.

For the law to work, there must be a common commitment to high safety standards between the Inspectorate and all levels of a mining enterprise. For it to work in an effective preventative role, there must also be trust and a mutual understanding in a very complex industry that overcomes the problems of distance and often, a lack of resources.

The Kalgoorlie team are obviously well known to miners in their Inspectorate, but its time we made some of them known to the rest of industry:



Jim Boucaut

Jim has been with the Department since 1980, and spent nearly five years in Karratha as a District Inspector before transferring to Kalgoorlie in 1984. He was appointed Regional Mining Engineer/Senior Inspector of Mines (Kalgoorlie) in December, 1989.



Kris Biegaj

Like Jim, Kris came to Kalgoorlie from the Karratha Inspectorate and he has been a District Inspector at Kalgoorlie since August 1989. Kris is originally from Poland, and worked there in both copper and coal mines. He gained underground experience here at Kambalda Nickel Operations before joining the Department of Mines in February 1987.

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EDITORIAL

Every miner in Western Australia needs to be concerned about the negative image of the industry being projected by critics of the Resource Sector.

We work in an industry that provided \$9.3 billion to the State economy and 60% of our exports during 1989. It is an industry that employs either directly or indirectly, over 140,000 Western Australians. Translated into real terms, the figures mean that each and every miner influences how nearly every other Western Australian lives. Miners are making it possible for most people in this State to enjoy high standards of living and enviable lifestyles.

Mining made this State, and it is difficult to imagine that the influence of mining would ever cease to matter to our quality of life.

The mining process affects almost every facet of daily living, either directly or indirectly. Construction, manufacturing, transport communications and public utilities incorporate minerals as basic components. Everyday products at home and in the workplace are taken for granted but most exist because of the mining process.

Miners can be the Industry's best public information officers, and mining can benefit if individuals share their knowledge with people outside the industry.

Advocates from all sectors of the industry are spending a good deal of time, energy and money on information campaigns, and their efforts need to be supported by individuals. The public need to have the facts about mining. Miners are the best people to tell them.

CONGRATULATIONS !!!

Employees at Kambalda Nickel Operations Long Shaft Underground operations have accumulated a total of 221,000 man hours without a lost time injury, easily beating the previous site record of 135,000.

The Thiess Contract mining at the Darlot mine have also achieved 60,000 man hours worked without a lost time accident.

Just the kind of good news Mining Engineering personnel wish to hear!

MAILBAG

GUIDELINES FOR SHOTFIRERS PERMITS

MINESAFE VOL. 1 NO. 2

Please explain the other rules for: "Shotfirers permits are not required by persons using explosives on a mine; other rules apply".

Thank you for your interesting Publication

Dieter Burmeister
Mt Magnet

The Explosives and Dangerous Goods Act and Regulations control the importation, manufacture, conveyance, storage, sale and, at places other than minesites, the use of explosives throughout Western Australia. Shotfirers permits required by these regulations are issued by the Explosives and Dangerous Goods Division.

The use of explosives in mines and quarries in Western Australia is controlled through the Mines Regulation Act 1946-1974 and Regulations. A person using explosives on a minesite does not require a Shotfirers permit but must comply with Regulation 7.15(1) which states "A person employed in a mine shall not charge or fire explosives or blasting agent unless he has satisfied the owner, manager, foreman or supervisor by a practical test that he is competent to do so". It is the obligation of the manager to enforce the regulations applicable to the mine under his charge.

Copies of the Mines Regulation Act 1946-1974 and Regulations are available from the Department of Mines in Perth or the regional centres.

Editor

REMINDER AXTAT MONTHLY STATUS REPORT FORMS AXTAT COMPETITION

We notice that some companies are falling behind with their AXTAT Monthly Status Report Forms.

For the first fifty companies completely up to date, we will send you one years free subscription to the "Minesafe Newsletter", plus one years supply of Monthly Status Report Forms!

HAZARD DATA SHEETS

There appears to be a lack of understanding in the industry about the use of hazard data sheets.

There needs to be ongoing education programs involving everyone in industry so that these products can be used confidently and safely.

Bruce Roberts
Collie

Employees should ensure that no substances are purchased and used without toxicological data sheets being supplied with the product.

The data sheets should be posted, and the information available to all potential users.

The sheets should include information about the chemical composition, directions for use, including any precautions and procedures to be followed in case of accident.

The General Duty of Care Amendments to the Mines Regulation Act and the Coal Mines Regulation Act will include clearly defined responsibilities of both Employers and manufacturers with respect to hazardous substances.

Editor

DOES EVERYONE ON SITE HAVE ACCESS TO MINESAFE? ORDER MORE COPIES BY PHONING (09) 222 3436 OR CONTACT YOUR LOCAL INSPECTORATE. KALGOORLIE (090) 213 066, KARRATHA (091) 868 243, PERTH (09) 222 3132, COLLIE (097) 341 222



Induction training is the cornerstone of risk management programs at Western Mining's Leinster Nickel Operations.

Resident Manager, Rob Dennis, heads a direct line management chain which actively promotes the idea that the best safety officers are the employees themselves. Achieving the right attitude towards safety is a process which begins even before the employees (a high percentage of which are contractors) arrive on site, and it is consolidated at induction.

Well before the potential employee obtains the required site clearance for the mine, the Contractor is aware that his employees will be required to attend a basic safety induction course before beginning work. The one day basic induction is funded jointly by the Company and the Contractor.

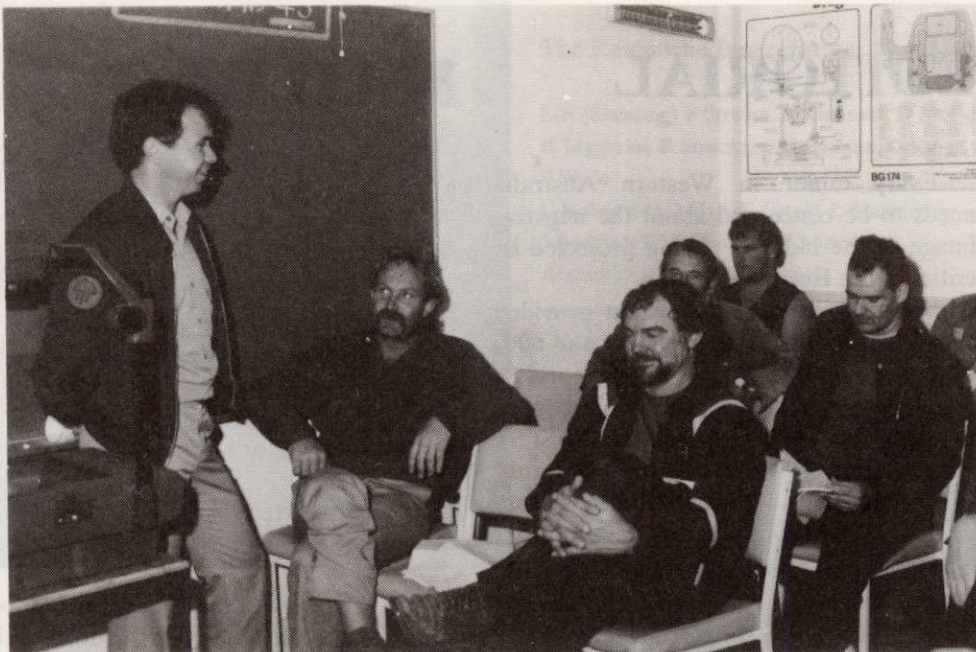
Each employee must also confirm in writing that he is competent to do the nominated job and that he holds a Mine Worker's Health Certificate, and if applicable, a current driver's licence. They must also confirm that they understand and will comply with company safety procedures, which include a high standard of working practices.

While this preliminary procedure ensures a smooth transition into the workforce, it also conveys a much stronger message - Safety consciousness is an integral part of the working process at L N O and working there requires a personal commitment to safety.

The induction process re-inforces the preliminary commitment. A general safety induction is followed by site specific safety training which includes issuing everyone with colour coded identity badges that are currently valid for 12 months. The colours indicate the type of induction undertaken, and are a simple, inexpensive and effective means of ensuring personnel do not enter areas with which they are unfamiliar. The system will be reviewed as requirements change.

The Company does not tolerate a casual attitude to any aspect of safety and emphasises this by not accepting latecomers to any induction class. Late arrival results in a 48 hour wait until the next session on that particular area.

At induction, employees are made thoroughly familiar with Leinster Nickel Operations safety policies, and the personal responsibility of each employee is explained. The sessions are confined to general safety across the minesite for the first two hours and specific departmental



Induction Session - Leinster Nickel Operations

safety rules are explained in the following two hours. Every employee is issued with a general safety manual, and a specific departmental safety manual. Employees are also asked to sign a form stating that they have read and understood the manuals.

The Company makes it very clear that the initiatives supplement the requirements of the Mines Regulations Act and Regulations, and while the programs are still being developed, they demonstrate that the company is on the right track.

The most striking feature of the induction process is its basic simplicity, based as it is on common sense and the willingness of employees to be accountable for their own safety. It is successful

because employers and employees recognise that regulations and rules can only be as good as the level of commitment from everyone concerned.

At Leinster they think safety, and the program of induction procedures, training and induction is starting to pay dividends for both the company and the employees.

The Leinster philosophy is one that can be adopted by any organization and is particularly relevant to company's who employ a large number of contractors, or who do not have the extensive resources of big organizations at their disposal. True, the Leinster operation is a part of a major mining house, but this program was developed on site to suit this mine, and as such it is an individual initiative that is worthy of imitation.



Decline Entrance - Leinster Nickel Operations

YOU WANTED TO KNOW....

MINE WORKER'S HEALTH CERTIFICATE

Q: *What is it?*

A: A Mine Worker's Health Certificate is a health certificate required by the Mines Regulation Act. It verifies that the holder is medically fit for employment as a mine worker, and does not suffer from either active pulmonary tuberculosis or from pneumoconiosis.

Q: *Who needs one?*

A: Every person employed in a mine or mining operation. The necessary medical must be had within 3 months of the date that the person began work at any mine.

Q: *Why do I need one?*

A: The competently performed medical examination will ensure the potential employee is not a health risk to himself or fellow employees.

Q: *What do I need to get one?*

A: . A medical report by a registered medical practitioner certifying the applicant's fitness to work in a mine.
. A chest x-ray processed by the Perth Chest Clinic (A and B Class mines only).
. An entry audiogram.

Q: *What next?*

A: Both the medical report and chest x-ray are to be presented to the Mines Medical Officer for assessment. John Masters (Mines Medical Officer) Perth Chest Clinic, 17 Murray Street, Perth. Ph (09) 325 3922.
When either of the two is missing or misplaced, delay will be inevitable.

Approved Mine Worker's Health Certificates are sent directly to the employer.

It is the employers responsibility to ensure that the certificates are completed and returned to the employee on leaving the mine.

It is also in the employees interest to make certain that they receive their Medical Certificates before they leave and present it to their new employer.

Q: *When do I renew?*

A: Renewal of Mine Worker's Health Certificates are required after 2 to 5 years depending on the class of mine.

Q: *What do I need to do?*

A: Persons are only required to undergo a chest x-ray. This must be presented to the Mines Medical Officer accompanied by a statement that the person is a current certificate holder and preferably with the Mines Number.

Note to employers: Advisory letters of intended visits by the Mobile x-ray unit, are sent to the mine in advance.

To accomplish a successful visit, Managers are urged to co-operate and ensure that all employees who require to have x-rays be prepared and available when the mobile unit visits the mine.

REFERENCES FOR FURTHER INFORMATION

Part 9 of the "WA Mines Regulation Act 1946-74, and Regulations".

John Masters (Mines Medical Officer) Perth Chest Clinic, 17 Murray Street, Perth. Ph (09) 325 3922.

Q: *There have been a number of articles in the press recently concerning the radioactive gas Radon which supposedly originates naturally from soils and rocks. How can I tell if there is Radon in the air and have there been any test for the levels of radon in mines?*

A: Radon is a colourless and odourless gas, that can only be detected by use of specialized detection equipment. However, the concentration of Radon is easily controlled, by ensuring that workplaces are adequately ventilated.

The Mines Department is currently conducting a research program aimed at evaluating the concentrations of Radon (and daughter products) in underground mines. The program, representing a joint effort between MED, Curtin University and the Chamber of Mines is due to conclude in December this year.

A preliminary survey, conducted at sites in the Goldfields area has found that the concentrations of Radon and its daughter products are minimal, and represent a very low health risk to workers.

For more information regarding the research project call Stuart Evans on (09) 222 3651.

MINESAFE INTERNATIONAL 1990

Minesafe 1990, an International Conference on Occupational Health and Safety in the Minerals Industry, is being held in Perth from the 10th to the 14th of September.

The conference papers will focus on "Future Perspectives in the Minerals Industry" and is being organised by The Chamber of Mines and Energy of W.A. and is co-sponsored by The Australian Mining Industry Council, The National Occupational Health and Safety Commission and the Department of Mines of W.A.

For further information, contact:

Mr Pat Gilroy, Conference Secretary
Minesafe International 1990
The Chamber of Mines and Energy of WA Inc
7th Floor, 12 St Georges Terrace
PERTH WA 6000

Phone: (09) 325 2955 Fax: (09) 221 3701

BLASTING FUME HAZARDS IN UNDERGROUND WORKINGS

In the course of the recent Inquiry into Safety in Underground Gold Mines it became apparent that although miners are aware that some residual gases from blasting are toxic, many do not fully comprehend the types of gases and their effects. Some had confused asphyxiation due to lack of oxygen with the poisoning effect of toxic gases.

This was further underlined at the inquest in late June into the death of a miner who entered a rise which had not been ventilated since blasting on the previous day.

An important characteristic of any underground mine is that it is a closed environment and therefore a system has to be designed, installed and operated so that all workplaces are continuously ventilated. Rises are a particular case and rise ventilation will be given emphasis later in this article.

After any blast a range of atmospheric contaminants is produced including:

- dust
- water vapour and aerosols
- carbon monoxide (CO)
- carbon dioxide (CO₂)
- nitrous gases, chiefly Nitric Oxide (NO) and Nitrous Oxide (NO₂)
- ammonia (NH₃)
- mixtures of nitrogen carbon, oxygen, hydrogen, etc as organic complexes.
- nitroglycerine remnants (if gelatinous explosives are used)
- sulphur dioxide (SO₂) in some cases.
- hydrogen sulphide (H₂S) in some cases.

Normally these residual products are dissipated rapidly by the installed ventilation system, as access to the workplace is required within 40 to 60 minutes after blasting at most multishift operations.

Where a heading has not been ventilated after blasting for any reason, no entry should be made until adequate ventilation has been restored; (Regulation 8.25).

In addition to the normal visible indication of dust haze, aerosols, and vapours, there may be evidence of NO₂ as a reddish brown vapour. Other products may be generated in the blasthole itself due to reaction of minerals in the ground to the high temperatures and incredibly high pressures,

(thousands of atmospheres), which are developed instantaneously when the explosive is detonated.

Much of this visible evidence will diminish with time, but the characteristic smells will remain. Where rock has been blasted, particularly in development headings and stopes, fumes, vapours, and residual solids remain trapped in the muck pile and will be absorbed to some extent when the area is watered down. Further release takes place when the muck pile is disturbed in loading out.

Miners accustomed to using gelatinous (nitroglycerine based) explosives such as A N Gelignite 60, will be only too familiar with the residual fumes which it produces. The very widely used blasting agent ANFO is designed to produce a "balanced" explosion at 6% fuel oil by weight, but this is rarely achieved in practice due to oil migration and loss from the prill, and different mixes of fumes result.

In some situations, particularly where an area is not re-entered for a shift or two, the dust and aerosols may disperse or settle, and some more soluble gases such as NO₂, may become dissolved in water.

Carbon monoxide presents the most insidious danger as it is tasteless, colourless and odourless and is lighter than air and will therefore remain in high sections such as the top of a blind rise heading. This gas can be lethal in a relatively short time in concentrations as low as 0.1%.

Carbon dioxide is an asphyxiant, in that in addition to its adverse physiological effect on the respiratory system, it may displace oxygen to sufficient extent to cause unconsciousness or loss of life. Its presence in the atmosphere at levels of a few percent can cause distress and a faster breathing rate.

This reaction is a natural bodily function, as it is the build up of CO₂ in a person's lungs which maintains the breathing process. The compelling urge to exhale after holding the breath is due to this reaction. The effect becomes dangerous at higher levels of CO₂ concentration.

Nitrogen dioxide (NO₂) is a powerful irritant which attacks the lungs. There may be a delayed reaction up to 72 hours after exposure, with fluid build up in the lungs.

For this reason, persons who are affected by fumes to the extent of requiring resuscitation or medical attention, should be placed under observation in hospital for at least 24 hours.

Ammonia also has a strong irritating effect on the breathing system and the eyes.

The nature and effect of the gases likely to be found after blasting are summarized in the table on page 10. With the exception of NO₂ and SO₂, most of the effects are transient at low to moderate levels of exposure.

Rise Ventilation

There are particular problems with rise ventilation and these are mainly related to blind rises.

Rises driven on a pilot hole (including gig rises) are easily and effectively ventilated through the borehole, and present no problem with correct operating practice. This also applies in the case of ALIMAK rising, where there is installed air/water flushing in the ALIMAK climber rail to within 2 or 3 metres of the face.

In blind rises, the common practice has been to maintain a dedicated steel pipe of 25mm diameter fixed to the rock at intervals, through which the rise is ventilated with compressed air. By the use of a 'Y' piece, a combined compressed air/water blast is applied after firing. This method has proved over many years to be a simple and reliable method for removal of blasting fumes, but care still needs to be exercised. The end of the pipe must be kept close to the face to allow the air jet to sweep CO out effectively, as it is lighter than air and accumulates at the face itself.

A 25mm compressed air pipe is sufficient to sweep blasting fumes out of the small cross section of rise normally driven off ladders; (normally 1m x 1.2m up to 1.3m x 1.6m). In larger rises it is possible to instal metal vent duct or to pull a fabric duct up into the rise. Some mines have run PVC pipe of 150mm diameter on brackets on the hanging wall to which is attached a low volume high pressure fan. In such cases the 25mm steel pipe is still useful, particularly for the air/water blast function. Moreover it is generally less prone to damage than the PVC pipe.

Wherever possible, however, ducted ventilation must be provided, in addition to the compressed air pipe.

The compressed air pipe should be left running prior to and after blasting. The air volume can be reduced if the job is to be left for one or two shifts before re-entry, provided that full flow is used for an adequate period on the shift when the miner returns, and before he attempts to enter the rise. Air/water blast should be applied at this time. Apart from washing down dust and dissolving any soluble fumes, the water blast and water return helps to dislodge any loose rocks in the rise face area in particular.

The control valve must be located in a fully ventilated area, as required by Regulation 8.24(3).

Fume clearance of the rise by compressed air should be relied upon only for the length of the small cross section of the rise. If the rise develops into a larger area at the access and there is no through flow ventilation, then a fan and vent ducting must be used to sweep away rapidly the fumes which have been displaced from the restricted rise opening by compressed air. This will ensure rapid clearance of fumes in the minimum time. The compressed air pipe cannot deliver enough volume to generate a

REPORT ON THE INQUIRY INTO SAFETY IN UNDERGROUND GOLD MINES IN WA

SUMMARY OF RECOMMENDATIONS

EXAMINATION OF THE MAJOR ISSUES

The Mines Regulation Act and Regulations.

We recommend:

that management across the industry make a commitment to maximise the comprehension of the Mines Regulation Act and Regulations, and in particular the amendments to incorporate the OHSW provisions Parts III & IV, throughout the workforce;

that the Chamber of Mines & Energy and the Inspectorate, in conjunction with the Australian Workers' Union and other involved unions, arrange for appropriate regional seminars and on site presentations throughout the gold mining sector to ensure that awareness and understanding of the legislation becomes thorough and widespread as rapidly as possible after its enactment;

that consideration be given by the Chamber of Mines & Energy, the Inspectorate and the Australian Workers' Union, to the establishment of a joint body to review proposed changes to underground mine safety regulations on an annual basis;

that mine employers and Registered Managers review critically the procedures in place for the management of safety performance and compliance with mine safety legislation by contractors employed on their operations;

that consideration be given by the Chamber of Mines & Energy to producing a guideline or code of practice aimed at ensuring a uniform high standard of safety performance by contractors employed by the gold mining industry;

Interaction with the Inspectorate

We recommend:

that Mining Inspectors with the full co-operation of management of mining operations, maximise the opportunity for regular informal contact and consultation with individual members of the workforce, and with work groups, as well as with union and health and safety representatives;

that the Regional Inspectorates take the opportunity of participating in joint safety meetings on mine sites on a regular basis, if necessary in rotation on the larger sites;

that the Regional Inspectorates arrange for periodic informal meetings with groups of workforce representatives for the purpose of general liaison;

General Observations on the Inspectorate Operation

We recommend:

that the highest priority be given to providing approval for the appointment of the necessary inspectorate staff, (adequately qualified and experienced District Mining Engineers and Workmens' Inspectors of Mines), and allocation of operating budget to ensure that adequate financial resources are provided to enable the level of

inspection services and administrative back up, including data distribution and training and development initiatives, may be maintained and expanded;

that so far as practicable, the Mining Engineering Division, through its Inspectorate, conduct a formal audit of each underground mine on an annual basis, to a format developed in consultation with industry participants;

that each mine commits itself to implementing recommendations arising from the audit;

The Common Law Duty of Care

We recommend:

that management regularly review systems of work and design and application of plant and equipment to ensure that the best practicable and economic approach is taken, over and above the requirement to meet the minimum standards of the regulations;

that management consult with health and safety representatives where intended changes to plant and equipment used at the workplace may reasonably be expected to affect the health and safety of the workforce.

Provision of Information and Use of Data Bases

We recommend:

that the Mining Engineering Division Inspectorate continue to develop and extend the use of data bases and published safety material to generate a high level of operating safety awareness in the industry, and that adequate funding for this essential service be specifically identified as of the highest priority in the Division's annual budget;

that the published safety material provided by the Inspectorate, the Chamber of Mines & Energy and other bodies be distributed as widely as possible and that effective use of it is made at all levels, in particular by safety representatives and safety committees;

that particular effort is applied to the effective use of the AXTAT system in the operation of safety management programmes at all mines;

Management of Safety Programmes and Development of Systems

We recommend:

that the Chief Executive Officer for each mine or mining group review critically the safety policy and management systems at all operations under his control and ensure that the clear commitment of himself and the management of those operations to safe performance is documented, promulgated and implemented;

that mine management review existing induction programmes and ensure that they are commensurate with the nature and scope of the mining operation, and that their effectiveness is regularly monitored in consultation with the workforce;

that mine management place the highest priority on the implementation of structured training programmes, particularly for underground workers, and ensure that these include an adequate level of documentation in the form of standard work procedures and equipment operating manuals;

that mine management apply particular emphasis and effort to training and development in management skills for front line supervisors and that forward planning of supervisory requirements accommodates the time requirements for this to be accomplished;

that the industry, through the Chamber of Mines & Energy, afford the highest priority to the framing and subsequent implementation of modular training programmes for mine operations, with first priority allocated to the underground mining and supervisor training sections;

Formal Accident Investigation and Accident Prevention Programmes

We recommend:

that mine management ensure that formal accident investigation and accident prevention programmes are established, that line managers and supervisory staff are formally trained in the operation of the systems, and that the Registered Manager reviews critically each report and ensures the implementation of necessary remedial measures;

Joint (Consultative) Safety Committees

We recommend:

that where joint (consultative) health and safety committees are established, whether formal and structured or informal, management and the workforce maximise the opportunity that this system provides for open and constructive consultation on all major issues;

that all necessary information, technical and statistical data and resources necessary for its effective performance is made available to the committee;

that at the commencement of such committees the terms of reference and mode of operation are fully understood and agreed, and the pitfalls which may lead to failure of performance are identified, discussed and avoided;

that training courses in occupational health and safety for health and safety representatives should be established by consultation between management and unions or general workforce representatives, and that the courses be conducted with joint participation by management and union and workforce;

that the health and safety training courses should be tailored to suit the mining industry sector, with, where necessary, elements specific to the particular mine or enterprise and that such courses should be provided in regional centres of the State;

that mine management regularly (at least yearly) arrange for a formal audit of the safety management system by persons independent of the chain of operating responsibility, whether in-house or external to the company;

that the Registered Manager and the Chief Executive Officer review critically the results of the audit and agreed on necessary remedial action;

that audit results are considered by joint health and safety committees;

The Workplace

We recommend:

that mine management examine and review carefully their supervisory structure, in terms of experience, training and competence and ensure, so far as practicable, that salary and conditions are such that persons of adequate calibre can be recruited and retained;

that mine managers avoid the temptation to overcome the difficulty of recruiting shift supervisors by the employment of too high a proportion of trainee mining graduates in this role;

that managers ensure that the supervision of the mine is structured and staffed so that in addition to meeting the statutory requirement for workplace visits, time is allowed for assistance and instruction to crews having difficulty with a job and for training of less experienced persons in tasks;

that management and supervisory staff keep under review situations where men work alone in terms of supervision and communication; particular attention is required to the workplace and the training, experience and work practices of those men required to work alone;

that mine managers ensure that primary ventilation requirements are given priority in the planning and design stage of projects and in particular that flexibility is built into the plan;

that the important health and safety aspects of practical mine ventilation are clearly communicated and given heavy emphasis during induction and training of new employees, and that existing employees are given refresher training;

that mine management ensure by training and induction and by vigilant supervision that the critical function of maintaining safety in the workplace by continued regular scaling and checking is performed to the highest standards;

that the necessary equipment of adequate quality is provided and kept on the job and that work practices are regularly reviewed;

that mine management examine carefully work practice, control systems and equipment design in relation to drilling and blasting and ensure that their mining operations comply with all relevant regulations and can stand close scrutiny under the common law duty of care;

that a joint working party be established (AWU, Mining Inspectorate and Chamber of Mines & Energy) to frame requirements for blasting certifications, both underground and open pit;

that mine management and supervision review critically the standards of construction and conditions of ladders and ensure that both statutory requirements and common law duty of care expectations are met or exceeded;

that mine managers ensure that underground route and locality marking be maintained to the highest practicable standard, and that effective distribution of current locality and level plans is made;

that mine management continue to seek engineering solutions to the ambient noise problem, and adopt a policy of giving preference to noise attenuated equipment of equal merit in technical design and performance;

that mine management direct attention to the appropriate design and operation of vehicles used in underground personnel transport;

that mine management examine carefully the implications of present personnel check procedures and their effectiveness with a view to providing maximum control and protection to all personnel required to work underground;

that regulations for systematic recording and control of personnel working underground be devised and implemented as a matter of priority;

SPECIFIC ISSUES

Mine Ground Support

We recommend:

that mine management review and examine carefully the practices, policies and procedures for ground support at their operations and ensure that sound and practical principles of geomechanics are followed;

that mine management ensure that ground support principles and appropriate methods and practice are included in induction and training programmes and that supervision ensures a high standard of performance and quality control in the execution of the work;

that close attention is paid to ground support standards during safety audits and appraisals, with regular attention given by Underground Managers and Registered Managers to these aspects;

that the industry through the Chamber of Mines & Energy and Tertiary Education Bodies, ensure that a high level of geotechnical training is established as a specialist discipline and as substantial elements of qualifications for mining engineers and structural geologists;

Vertical Opening safety Practice

We recommend:

that mine managers review critically the nature and extent of hazards associated with vertical opening practices in the mine, and ensure that design, construction and operating procedures are in place to manage the risk;

that mine managers ensure that vertical opening hazards and associated safe practices are thoroughly covered in induction and training;

Proximity of Mining to Old Workings

We recommend:

that mine managers examine carefully the potential hazards presented by proximity to or encroachment upon old workings and that procedures are established and promulgated for the safe management of the risks identified or suspected;

Safety in Shaft Operating Practice

We recommend:

that mine management review very carefully all operating shaft practices and standard procedures and ensure that experienced shaft operating personnel are consulted in this process, that standard, non-standard and emergency procedures are clearly posted and understood and that these procedures are thereafter regularly reviewed and re-iterated - nothing in relation to shaft practice can be taken for granted;

that a thorough understanding of shaft operating procedures and the attendant hazards is incorporated into induction and training for all underground personnel;

that particular attention is paid to training and operating practices for winder drivers and shaft platmen, bracemen and skipmen, and that winder drivers are kept fully informed on a shift by shift basis, of non-standard activity;

Emergency Preparedness

We recommend:

that Chief Executive Officers and mine management review critically the state of emergency preparedness (in particular response capacity) at all mines under their control and ensure that they are adequate;

that Chief Executive Officers ensure that statutorily responsible mine managers are not compromised in terms of their responsibilities by deficiencies in resources due to perceived budget constraints;

that mine management ensure that all personnel are trained and instructed in emergency response and fully comprehend procedures and their roles as individuals;

that the Chamber of Mines & Energy continue with its co-ordinating role to improve the level of standards and the aggregate capacity for emergency response in the industry;

that mine managers take all possible measures to establish credible and effective mine rescue teams for underground operations and to establish the capacity to train SCBA teams to at least basic proficiency level on site;

Contract and Bonus Payment - Impact on Safety

We recommend:

that mine management adopt the concept of building a margin of safety into the production plan and work systems on a joint (consultative) basis and ensure that the concept is fully understood and supported in practice;

that mine management monitor the potential impact of incentive systems on safety performance, particularly in the accident investigation process;

Usage of Drugs and Alcohol

We recommend:

that mine managers should ensure that line management and supervisory personnel are trained in identification strategies in relation to drug and alcohol use by employees and that clearly understood procedures are in place for prevention of affected persons from attempting to work;

that education and counselling programmes for employees are undertaken across the industry on the implication of alcohol and drug usage, and in particular the risks associated with combining these substances with a high-risk occupation such as mining;

that consideration is given to the development of formal employee assistance programmes for persons who are identified as having problems in respect of drugs and alcohol;

Working Supervisors

We recommend:

that all managers of operations in the industry, including contractors, review their policies and present distribution of supervision, and ensure that the integrity of underground supervision of work is in no way compromised by supervisors having to undertake tasks to the detriment of their principal duty;

that the Inspectorate maintain vigilance on the integrity of underground supervisory requirements and if an adequate standard is not maintained that consideration is given to legislate more specific requirements;

Legislative Amendments

We recommend:

that the Government implement amendments to the Mines Regulation Act to incorporate Parts III and IV of the Occupational Health Safety & Welfare Act as a matter of priority;

that when the amended Mines Regulation Act is proclaimed that the Government agencies and the Chamber of Mines & Energy promulgate the new principles as a matter of priority;

Future Regulatory Initiatives

We recommend:

that the Mining Engineering Division of the Department of Mines develop, in consultation with the Australian Workers Union and Chamber of Mines & Energy representatives, a format and guidelines for a Notice of Intent for safe operation of new mine proposals and that the Mines Regulation Act Regulations be amended to include approval of such a notice as a condition for commencement of operations;

that the Government ensure that the Department of Mines is allocated staffing and resources for the Mining Engineering Division and its Inspectorate to enable a high level of engineering input to the industry including assessment of the proposed Notices of Intent for safe operation, and also to maintain or improve the frequency and scope of regular (audit) inspections.

CONCLUSION

We recommend:

that an informal joint committee of review be established within eighteen months from the release of this report to examine the extent to which safety practices and programmes in underground gold mines have been impacted upon by the recommendations contained within it.

rapid rate of fume clearance in a large cross sectional area.

Particular attention must be paid to the Regulations under Part 8 - VENTILATION AND CONTROL OF DUST AND ATMOSPHERIC CONTAMINANTS, both during induction and training, and regularly in the course of work, by miners, supervisors and management.

A person must not enter any mining workplace before it has been checked and made safe by the miner, unless he has been approved by the Manager as a person competent to do so.

FROM PAGE 2



Bob Leggerini

Bob was elected to the position of Workmen's Inspector in February 1975. He has been the Australasian Rock Drilling Champion three times. In 1984, 1985 and 1986 he also took the championship in Queensland, New South Wales and Tasmania respectively.

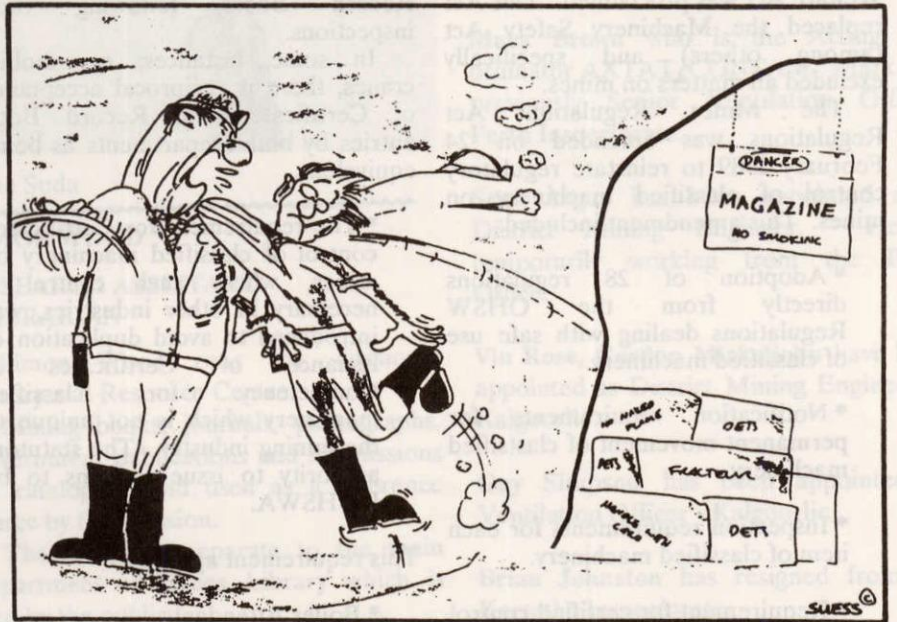
AUSTRALIAN INSTITUTE OF OCCUPATIONAL HYGIENISTS ANNUAL GENERAL MEETING AND CONFERENCE 1990

Observation City, Perth.
December 2-5, 1990.

Setting standards for the nineties - formal paper, workshops, poster presentations and trade tutorials will provide opportunities for participants to debate the issues facing Health & Safety Professionals.

For information contact: Mr Geoff Taylor (09) 470 0666.

9 OUT OF 10 DOCTORS AGREE THAT SMOKING WITHIN 8m. OF EXPLOSIVES CAN REDUCE YOUR FITNESS



INSTANTLY!

EXAMINATIONS

Mines Regulation Act 1946-74

Coal Mines Regulation Act 1946-74

Underground Supervisors & Restricted Quarry Managers

Closing date for applications: 3 p.m. 21/09/90

Advertisements:

(Public notices section -

The West Australian 18/08/90 and
& Kalgoorlie Miner) 25/08/90

Examination Dates: 29-30/10/90

Closing date for

applications: 07/9 /90

Examination Date: 22/10/90

DOES THE WORKFORCE HAVE ACCESS TO MINESAFE? PHONE 222 3436 FOR EXTRA COPIES.

CLASSIFIED MACHINERY ON MINES STATUTORY REQUIREMENTS & RELATED INFORMATION

Statutory requirements for classified machinery on mines changed on 16 September 1988 when the Occupational Health Safety and Welfare Act was proclaimed. This Act replaced the Machinery Safety Act (among others) and specifically excluded all matters on mines.

The Mines Regulation Act Regulations was amended on 24 February 1989 to reinstate regulatory control of classified machinery on mines. This amendment included:

- * Adoption of 28 regulations directly from the OHSW Regulations dealing with safe use of classified machinery.
- * Notification requirements for permanent movement of classified machinery.
- * Inspection requirements for each item of classified machinery.
- * Requirement for certified control of certain types of classified machinery.
- * Provision for "approved" persons, other than Departmental Inspectors, to carry out statutory inspections of classified machinery.

The implications of these amendments and details of implementation are:

- * The adoption of regulations 501 to 526 and 527 to 529 of the OHSW Regulations maintain the same degree of safety for the use of classified machinery on mines as that applied to industry in general.
- * Notification of classified machinery movement to facilitate the efficient inspection requirements under statute.
- * The inspection requirements reflected those of DOHWSA with respect to maximum periods between inspections; Schedule 4 of the OHSW regulations is quoted in

the Mines Regulation Act amendments. This Schedule outlines the required frequency of inspection for each category of classified machinery.

The most significant difference between inspections carried out by DOHWSA Inspectors and Mines Inspectors is in the issuance of Certificates of Inspection and use limitations.

DOHWSA issues Certificates and Prohibition Notices, as necessary, following their inspections.

The Mines Department makes entries in the "Classified Machinery Record Book" following their inspections.

In some instances, eg. mobile cranes, there is reciprocal acceptance of Certificates and Record Book entries by both Departments as being equivalent.

- * The requirement for Certificated control of classified machinery on mines, where such control is necessary in other industries, was introduced to avoid duplication of issuance of Certificates of Competency for classified machinery which is not unique to the mining industry. The statutory authority to issue remains to be DOHWSA.

This requirement applies to:

- * Boiler Attendants.
- * Internal Combustion Engine Drivers.
- * Crane Drivers.

For crane driver applicants, procedures have been introduced which involve Mines Inspectors carrying out oral and practical examinations.

All the above categories of drivers/attendants must apply to DOHWSA for Certificates and meet all requirements of the OHSW Act.

- * "Approved" Persons introduction, on mines, is viewed as a step towards self-regulation and is not unique, and we have seen the OHSW Act decrease the frequency of statutorily required inspections of most categories of classified machinery. A move which can be viewed as one towards a greater degree of self-regulation by the industry at large.

In introducing "approved persons", strict criteria was laid down, in consultation with the mining industry,

to assess the suitability of persons nominated for the purpose of carrying out statutory inspections of classified machinery.

The criteria included, not only the actual person, but also the organisation nominating that person.

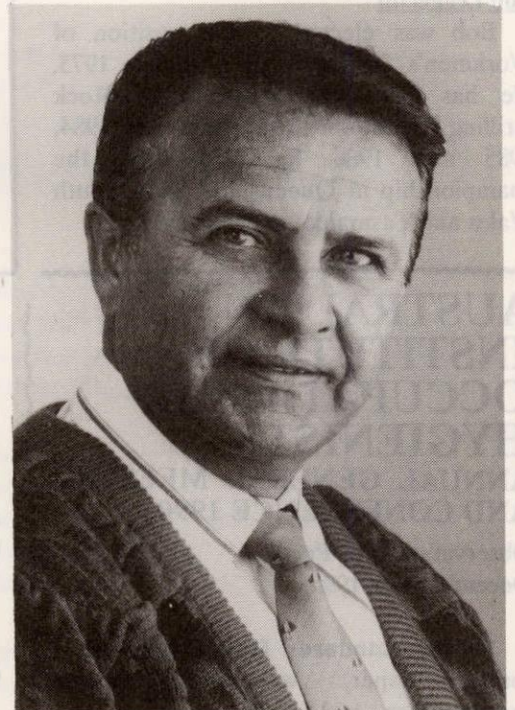
For the organisation, acceptable levels were set for the required size, infrastructure and engineering support available.

For the person, acceptable levels of education, relevant knowledge and experience, with each category of classified machinery, were set.

Persons approved may be limited to certain categories and/or specific mine locations, dependent on their overall experience etc. These approved persons have the same powers and authority as a Special Inspector of Mines, but these powers and the authority are limited to the function of statutory inspections in accordance with approved Inspection Check Lists.

In setting the requirements for approved persons provision has been made for an auditing function, of actual inspections carried out, by Departmental Inspectors.

Overall the move towards self-regulation by the appointment of "approved persons" has been implemented cautiously and responsibly by the Department.



John Jance, Principal Technical Engineer

WESTERN AUSTRALIAN COAL INDUSTRY TRIBUNAL

The Western Australian Coal Industry Tribunal was formed in 1952 and has its own Act of Parliament. The tribunal's responsibility is to determine industrial disputes or matters within the State's coal mining industry.

The tribunal consists of five people: A chairman, two employer members, and two members representing the concerned union(s). It is an independent body administering industrial relations and is chaired by an industrial relations commissioner, Mr Gavin Fielding.

Administration of the tribunal is carried out by the Mining Engineering Division Administration Manager, Mr John Suda. As Secretary, he is responsible for maintaining awards, managing finances and liaising with companies and union officials on industrial relations/tribunal matters.

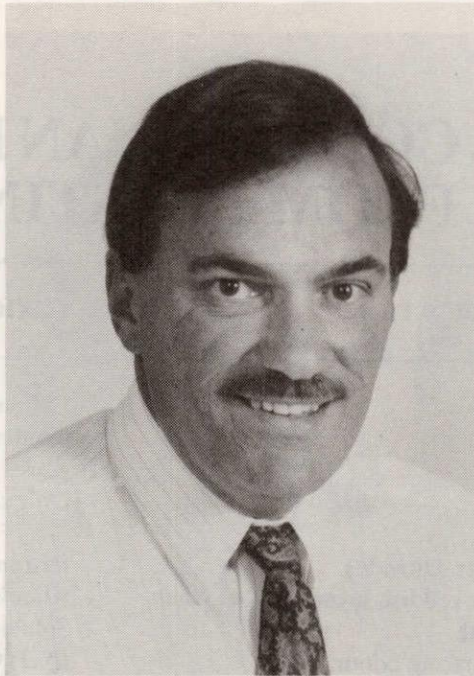
There are two important issues the tribunal will continue to face in the coming years: one is ensuring the economic viability of coal mining; the other is maintaining the already solid industrial relations framework.

The coal industry in this state has an almost strike free record over the past 30 years making it one of the most industrially stable industries in the country.

Most of the credit must go to the tribunal which operates under a structure that requires genuine commitment from all the participants. That, coupled with the fact that there are no lengthy delays in convening the tribunal, ensures matters are resolved with minimum disruption.

John Suda

Administration Manager



John Suda

~~~~~  
**SIMON WOOD**

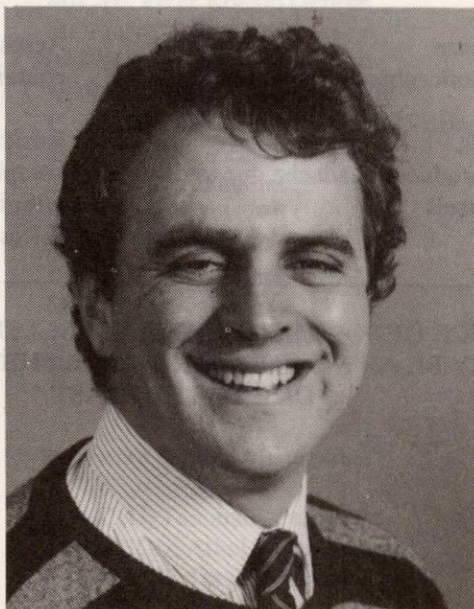
**RESEARCH ASSISTANT  
/LIBRARIAN**

Simon Wood runs the divisional Library and Resource Centre.

Mining books, journals, photographs, Government publications and submissions are catalogued and used as a reference source by the Division.

The facility is separate to the main Department of Mines Library which is used by the public.

Simon receives many enquiries from the public, particularly students wanting information or literature on the mining industry. In most cases, the Resource Centre can help. If not, Simon can direct callers to other holding locations. Simon can be contacted on (09) 222 3436.



Simon Wood

## STAFF CHANGES

**Simon Ridge** has joined the Division and will be based in the Karratha Inspectorate as a District Mining Engineer.

**Jenny Oosterhof** is the new Ventilation and Noise Officer in the Perth Inspectorate: Tel: 09 222 3540.

**Chris Stublely** (Mining Engineer - Projects) will no longer be co-ordinating AXTAT. That task has been taken over by:

**Mark Brown** who is the Acting Co-ordinator AXTAT/CONTAM. Mark was previously Senior Ventilation Officer, Perth Inspectorate.

**Sean Argus** has been appointed as a District Mining Engineer. He is temporarily working from the Perth Office.

**Vin Rose, Gordon Mickeljohn** have been appointed as District Mining Engineers - Kalgoorlie.

**Guy Simpson** has been appointed as Ventilation Officer - Kalgoorlie.

**Brian Johnston** has resigned from the Karratha Inspectorate.

**Paul Charman** has resigned from the Kalgoorlie Inspectorate

### Seconded:

**Chris Orr** to research long term stability of Open Pits and provide Geo Technical advice to the Inspectorates.

**Martin Dawson** to Research and Technical Services as a Project Engineer.





# GASES AND CONTAMINANTS RESULTING FROM BLASTING

| GAS/CONTAMINANT                                     | INDICATION                                                                                                                                 | TOXICITY AND CHARACTERISTIC                                                                                                                                                                                                                                |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Carbon Monoxide (CO)                                | No Indication.<br>- Tasteless<br>- Colourless<br>- Odourless                                                                               | - Extremely toxic even at low concentrations.<br>- Lighter than air and may remain in pockets and blind rises.<br>- Only slightly soluble in water.                                                                                                        |
| Oxides of Nitrogen<br>Mainly NO and NO <sub>2</sub> | NO <sub>2</sub> (Nitrogen Dioxide)<br>- appears as a reddish brown vapour when concentrated.<br>- pungent irritating odour.                | - Extremely Toxic.<br>- Affects the lungs and the effect may be delayed.<br>- Soluble in water.<br>- (NO) Oxides to (NO <sub>2</sub> ) in air.                                                                                                             |
| Carbon Dioxide (CO <sub>2</sub> )                   | - No visible indication.<br>- At levels of a few percent respiration rate will accelerate.<br>- Irritates the eyes at high concentrations. | - Danger to life at high concentrations as it will depress the central nervous system and result in unconsciousness and respiratory arrest.<br>- At high concentrations it displaces oxygen and as such is also an asphyxiant.<br>- Very soluble in water. |
| Ammonia (NH <sub>3</sub> )                          | - Normally not visible but may be caught up in aerosols.<br>- Pungent acrid smell, easily detected at very concentrations.                 | - Toxic.<br>- Attacks the nasal passages and lungs<br>- Readily soluble in water.                                                                                                                                                                          |
| Sulphur Dioxide (SO <sub>2</sub> )                  | - Not visible<br>- Pungent acrid smell<br>- Acidic Taste<br>- Easily detected a very low concentrations.                                   | - Toxic.<br>- Attacks respiratory system.<br>- Effects may be delayed.<br>- Soluble in water.                                                                                                                                                              |
| Hydrogen Sulphide (H <sub>2</sub> S)                | - Not visible<br>- Pungent unpleasant odour of rotten eggs.                                                                                | - Extremely toxic. At high concentrations the sense of smell for this gas is lost.<br>- Irritates the lungs and respiratory tract.<br>- Narcotic effect on the nervous system.                                                                             |
| Water Vapour and Aerosols                           | - Visible as haze.<br>- May have noticeable or acrid adour.                                                                                | - Aerosols and vapours may be present with dust or contain entrained particles and dissolved gases.                                                                                                                                                        |
| Nitroglycerine Remnants                             | - Acrid smells.<br>- Exposure produces headache due to dilation of blood vessels                                                           | - Residual fumes of Nitroglycerine and chemical complexes from incomplete detonation can remain after blasting. Often entrapped in the muck pile and released when loading out.                                                                            |

THE PRESENCE OF SO<sub>2</sub> AND H<sub>2</sub>S AFTER A BLAST IN HIGH SULPHIDE AREAS MAY BE AN INDICATION OF A SULPHIDE DUST IGNITION DUE TO THE BLAST

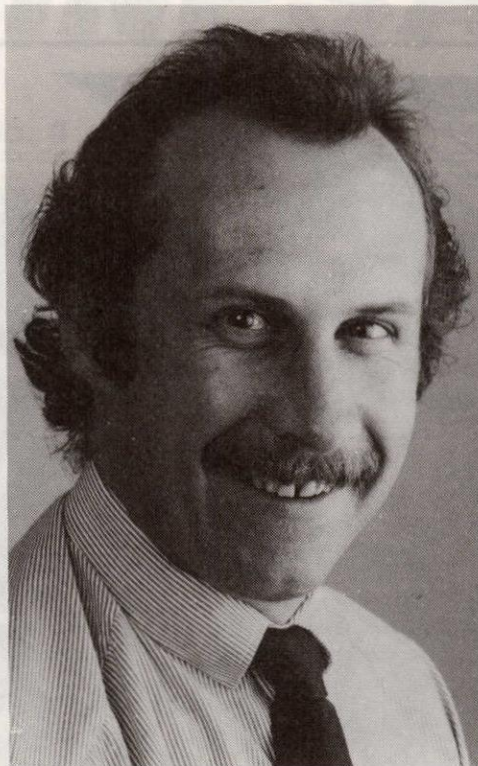


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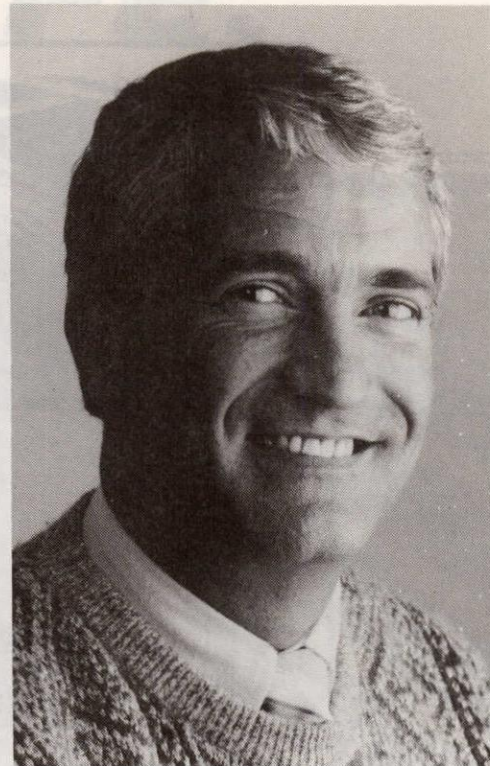
long term behaviour is being studied by Chris Orr so that Departmental guidelines can be prepared to ensure pits are abandoned in a safe way.

Chris Swindells and Chris Orr have addressed mine managers at the Chamber of Mines and Energy regional council meetings at Kalgoorlie, Southern Cross and Koolan Island, and will be doing so shortly in the Murchison District. The presentations have included the showing of an unique video of a pit wall in the process of failing and have stressed the importance of carrying out geotechnical work during the planning and operational phases of open pit mining in an effort to reduce the incidence of wall failures. Typical monitoring strategies to reduce the safety risk to pit personnel have also been discussed.

The Department will be convening special seminars during August for geologists, supervisors, foreman and Union and workforce representatives. The purpose of these seminars will be to increase industry awareness of the need for safer operating procedures in open pits and to further stress the importance of technical studies to justify open pit designs.



Dr C Swindells



Chris Orr

**CONGRATULATIONS!**

The following candidates have fulfilled the requirements of the Act and have been issued with a Certificate of Competency:

**First Class Mine Managers**

- CARROLL, Ian Ross
- CLARK, David Murray
- GOODWILL, Neil Stephen
- LAW, Simon Richard
- LEEDHAM, David Geoffrey
- MOKOS, Peter Philip
- NORCOTT, John Humphrey
- RICHARDSON, Mark
- TONKIN, Luke

**Quarry Managers**

- LENARTOWICZ, Derek
- MILLARD, Christopher John

**Underground Supervisors**

- ANSONS, Gvido Argot
- BIRCH, Frederick George
- BOYLE, Gary Allan
- BROWN, John Francis
- CHIDLOW, James Anthony
- CLARIDGE, Dominic Christopher
- COLLOPY, David Robert

- DEAN, Wayne George
- DOLAN, Kym Matthew
- EDWARDS, Rodney David
- FARINA, Peter John Colin
- FLACK, Geoffrey William
- GARNETT, Gregory John
- GIBNEY, Fergus Paul
- GRAHAM, Ross John
- HERON, Bruce Anthony
- HOGAN, Kevin Raymond
- HOWARD, Gary Walter
- KELLY, John William
- KUMAR, Atish
- McLAREN, Hector Smith
- \*MARTIN, Daniel Gerrard
- MILNE, Peter Ronald George
- MOLONEY, Kenneth Ross
- NOORT, David John
- NORREGAARD, Johannes Stig
- PICKARD, Christopher Gerard O'Brien
- SAVATOVIC, Zeljko
- SEBO, Steven Thomas
- SHEPPARD, Maxwell Carl
- SILVA, Hector Sergio
- \*SINTON, Kevin Barry
- SPROULL, David John
- WICKS, Anthony Marston
- ZVORC, Drago Dennis

**Restricted Quarry Managers**

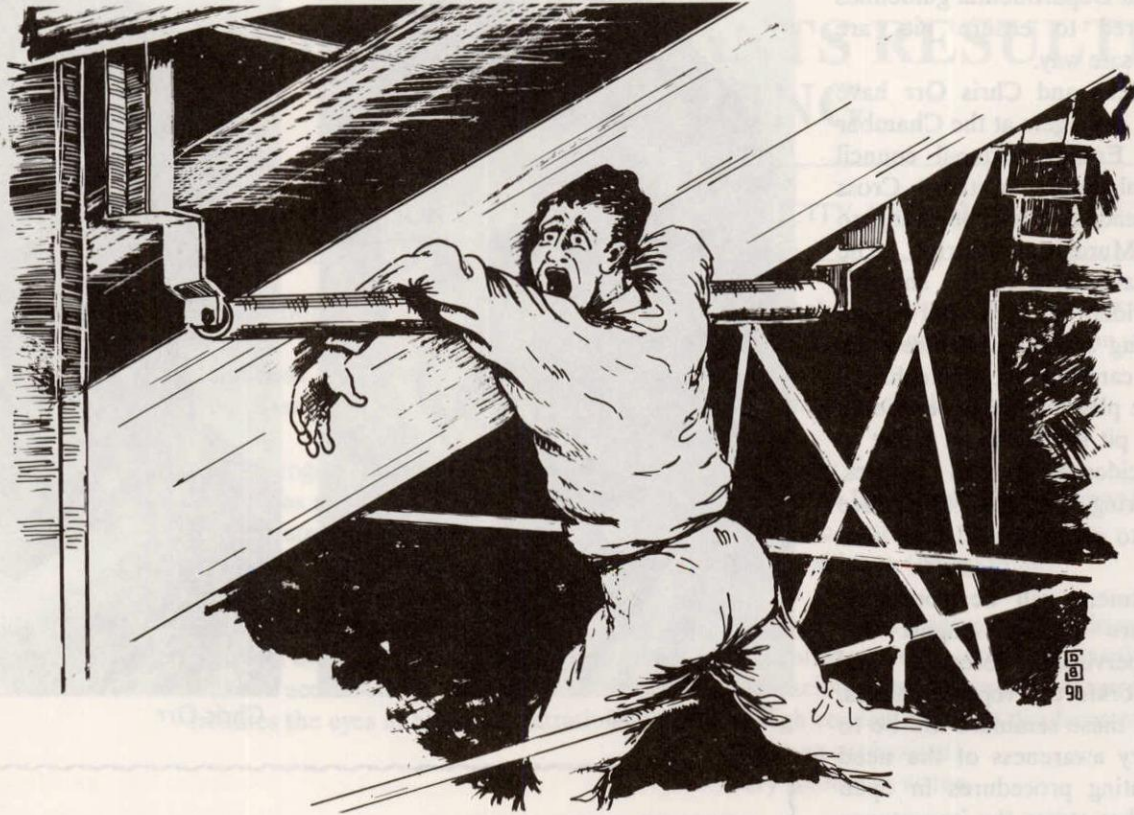
- \*ANARU, Tamihana Perry
- ATKINSON, Athol Bryan Mervyn
- BARTLETT, David Anthony
- BASSETT, Craig

- BLACKWELL, Robert Stephen
- \*BOLIVER, Leslie James
- BOWMAN, Gordon William
- \*BOWRA, Robert Harold
- CAIRNS, John Marshall
- \*COOPER, Trevor William
- \*DOBRICH, Glendon Frederick
- FOGARTY, Daniel Patrick
- \*GARDINER, Bruce Strickland
- HASLAM, Andrew Malcolm
- HILL, Leon Victor
- JEISMAN, William Arthur
- KASCHULL, Hans Jurgen
- LAMBERT, Stephen Arthur Sidney
- LEWIS, Brian Ernest
- McCARTHY, John Maurice
- McINTOSH, Peter Maxwell
- \*MORA, Peter Norman Mark
- MUNRO, Kevin Noel
- NUTTALL, Timothy James
- RADOSEVICH, David Laurence
- SALLIE, Ian
- SAVILLE, Ian James
- \*SCALLAN, Patrick Michael
- VALENTI, Mario Valenti
- WORTH, Graeme

\* Restricted Certificates

**SECRETARY  
BOARD OF EXAMINERS**





## ACCIDENT BRIEF

### Mines Regulation Act Regulations 6.4, 6.11

**Failure to observe conveyor belt safety regulations and operating practices can result in serious injury or death.**

Most conveyor belt accidents happen to people attempting to work on the belts while they are moving.

Isolate and "tag out" conveyors before carrying out any work!

## MINESAFE

Published by the:

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100 Plain Street

EAST PERTH WA 6004

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Pieter Bakker

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## PUBLISHED SIGNIFICANT INCIDENT REPORTS

| INCIDENT NO: | TITLE OF REPORT                               | DATE ISSUED |
|--------------|-----------------------------------------------|-------------|
| 1.           | Pressurised Gearbox Explosion                 | 23/08/89    |
| 2.           | Conveyor Belt Fatal Accident                  | 05/09/89    |
| 3.           | Compressed Air Hose Connection Fatal Accident | 29/09/89    |
| 4.           | Welding Equipment Electrocuton Fatal Accident | 11/10/89    |
| 5.           | Split Ring Tyre Assembly Explosion            | 12/10/89    |
| 6.           | Safe Use of Radiation Gauges                  | 29/11/89    |
| 7.           | Chemical Handling - Caustic Burn              | 10/01/90    |
| 8.           | Rockbolting U/G Fatal Accident                | 30/01/90    |
| 9.           | Gold Room Explosion - Molten Metal Burns      | 12/02/90    |
| 10.          | Cynide Poisoning                              | 22/03/90    |
| 11.          | Emu Mine Disaster                             | 10/04/90    |
| 12.          | Slope Failure - open pit mine                 | May 1990    |