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Report Of The Commission Of Inquiry
Into Safety And Health
In The
Mining Industry
Volume 1

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Dr. David W. Stanton

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21 October 2003

COMMISSION OF INQUIRY INTO SAFETY AND HEALTH IN THE MINING INDUSTRY

Commission of Inquiry into Safety and Health in the Mining Industry

TO THE PRESIDENT OF THE REPUBLIC OF SOUTH AFRICA
MR PRESIDENT

MAY IT PLEASE YOU

In consequence of a statement made by the Minister of Mineral and Energy Affairs, Mr G. Bartlett, on 28 MAY 1993, you deemed it expedient to appoint a commission of inquiry into safety and health in the mining industry, hereinafter referred to as "the Commission", consisting of the following members:

RAMON NIGEL LEON
MIKLOS DEZSO GYORGY SALAMON
ALBERT WILLIAM DAVIES
JOHN CAROL ANTHONY DAVIES

and with the following terms of reference as published under Government Notice R.889 of 6 May 1994:

To investigate all aspects of the legal regulation of health and safety in the mining industry as defined in the Minerals Act, 1991 (Act No 50 of 1991)

To make recommendations to the State President on improvements to the existing regulations and implementation thereof in the light of the circumstances prevailing in the industry and of international standards.

The Commission undertook and discharged its assigned task to the best of its ability.

We, the undersigned, have the honour to present herewith the Commission's report together with its recommendations, a summary of which is given in Chapter 12.

Signed:

The Honourable R.N. Leon
Chairperson

Professor M.D.G. Salamon

Professor A.W. Davies

Professor J.C.A. Davies

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REPORT

OF THE COMMISSION OF INQUIRY INTO

SAFETY AND HEALTH

IN THE

MINING INDUSTRY

VOLUME 1

CHAPTER TWO

A REVIEW OF THE STATE OF THE INDUSTRY

2.1 HISTORY AND ORGANISATION

2.1.1 The Chamber of Mines (COM), and the influence of the migratory labour system which led to the establishment of compounds and hostels.

The Chamber was formed over 100 yeas ago. It is a voluntary association of private sector mining finance houses, mining companies and mines. It has over 80 members drawn from South Africa's gold, coal, diamond, platinum, antimony, asbestos, maganese, lead and copper mining sections (Appendix 4). The members account for about 85% of the mineral output of South Africa. Some significant mining organisations such as SASOL remain outside the Chamber, together with a large number of small mines.

The Chamber's primary function is to promote and protect the interests of its members, doing this through joint action, at industry level, in areas where it is considered by the Chamber to be economically beneficial, prudent, and desirable for members to co-operate and act in concert. The services it offers members extend over a wide range of technical, legal, medical, social and environmental issues. It operates through a range of committees on which sit representatives of the major finance houses and mining companies, and at which policy agreements are arrived at.

The Commission heard evidence (Wilson pp 730/824) on the historical perspective concerning the employment of labour in South African mines. Professor Francis Wilson is an authority on this subject, being the founder Director of the South African Labour and Development Research Unit in the University of Cape Town, and the author of many books on the subject.

A central feature of the gold mining industry is that there has been an oscillating migratory labour system in South Africa. Labour has been brought in on a temporary basis for a fixed period and then returned to the rural areas. In the first phase of this development, for many decades, men came for short contracts of nine to twelve months and many did not return at all, or returned only once or twice. More recently, in the second phase of this development, some 90% of mineworkers spend more than 10 years of their lives on the mines in total, but they remain migratory workers. Their position is akin to "guest workers" in Germany and elsewhere in Europe and the USA. This distinction is important from the point of view of training and environmental exposure to dust, radiation, noise and other contaminants. From the point of view of the worker himself, and particularly his family, he remains a migrant. He is divided in half as a human being; that is, a labour unit working at a mine, and a family man with his family in the rural areas.

In the early days of South African mining, cheap housing was a way of controlling labour. As far back as 1890, when the COM was formed, mining compounds were established to control labour, and the Chamber established recruiting agencies. In these early days of the Chamber's history one of its primary functions was stated to be – "to reduce native wages to a reasonable level because they wanted to prevent

competition", and to find ways and means of recruiting labour. The wages paid were sufficiently high to induce people to make the long journey from their homes and serve in the dangerous and arduous mines. Accordingly a whole process of recruiting labour from all over the subcontinent was established. By 1899, 100 000 black mineworkers were needed on the mines, and at that time 60% of the labour came from outside South Africa, mainly from Mozambique.

At the same time the color bar was fought for by white mineworkers and the management felt obliged to go along with their demands. The COM played a specific role in putting in place the Pass Laws, which played a critical role in maintaining the migrant labour system for over 100 years. From the employer's point of view it was necessary to try to ensure a regular supply of labour at wages which the mining industry felt reasonable. The Commission was reminded by Professor Wilson of the quotation from Cecil John Rhodes when introducing the Glen Grey Act in support of an argument for a hut tax in order to obtain labour for the mines:

"You will remove them, the natives, from the life of sloth and laziness, you will teach them the dignity of labour, and make them contribute to the prosperity of the State and give them some good return for our wise and good government." The mining industry was locked into the migrant labour system which gave it a control over the labour force so that there was no question of strikes, which were illegal, and there was a dominance of management over labour: what mine management said went. By 1910 workers were being recruited from all over Southern Africa but far from Johannesburg itself.

Certain historical events changed the picture.

In April 1974 some Malawian mineworkers were killed in an air crash which caused Dr. Banda, the President of Malawi, to ban further recruiting from his country. In the same month the political coup in Lisbon spelled the end of the Portuguese empire, causing Angola and Mozambique to become independent, and not wishing to be seen as being linked to the apartheid labour system in South Africa. In one month the Chamber of Mines was faced with a loss of 50% of its labour force from Malawi and Mozambique. From then on there was a rapid increase in wages, which had already been assisted by the rapid increase in the gold price since 1971, and a rise in the influence of unions.

For many years the COM expressed its opposition to the apartheid system but even today, with the apartheid system ended there exists a hangover from that system in the mining industry, where by and large black workers are at the bottom of the organisational pyramid, while white workers are further up. Job reservation for whites was formally abolished only in 1986.

From the evidence heard by the Commission it was clear that certain tensions and disagreements do still exist between the Chamber and the National Union of Mineworkers and other unions. With regard to the white mineworkers union their views are dealt with later in Chapter 2.1.2.2. However, there was a broad measure of agreement on the following matters between all the parties:

previous periods, leading to greater exposure to dust and the development of dust related diseases.

It is sufficient in this chapter to give a broad outline of some of the statistics put before the Commission, particularly by Dr. Leger and Dr. White.

-Tuberculosis rates were about 58 per thousand after 15 years exposure. After 10 years exposure between forty and eighty per cent of workers involved in drilling operations would have hearing problems. An 18 year old man starting a career in mining at the stope face would have a one in two to one in three chance of being permanently disabled from accident or disease.

-A study of shaft sinkers, developers, stopers and shift bosses had shown that if a man were to work 8 000 shifts the probability of developing silicosis was over 30 per cent. If silicosis is severe it can develop into progressive massive fibrosis (PMF) which is one of the most feared complications of the disease.

-Asbestos is a fibrous mineral which is known to cause several kinds of lung disease. After 20 years exposure in an asbestos mine, twenty five per cent of the workforce can be detected as having lung disease. It has now been established scientifically that there is an association between asbestos exposure and lung cancer.

-Research has shown that after forty years of exposure, fifty to sixty per cent of coal miners would develop simple coal miners' pneumoconiosis, and about 5 per cent would develop PMF.

-About 4 000 miners develop tuberculosis every year. One survey in the 1930s suggested that about 60 per cent of these may die within two years. The longer a worker works at the mines the more likely he is to develop tuberculosis. Miners with less than five years experience develop the disease to the extent of only eight per 1000, while those with more than five years experience develop it to the extent of 20 per 1000.

-Lung function is reduced by lung disease. With silicosis after fifteen years exposure, a worker will have lost about fifty percent of his lung function if he reached 65 years of age.

-There has been a significant under diagnosis of coal miners' pneumoconiosis. Statistics from routine examinations suggested that the prevalence was 4% but autopsy studies show that it is 7,1%. Based on examinations at 61 collieries in the United Kingdom between 1990 and 1993, the prevalence for all age groups was 0,4% and for age groups below 44 years 0,1%.

Further comment on health issues in the mining industry will be made in Chapter Four.

Currently eleven mines operate at depths greater than 2 100m and these produced 213 t of gold in 1993 or 34,4%. Most of the new mine projects are at depths below 2 000m. Prospecting suggests that ore bodies that might be mined in the future are at levels close to 3 000m. These numbers and predictions with respect to future trends in mining depths are cause for concern.

3.2.5 Some Environmental Factors Affecting Health

Health hazards will be discussed in Chapter 4, but no discussion of underground conditions in gold mines can avoid mentioning a group of hazards that relate to the physical conditions discussed in this chapter. These relate basically to the hard abrasive and toxic nature of the quartzite in which most of the mineralisation occurs in the Witwatersrand System. Largely because of the nature of the reefs, it has not been possible to adopt a modern mechanised mining method in most of the underground gold mines.

This means that a large number of people are still involved in drilling blast holes using reciprocating compressed air drills. This drilling generates a lot of highly toxic dust (due to its quartz content). The drilling is also inherently noisy and involves a lot of vibration. While these problems can be mitigated to some extent (e.g. hydraulic drills are somewhat less noisy) the real solutions to these problems await the development of a new mechanised mining technology.

3.2.6 Conclusions and Some Remedies

This chapter has revealed that the deep gold mines operating in the Witwatersrand System are burdened by unusually onerous hazards, which have the potential to increase the perils of mining considerably. Possible trends suggest that the situation may become worse. How should the employers, the employees, and their respective associations, and the State react to this problem? This is an emotionally charged question to which there is no simple answer. The employers, in reality the shareholders in mining companies, made an investment in establishing the gold mines at a time when the morality of employing people in hazardous situations was not questioned. Their representatives, that is the company executives and managers, argue that the industry provides employment for nearly 400 000 people, and, including dependants provides a livelihood for some 1,6 to 2,8 million people who depend on the continued operation of the mines. This is a very significant number at a time when the country has several million unemployed. Furthermore, the gold mines in 1993 earned some R 23,2 billion in foreign currency, paid out R 8,4 billion in wages and salaries, spent some R 7,4 billion on purchases and paid R 1,305 billion in State revenue. In 1992 the industry paid R 1,3 billion in dividends to shareholders, and executives and managers were paid salaries.

The Commission gained only a limited view of the opinions of ordinary mine workers. The statements by elected representatives raised complaints mainly about some areas of neglect and historical remnants that should be addressed as expeditiously as possible. They said relatively little about the major issues, the frightening rates of fatal and non-fatal accidents.

health of workers. This matter should be considered by MRAC when re-drafting the regulations.

4.1.3 Some of the diseases of importance in the mines are listed in the Occupational Diseases in Mines and Works Act (Act No 78 of 1973). In addition the schedule which forms part of the Compensation for Occupational Injuries and Diseases Act (Act No 130 of 1993) lists the diseases compensatable in all workers, including miners. As a result occupational disease in miners must be reported to the appropriate one of two authorities responsible for certifying the presence or absence of the condition in a particular individual. Pneumoconiosis, for example, is reported to the Medical Bureau for Occupational Diseases (MBOD), whereas noise induced hearing loss is reported to the Workmen's Compensation Commissioner but is dealt with administratively by the Rand Mutual Insurance Company. This must be a source of confusion, and must, in some cases at least, penalise the worker, given the rapid turnover of medical practitioners on most large mines and the employment of part time doctors without postgraduate training in occupational health to provide services on most smaller mines.

A general lack of information about the administrative procedures for reporting cases of occupational disease leads not only to statistical errors but contributes to the prevailing inaction in dealing with adverse working conditions.

The COMMSSION RECOMMENDS that a comprehensive manual setting out the administrative procedures for reporting suspected cases of occupational disease should be published, taking into account any new provisions that result from the deliberations of the Commission.

4.1.4 The majority of mine-workers are, and will continue for some time to be, migrants. They may come from within South Africa or from any of the countries of the subcontinent. As a result it is essential to examine workers at regular intervals after they have retired from active employment. Practically no facilities exist for the examination and investigation of former mine-workers, either in this country or adjoining States.

Evidence shows that where such facilities have been established, for example at Groote Schuur Hospital, the commonest occupation associated with the diagnosis of silicosis is work on the gold mines. This is despite the huge distance between the facility and the major gold mining areas, and is due to the movement of migrant labourers from the Eastern Cape who have previously worked on gold mines in the Orange Free State and the Transvaal.

The COMMISSION RECOMMENDS that administrative arrangements should be made by the Department of Health to ensure that all occupational health facilities and academic medical centres offer benefit examinations to former mine-workers. In the rural areas, and in areas where a provincial or a district hospital is the only accessible health facility, special arrangements will have to be made to train and equip staff, and to ensure that the administrative procedures are understood. Liaison with the health departments of neighbouring countries will be necessary to establish facilities accessible to workers who have returned to those countries in very large numbers – in particular Lesotho, Mozambique, Malawi, Swaziland and Botswana. The existing infrastructure of the Employment Bureau of Africa, established for the recruitment of labour, could assist with these administrative arrangements.

4.3.3 Regulation of exposure to diesel fumes is controversial and in view of the increasing use of diesel engines, particularly in coal mines, the COMMISSION RECOMMENDS that this matter be re-examined in detail, and that definitive research studies are essential.

4.3.4 The COMMISSIONER CONCLUDES that the content of the regulations does not compensate for the deficiencies in the enabling Act, particularly in respect of occupational medicine. There are insufficiently detailed provisions relating to gasses and dust in Chapter 10 of the regulations, and regulations which directly concern the health of workers are interspersed among those which regulate the operation of machinery or the mechanics of ventilation.

4.3.5 Regulations for the examination of workers are made in terms of the ODMW Act for those diseases defined in that Act. It is a matter for concern that no new regulations have been promulgated in terms of the ODMW Act since it was promulgated in 1973, and that the ODMW Act is no longer the responsibility of the DMEA.

4.3.6 The Commission is led to the conclusion that the Minerals Act and the derived regulations are inadequate for the prevention, control and early recognition of work related health conditions. This suggests, a priori that occupational diseases will not be shown to have been satisfactorily controlled.

4.3.7 The critical point which is missing from the legislation is the risk assessment process. Unless the legislation is amended to set in train a process enforceable in terms of explicit regulations or approved codes of practice, and unless exposure and outcome are linked through systematic data collection and analysis the present uncertain and unsatisfactory situation will continue. The opportunity to revise and rearrange the whole body of regulations under the supervision of a tripartite committee, should not be missed as the present arrangement does not make the regulations easy to use.

The COMMISSION RECOMMENDS urgent revision of the whole body of the regulations in line with the many recommendations made throughout this chapter and elsewhere in the report, and that the process of revision pay due regard to practice elsewhere, and that professional and technical experts be involved ab initio.

4.4 OCCUPATIONAL DISEASES IN MINES

4.4.1 The cause of a particular disease is not always a single agent, nor is the manifestation of disease uniform in all individuals exposed to the same working conditions. Disease may be the resultant of a number of causes, some of which are specific to the workplace and others unrelated to occupation. Commonly occupational and life style factors interact to produce disease, for example, chronic obstructive airways disease in persons exposed to dust who smoke, or tuberculosis in dust exposed miners living in hostels or overcrowded slums and squatter settlements adjacent to mines.

4.4.2 Real understanding of the pattern of disease in a community or group depends not only on determining the outcome (the incidence of a particular disease) but also on relating exposure at work to subsequent disease. This is studied to establish a dose-

4.5.4 Dr. White, a specialist in the field of lung disease, in a submission running to more than 120 pages, citing 134 references to mainly South African scientific studies, demonstrated that those response relationships have been established in South Africa and elsewhere for exposure to quartz and subsequent silicosis, for exposure to asbestos fibre and subsequent non-malignant and malignant asbestos related diseases, for length of mining experience or quartz exposure and pulmonary tuberculosis, and for exposure to mine air and chronic obstructive pulmonary disease. A number of other diseases are also known to be associated with work in mines. It has also been shown that severity of disease and life expectancy are negatively correlated.

4.5.5 In determining the trends in incidence there are, it is agreed by White, Leger and others, formidable difficulties in establishing reliable numerators and denominators, as discussed above, and in piecing together fragments of information held by the various agencies involved, viz. the DMEA, the DoH, the Workmen's Compensation Commissioner, the Rand Mutual Insurance Company, individual mines or mining conglomerates, etc. On balance it appears that there is no conclusive evidence of a downward trend in the incidence or prevalence of any of the diseases of major concern in the mining industry.

4.5.6 More importantly the evidence suggests that in almost all instances there is evidence of under ascertainment of the number of cases, and that stabilisation of the workforce is likely to increase the incidence and the prevalence of occupational diseases among the smaller number of persons now employed in mines. Leger (pp 73-77) concludes that as occupational diseases are related to prolonged exposure in the work environment, increased length of exposure on its own will result in an increased incidence of disease. However at least two other factors are likely to contribute to what may prove to be a very significant increase in the incidence of pneumoconiosis, noise induced hearing loss and tuberculosis. Prior to stabilisation workers commonly left the industry before the disease became manifest, but as an increasing proportion remain in employment for 20 years or more they will develop the disease while still within range of diagnostic services. The position will be compounded in respect of pulmonary disease by the fact that older workers are more susceptible to tuberculosis.

Leger then cites evidence from a number of sources to show that, despite the fact that "No direct measures of mine service or the age profile of the workforce as a whole exists", the demographic change is surprisingly rapid. A series of studies of autopsy data shows that in 1988 58% of miners dying in service were between 20 and 29 years of age, but by 1992 the comparable figure was 19%.

4.5.7 Solutions to the problem depend on "the replacement of the pre-1993 system of medical intervention with one that is equitable and not racially discriminatory, effective in both the prevention and early detection of work related diseases, accessible and affordable, participatory and non-coercive and in addition to adequate compensation, also offers retraining or alternative placement options to miners with work related diseases" (White, p 78). It is also evident that much of the information has been held in confidence by management and that access to mines for research purposes has not been easy to obtain. There is some evidence that as a result of the Commission's deliberations this will change.

4.5.8 Medical intervention must include "initial fitness certification, periodic examination, exit examinations and benefit examinations" (White, p 78). The term "benefit examination" is in common use to describe examinations carried out at the request of persons who are no longer in employment in the mines but who have been exposed to dust or other risks in the past.

4.5.9 Regulations should provide for both the frequency of examination and the type of testing to be carried out. The schedule taken from Dr. White's written submission (Table 10) illustrates the fact that a properly planned series of examinations has obvious advantages over slavish adherence to periodic X-ray examinations, and may well be more cost effective. The details of the schedule may vary from mine to mine but all will include the elements required to enable the authorities to compile a uniform data set for all mines.

TABLE 10: PROPOSED SCHEDULING OF HEALTH INTERVENTIONS FOR MINES TIMING INTERVENTION

YEARS OF SERVICE	HEALTH PROMOTION	LARGE CHEST X-RAY	PULMONARY FUNCTION TEST	TUBERCULOSIS SCREENING	AUDIOGRAM
1	+	+	+	*	+
2	+		+	+	
3				+	
4				+	
5	+	+	+	*	+
6				+	
7				+	
8				+	
9				+	
10	+	+	+	*	+
11				+	
12	+	+	+	*	+
13				+	
14	+	+	+	*	+
15				+	
16	+	+	+	*	+
17				+	
18	+	+	+	*	+
19				+	
20	+	+	+	*	+
etc					
EXIT EXAM	+	+	+	*	+

*CXR not required in TB screening this year

4.5.10 Official figures for the number of cases of occupational disease certified in terms of the ODMW Act are published annually in the report to Parliament of the Director of the MBOD. Table 11 shows the total number of cases of pneumoconiosis, tuberculosis and pneumoconiosis with tuberculosis certified each year since 1974. The certifications of first and second degrees of disability in persons previously classified as white or coloured includes both pneumoconiosis and chronic obstructive lung disease, whereas in the case of those previously classified as black practically all certifications classified as compensatable disease were for pneumoconiosis.

TABLE 11: CERTIFICATION UNDER ACT 78 OF 1973
WHITES AND COLOUREDS

	LIVING					DECEASED				
PERIOD	**1ST**	**2ND**	**2+T**	**T**	**Total**	**1ST**	**2ND**	**2+T**	**T**	**Total**
10/73 - 3/74	248	14	13	19	294	40	3	5	1	49
4/74 - 3/75	525	102	35	50	712	172	21	14	2	209
4/75 - 3/76	521	114	52	59	746	227	17	18	4	266
4/76 - 3/77	558	101	58	70	787	218	17	24	6	265
4/77 - 3/78	537	102	58	74	771	222	13	14	5	254
4/78 - 3/79	480	200	64	62	806	214	18	21	9	262
4/79 - 3/80	393	176	41	74	684	258	22	20	12	312
4/80 - 3/81	376	169	32	61	638	292	23	27	6	348
4/81 - 3/82	344	149	28	45	566	255	23	22	3	303
4/82 - 3/83	370	153	36	59	618	237	30	17	4	288
4/83 - 3/84	327	141	40	55	563	229	35	36	5	305
4/84 - 3/85	422	149	34	44	649	249	24	22	7	302
4/85 - 3/86	458	157	48	67	730	169	31	30	11	241
4/86 - 3/87	583	124	52	73	832	191	25	32	7	255
4/87 - 3/88	655	160	55	58	928	169	23	21	9	222
4/88 - 3/89	543	132	59	74	808	159	21	33	13	226
4/89 - 3/90	408	108	39	83	638	154	23	22	12	211
4/90 - 12/91					1256					324
1/91 - 12/92	320	150	39	84	593	155	45	24	15	239
					13619					4881

CERTIFCATION UNDER ACT 78 OF 1973: BLACKS

			LIVING			DECEASED				
PERIOD	**CD**	**CD+T**	**T/c**	**T/a**	**Total**	**1ST**	**2ND**	**2+T**	**T**	**Total**
10/73 - 3/74	323	578	981	192	2074	152	43	35	2	232
4/74 - 3/75	740	1055	1900	421	4116	325	55	66	6	452
4/75 - 3/76	847	1312	2293	549	5001	440	60	109	4	613
4/76 - 3/77	1077	1389	2692	508	5666	359	46	73	3	481
4/77 - 3/78	1039	1153	2795	361	5348	344	58	94	3	499
4/78 - 3/79	774	759	3042	414	4989	330	68	103	1	502
4/79 - 3/80	660	620	3071	300	4651	385	61	84	4	534
4/80 - 3/81	682	968	3175	305	5130	491	86	107	0	684
4/81 - 3/82	620	913	2978	276	4787	423	76	111	3	613
4/82 - 3/83	660	793	3273	154	4880	406	74	103	2	585
4/83 - 3/84	649	890	3424	205	5168	415	78	130	2	625
4/84 - 3/85	576	669	3217	117	4579	463	83	108	1	655
4/85 - 3/86	2282	646	3534	177	6639	414	95	119	4	632
4/86 - 3/87	2414	599	3964	152	6859	451	130	116	2	699
4/87 - 3/88	2927	606	3390	130	7053	420	97	112	2	631
4/88 - 3/89	2211	674	3678	136	6699	455	85	156	3	699
4/89 - 3/90	1215	487	3939	164	5805	277	67	126	2	472
4/90 - 12/91					4990					915
1/91 - 12/92					4628 99062					491 11014

T = TB only Tc = TB current T/a = TB antedated

In a period of about 20 years 128 575 mineworkers have been certified as having acquired occupational diseases. The actual number is certainly much higher as a result of under ascertainment among migrant labourers who have returned to their rural homes in any one of several labour reservoirs within South Africa or the neighbouring States. Practically nothing is known about the fate of the persons with certified occupational disease. A systematic study of the vital status of cases at intervals after certification is essential if appropriate services are to be provided for

persons who have acquired disease in the course of their employment in the mines. Though there is evidence that simple silicosis progresses very slowly, if at all, once exposure has ceased, there is no doubt that tuberculosis superimposed on simple silicosis may lead to rapid deterioration, and that asbestos sets in train a progressive disease in the absence of further exposure.

Careful scrutiny of this table may lead to a number of differing conclusions. It can be said with confidence that it is not possible to demonstrate a consistent downward trend in the numbers certified in any category. In addition it is clear that the number of cases of tuberculosis certified among currently employed black miners is evidence of a failure of control in the mining industry and in the country as a whole. The table does not include cases of tuberculosis in workers employed in non-risk work. There is no information on the number of such workers, but it is reasonable to assume that the actual total of cases is considerably larger than the official figures suggest.

4.5.11 Evidence put before the Commission by Dr. White and Dr. Leger suggests similar conclusions. In addition they show that although the time between first exposure and the diagnosis of pneumoconiosis has increased for white miners, this is not true for black miners. This is consistent with the hypothesis that white miners in a largely supervisory position are less exposed to dust whereas black miners in the stopes are as heavily exposed as they were several decades ago. Elsewhere evidence will be cited to suggest that dust levels have not changed for decades. Evidence from a recent study of pneumoconiosis among coal miner's suggests that though fewer workers are developing coal worker's pneumoconiosis they are developing it sooner.

The evidence demonstrates only too clearly the failure to relate dust levels to the pattern of certification, and to identify the risk areas and the groups of workers at risk. The absence of a systematic approach to the control of respiratory disease reflects the absence of appropriate analysis of available data and the long standing fragmentation of services between distinct government departments.

4.5.12 Evidence cited by Dr. White from work done by him in the early 1980s indicated that the death rates among South African miners from all causes or from disease had not changed substantially between 1940 and 1980, despite the dramatic fall in both rates between 1920 and 1940 (White Fig 1.1 p 10).

4.5.13 Estimates of the proportion of miners employed in particular tasks who will develop pneumoconiosis still rely heavily on the original studies carried out by Beadle, and amplified and commented on by Du Toit, Hnizdo and King, and cited in evidence to the Commission by White and Leger. There is general agreement that a worker in high dust areas such as drilling, high speed development or shaft sinking for 20 years or more may face a 20 - 30% risk of developing simple silicosis. Using a proxy measure for risk, the length of employment of certified cases of pneumoconiosis, it can be shown that the risk has not changed for black miners.

4.5.14 Attention was drawn to the fact that apart from the study referred to earlier, which suggests that coal miners are developing disease sooner, there is very little information on the risk in gold, platinum and other mines.

4.5.15 The risk of developing tuberculosis declined steadily among white and coloured miners prior to 1940 but since then has remained relatively stable at about one per thousand per year. However Leger expresses concern that the rate may now be increasing (Leger pp 85-93). The best estimates of the risk of tuberculosis among black miners place this above 10 per thousand per year. Attention has also been drawn to the fact that black miners develop the disease on average after 10 years of employment, whereas among white and coloured miners the period is 20 years. There is also some evidence that the risk of developing tuberculosis is higher for drillers, winch drivers and other groups of workers exposed to high dust levels underground. It is worth repeating that the advent of HIV infection lends a sense of urgency to the control of tuberculosis on mines, in view of the fact that even before the HIV epidemic began the incidence of tuberculosis was probably rising. The annual reports of the Central Mining – Rand Mines group (cited by White p 71) shows that the incidence reached a peak at 16/1000 per year in 1912, falling to a low level of 2-4/1000 per year between 1930 and mid 1950s, and thereafter rising irregularly to just under 10/1000 in the period 1980 - 85. The annual report of the Goldfields group (the only major mining house which still publishes an annual medical report) suggests that there is considerable variation in the incidence between mines. Within the group of eight Goldfields' mines in the Carltonville area the range is from below 10/1000 to nearly 20/1000 per annum in the period since 1990.

4.5.16 The evidence submitted to the Commission in respect of the prevalence and the trends over time in the incidence of pneumoconiosis, tuberculosis and the two in combination should be read in its entirety. It is not possible to summarise it, and in any case the interpretation of admittedly fragmentary and some times contradictory or incomplete data sets depend on the stance of the reader. It is a matter of considerable concern to the Commission that so few really authoritative studies have been done.

4.5.17 The industry has put in place an extensive infrastructure for performing screening audiometry since regulations were first promulgated in 1989. The effect of exposure to excessive levels of noise has therefore been documented in a very large number of miners. The number of cases of noise induced hearing loss identified (COM p 49) has nearly trebled between 1988 (226 cases) and 1992 (602 cases). Experts in the field acknowledge that the regulations have done little to reduce the damage done by noise as emphasis has been placed on audiometry and hearing protection. Compliance is widely recognised as a major problems in this field, and there is no doubt that the industry faces difficult problems in controlling noise by engineering methods. Evidence as to the extent of the problem is scanty but a study carried out in 1986 is said to have shown that two out of three men employed as rock drillers would have significant hearing loss after 10 years service.

4.5.18 Numerous other risks, including the whole range of asbestos related diseases, lung cancer, chronic obstructive airways disease, asthma, progressive systemic sclerosis and a number of heavy metal poisonings are recognised as important problems in the mining industry. No useful purpose would be served by attempting to catalogue them all and present unreliable or incomplete evidence as to the prevalence of each. From a review of the evidence in respect of three diseases of great importance, namely pneumoconiosis, tuberculosis and noise induce hearing loss, the Commission feels confident that the following conclusions are justifiable:

-there is no evidence to indicate a decline in the prevalence or severity of any occupational disease in the mining industry during the past 20 years;

-there is no evidence that the current legislation or the existing enforcement agencies offer any prospect of control; and

-radical steps are required to deal with the serious occupational health problems described in evidence presented to the Commission.

4.6 INTERVENTION TO CONTROL THE WORKING ENVIRONMENT AND DISEASE

4.6.1 Intervention to ensure safety and the prevention of work related injury and disease does not automatically follow the unilateral imposition of rules and regulations by senior management or the introduction of stringent medical examinations by health professionals. This approach may in fact aggravate the situation. In one of his well known aphorisms Sir Thomas Legge, the first British medical inspector of factories, stressed that "unless and until the employer has done everything - and everything means a good deal - the workman can do next to nothing to protect himself, although he is naturally willing enough to do his share". This suggests that the prerequisite for effective intervention is that the employer rectify, or be seen to attempt to rectify, the patent defects in the workplace which constitute risks to health or safety. This is echoed in documents submitted to the Commission, which stress that unless health and safety are seen to be important to management no amount of rhetoric will succeed in changing conditions in the work place.

Nowadays health and safety at work and industrial relations are seen as areas in which consultation in good faith between management and workers is a legitimate expectation. In respect of health and safety it is essential to begin the process of consultation by ensuring that both parties share the maximum amount of information, and understand what is actually going on in the work place. It is equally important that areas of uncertainty or ignorance be acknowledged, and that active steps be taken to answer the relevant questions through properly designed research projects if necessary. Given a basis of shared information and mutual trust the way is open for remedial action in which management and workers participate actively. This process in the work place is extended, in democratic societies, to the drafting of legislation.

From the evidence it is clear that all parties found common ground in the principle of tripartism. There are, however, formidable obstacles between the adoption of the principle and the achievement of truly participative strategies to deal with the hazards of the workplace. The historical and political determinants of the adversarial relationship between managers and workers may continue to influence the process for a long time. In South Africa the wider than usual economic gap between managers and workers is a greater impediment than it is, for example, in Japan. Defects in education, and in health and safety training at all levels, and the cross cultural effects on fundamental concepts and attitudes, all contribute to what can only be a complex situation.

The introduction of tripartism will open the way for discussion of intractable problems which management or workers might prefer not to have to discuss face to face. Two matters illustrate this: firstly, the actions of organised workers to support their demands by means of work stoppages, and, secondly, the conditions under which miners are housed. It would be unrealistic to think that either side is able to confine discussion to those areas in which they feel secure. This has important implications for health and safety professionals. Medical practitioners are not used to having their actions or their attitudes challenged by those whom they classify as lay persons. Nor are they accustomed to having to submit their proposals for medical surveillance or biological monitoring to representatives of the workforce for approval. Nor will they, or other health professionals, be enthusiastic when their credentials are scrutinised by tripartite committees, as is the custom in, for example, Canada.

Not to labour the point unduly, the acceptance of the principle of tripartism sets in train for reaching changes in the way things are decided in industrial undertakings, and a simplistic approach is a recipe for disaster. The key role of the inspectorate in this process will be referred to in Chapter 6.

4.6.2 The COMMISSION RECOMMENDS that regulations, or approved codes of practice, should ensure that a coherent process is set in train. This process must conform to the fundamental principles of modern occupational health practice. It must begin with the identification of the full spectrum of risk inherent in the process carried out at each mine. This must be followed by representative measurements of workplace conditions in respect of each identified hazard, with appropriate quality control of the measurement, and of the sampling strategy. Action to control conditions likely to lead to adverse health effects should follow, in parallel with appropriate medical surveillance of the groups of workers at risk.

4.6.3 It is clear that too much reliance has been placed on mass miniature radiography (MMR) for the majority of workers, despite the fact that it has been demonstrated repeatedly that MMR on its own does not lead to control of tuberculosis. Nor of course would it lead to the control of pneumoconiosis unless the identification of cases led to action in the workplace.

4.6.4 The diseases of most importance, by virtue of their number, are those due to dust exposure. The public information on dust levels in mines is slender. Reliance on old fashioned methods of dust sampling continued into the late 1980s despite the fact that most countries had changed to the gravimetric method many years ago. Work done by Beadle in the period 1950 - 70, and published in a series of papers between 1957 and 1969 is still the most frequently cited. Beadle's work has been used as the basis for commentary and elaboration by Du Toit and by King.

4.6.5 As a result of his own work, on the basis of dust measurements made between 1956 and 1960, Beadle concluded that there was little evidence of a decline in dust levels between 1938 and 1969. As a result of the work done by Du Toit and the unpublished review by King the Commission is of the opinion that dust levels have remained roughly the same over a period of about 50 years. This constitutes a priori evidence that the absence of a downward trend in the official figures for certification is correctly interpreted as a failure to control dust related disease.

4.6.6 It is not the role of the Commission to re-examine all the available evidence, but to form an opinion on the basis of the evidence submitted to it. No evidence was submitted to show that dust levels had decreased. It is a matter for concern that there is undue reliance on data which is now nearly 40 years old, and that the results of the many thousands of dust measurements which have been made in recent years have not been analysed and published in a form which makes it possible for experts in the field to describe the trends accurately, nor is it possible without access to the raw data to determine whether current sampling strategies and methods used to measure dust levels succeed in identifying the highest exposures accurately.

4.6.7 The data available on the time taken to acquire certifiable dust related disease indicates that although this has decreased steadily for white miners, it has not changed for black miners. The explanation for this is probably that white miners are now in supervisory positions and therefore less exposed to dust, whereas workers in the stopes are exposed to the same dust levels as in the past.

4.6.8 The failure to control tuberculosis in the mining industry must be a matter for grave concern in the light of the spread of HIV, and the effect of this on the acquisition of new infections and the relapse of past disease among miners.

Certifications, in life and following autopsy, have increased in number among both white and black miners. Tuberculosis among black miners has been the commonest certification for many years, and accounted, either alone or in combination with pneumoconiosis for three quarters of the more that 6 200 certifications among black miners in the financial year 1989 - 90, the last year for which comprehensive data are available. Among white miners the comparable proportion is less than one fifth; much smaller but not unimportant considering the generally low incidence of tuberculosis among the population from which white mineworkers are drawn.

Evidence cited by Dr. White derived from studies carried out on a large gold mine indicates that the incidence of tuberculosis is highest among the workers exposed to the highest dust levels. However the Commission is not persuaded that the sole cause of the failure to control tuberculosis is dust exposure.

The COMMISSION RECOMMENDS that a renewed effort to control the spread of tuberculosis among mineworkers is urgently required and this should be planned and implemented after detailed scrutiny of existing practice to identify weaknesses, and a through examination of current practice in areas in which HIV prevalence is high to ensure that the control scheme proposed has the best chance of success. This should be the responsibility of the Director of the MBOD.

4.7.11 The mining industry has in recent years adopted a policy of labour stabilisation. This system gives experienced miners the automatic right of return to their previous job provided they return within a specified time. It does not change the fundamentals of the migrant labour system. It does mean that the individual miner will spend on average a longer time in the mine. The objective is to stabilise labour supply and to retain skills, rather than to stabilise society or families. More time exposed to the adverse circumstances of living and working on the mines will mean for many a greater chance of acquiring overt disease.

There is suggestive evidence from the analysis of autopsy findings that the ageing of the workforce is accompanied by a higher prevalence of pneumoconiosis and tuberculosis. This should add a much needed sense of urgency to proposals to improve living and working conditions, medical surveillance and the compilation of statistical returns of sufficient quality and scope to enable health trends to be determined accurately.

4.7.12 The Commission concludes that the fundamental fault which underlies the migrant labour system, namely the dislocation of the family unit, is not changed or ameliorated by labour stabilisation. However, several companies have already made considerable progress towards providing family housing, and this should be encouraged.

4.8 RESEARCH INTO HEALTH AND DISEASE

4.8.1 The word research is widely misunderstood and is taken to mean studies devoid of any direct relevance to the everyday running of a mine. This is far from the truth. The major difficulty faced by the Commission and shared by those who gave written or oral evidence is the absence of data which can be used to define occupational risk by class of mine or mineral and by location of workplace within a particular mine. In the absence of reliable data for specific workplaces and for homogeneous risk groups remedial action to improve conditions at those sites responsible for adverse health outcomes will be impossible.

The first research task is to find out what is actually happening in each mine. The widespread practice of averaging - for example the average dust level for an entire mine, or a rate based on a denominator such as the total labour in service – serves only to confuse. Information is lost rather than gained by calculating averages or means for disparate groups of workers exposed to varying levels of risk, to different types of risk or possibly to no risk at all. The pooling of data derived from the examination of surface and underground workers is clearly wrong in principle.

4.8.2 There are nevertheless questions which need to be addressed by sophisticated and carefully designed research projects, supervised by capable scientists who have given detailed attention to all the ethical problems posed by the proposals to carry out research on human subjects. In this respect it is essential to involve the workers and worker organisations, management and expert advisers in the projects at the design slog. In the past a great deal of ad hoc research has proved to be unsuitable for generalisation, and while valuable in its own right proved to be unsound as a basis for policy formulation.

4.8.3 It is a matter for concern that both the name and the research programme of SIMRAC (Safety in Mines Research Advisory Committee) indicate a preoccupation with safety and an almost complete neglect of health. This organisation has a research budget far in excess of all other organisations undertaking research in the field of occupational health and safety put together.

The COMMISSION RECOMMENDS that the opportunity to establish effective tripartite management of this resource and to redress the balance to enable the health problems of the industry to be tackled more effectively should not be missed.

The determination of research priorities in any scientific field is a complex process which often fails to direct resources to the areas of greatest need or to projects which are likely to benefit the community at risk rather than the scientists carrying out the studies. The control of occupational health research in this country, in state institutions in particular, has been the prerogative of public servants, scientists, owners and managers. A few notable exceptions to this rule have demonstrated that the tacit knowledge and skills of workers may be vital in the design of studies to answer questions of real consequence.

4.8.4 In order to be of real use research findings must be published in peer reviewed scientific journals. In the list of references cited, for example, by Dr. White at the end of his evidence 40% are the result of work done by the MBOD/NCOH complex, and only 10% originate from the mining industry. Not only is there a need for more research but there is quite clearly a need for the industry to do much more of its own research. The work done at the Ernest Oppenheimer Hospital by Dr. Cowie and his colleagues, and a recent increase in research activity at this hospital demonstrates that this is possible.

4.8.5 The COMMISSION RECOMMENDS that official government and industry statistics should be published regularly in a standard format to enable independent researchers to analyse and interpret them, and that it is essential to establish effective audit mechanisms to ensure that the services provided on all mines, particularly small mines in remote areas, conform to regulated standards and that the statistical returns are accurate.

4.8.6 Access to mines for bona fide research projects should be made easier.

4.8.7 The deliberations of this Commission alone serve to generate a lengthy list of research questions, as reference to the written submissions and the verbatim transcript will show. No purpose would be served by attempting to produce a provisional list of research priorities but the COMMISSION FEELS STRONGLY that a great deal of epidemiological and biostatistical research work remains to be done before effective control of occupational diseases can be assured.

4.9 ENVIRONMENTAL CONDITIONS IN MINES

4.9.1 The measurement of dust levels and other indices of environmental conditions in mines is carried out in the main by the management of the particular mine. In the case of dust measurements these are submitted to the GME and stored in a computerised data base. By means of a complex formula an air quality index is

calculated for the whole mine. This index is used to determine the risk rating of the mine, and from this the levy payable to the compensation fund is fixed by the risk committee constituted in terms of the ODMW Act.

4.9.2 The raw data is not in the public domain, nor is it easy to determine the exact significance of the measurements, as the sampling strategy is not standardised. This is the underlying reason for the undue reliance, in the case of dust, on the work of Beadle and a few other workers, and for the assumption that dust levels in the mines have not changed for decades.

4.9.3 The COMMISSION RECOMMENDS that all mines regardless of size should be required to measure the relevant environmental conditions at regular intervals and compare the results to an agreed set of standards. These standards should be internationally acceptable and incorporated into regulations or into codes of practice.

4.9.4 The key to the control of occupational diseases lies in control of the working environment, and the identification of a case or cases of occupational disease should lead to an examination of the workplaces in which the particular worker was exposed. It may, and probably will, be said that today's disease is the result of past exposures - this point has been made repeatedly in this report, as has the point that stabilisation of the labour force is leading to longer exposures. If successive generations of workers are not to continue to be damaged at work, then the identification of an index case must be followed by a re-examination of the conditions which may have given rise to the disease.

4.9.5 In many cases it will be necessary to do more than simply measure the level of respirable dust in the air of the workplace. The composition of the airborne dust in terms of its mineral content needs to be determined. This has been confined largely to the determination of quartz in gold mine dust. In view of the range of minerals mined in this country there are obviously many situations in which the exact composition of an aerosol needs to be determined. Appropriate facilities for such analysis must be affordable, and available even to the smallest mine. Facilities must also be available for quality control by independent experts to ensure that measurements are valid.

4.9.6 The COMMISSION RECOMMENDS that the GME should have adequate resources and staff to ensure that the process can be audited at all stages from the sampling strategy to the analysis and presentation of the results.

4.9.7 The conclusion of a report entitled "Dust in the Mines" prepared by the Workplace Information Group reads as follows;

"Dust levels on South African mines continue to pose a risk to workers. Existing regulations and systems have proved ineffective in adequately reducing the levels of dust. If workers' health on the mines is to be adequately protected there is a need for a comprehensive dust abatement programme...". Similar conclusions could probably be drawn from the evidence in respect of noise, heat stress, gases, heavy metals, and a number of other hazards.

The DMEA however was opposed to self regulation. As an example of the extremely unsatisfactory problems to which self regulation gave rise evidence was presented by Mr Raath with regard to Regulation 2.10.2, which has been in operation since 1911. That regulation requires the manager not to permit an incompetent or inexperienced person to perform dangerous work or work upon which the safety of others may depend. That regulation was not effective and places an onus on the manager to ensure proper training, but in practice there were many sad and indeed tragic instances where this had not taken place. The proof of the pudding was in the eating.

The NUM contended that history had shown that where the industry had been left to self regulate this had failed. The alarming rate of deaths and reportable injuries in mines bore eloquent testimony to that, as did the examples in the following paragraphs.

The industry became aware, 26 years ago, of the dangers inherent in the use of polyurethane below ground. Yet repeated tragedies involving the use of this substance occurred culminating, but not ending, with the Kinross disaster eight years ago which claimed the lives of 177 persons. Today a debate is still taking place at a Western Deep Levels Inquiry as to how long it will take to remove polyurethane underground. This is a stark illustration of the danger of allowing even a well resourced industry to get on with its own regulation.

Radiation is another example. The DMEA regards radiation and dust as the two most serious underground hazards. Mining experts in the South African industry have been aware of the radiation hazard for many years but did nothing about the problem until the CNS was constituted in 1990 as an independent external agency. That was 17 years after the radiation danger in mines was ascertained.

The occupational disease figures constitute another example of the failure of self regulation.

So does the failure to install and maintain stone dust barriers in conveyor roads in coal mines, when the hazard of flammable coal dust underground has been well known to the mining industry since early this century.

The Commission is satisfied that self regulation has failed. In evidence adduced from Mr Raath and Mr Cameron reference was made to the mines particularly the smaller mines which are not members of the COM over which latter has neither control nor even moral influence.

The Commission has reason to believe that the situation regarding health and safety at these smaller mines is probably worse than in the bigger, better and more forward looking mines such as Elandsrand and Kriel. Photographs presented to the Commission taken in a small privately owned diamond mine reflected a situation where the employees were living in a state of squalor and degradation which the Commission could not accept without demur.

It is the view of the Commission that self regulation is unacceptable. The issue will be discussed further when dealing with the Regulations in Chapter 10.

CHAPTER SEVEN

RESEARCH POLICY AND RESEARCH MANAGEMENT

Historical Background

The South African gold mining industry commenced some research activities in the early part of the century. Initially the work was entirely restricted to health or health related matters (effect of dust, heat physiology) and to issues such as combating fungi in underground timber, vegetation of dumps and so on. Much of this work was carried out by a relatively small staff employed by the COM. In the first half of the century issues directly related to mining, such as the rockburst problem, were tackled on an ad hoc basis mostly by mining engineers, employed in various capacities by the mining companies. The realisation came only in the early 1950s that rockbursts and similar complex problems could not be solved by uncoordinated spontaneous efforts by individuals or even by individual companies. Thus, in 1953 the COM was asked to initiate and co-ordinate a major research effort to tackle the rockburst problem.

The COM commissioned the Council for Scientific and Industrial Research (CSIR) to form a team of scientists and begin a major investigation into the mechanics of rockbursts. Soon the industry found that the personnel at the CSIR were too remote from the mines and become somewhat disillusioned with the progress of the research. About 1960 the industry requested the advice of Sir Basil Schonland, an eminent South African scientist residing in the UK, with regard to the research policy it should follow. The advice received and accepted was that the gold industry has several major technological problems, and therefore, it should embark on a research programme of its own. In order to implement this programme it should strengthen its own research organisation considerably. The implementation of this policy commenced with the appointment of a research adviser in 1962 and the employment during the first half of the 1960s of several young engineers / scientist of international calibre. During this period the resources and the infrastructure of the Chamber of Mines Research Organisation (COMRO) were also greatly reinforced.

At about the same time when these developments in the gold industry, were taking place, the Coalbrook Colliery disaster occurred in 1960.

In this mine a major pillar failure caused the loss of 437 lives. Both the industry and the government felt that something must be done to avoid a repetition of such tragedy. It was decided to introduce a small safety research levy on coal production and initiate research using these funds. At the same time, the Coal Mining Research Controlling Council (CMRCC) a body on which the representatives of government and industry served, was established to oversee the research. It is worth interpolating here that this Council and this levy were the forerunners of the current SIMRAC and of the levy that funds the activities carried out under the control of this body. The current levy is collected from all sections of the mining industry.

At first the research by the CMRCC was carried out by the Fuel Research Institute (later the Institute became part of the CSIR), the CSIR and the small staff attached to the Council itself. At the end of 1966 the Council's own staff, by mutual agreement, was incorporated into COMRO and became the nucleus of the coal mining research within the COM.

In the early 1970s COMRO's research effort received a boost with the sudden and major increase in the price of gold. The profit of the gold mines increased considerably and it appeared that the economic base became available to develop the technological underpinning for the future of the industry. In 1974 the gold industry, through the COM, approved a 10 year capital research and development plan at an estimated cost of R 100 million. This was a great deal of money in 1974 and the decision to go ahead with the plan resulted in a three fold increase in COMRO's activities and resources. COMRO's new gold research programme, which was approved in June 1974, re-focussed research and development on the following four critical problem areas of the gold mining industry:

-rockbursts;
-mine cooling;
-mechanisation of stoping; and
-human resource problems.

Without attempting to give a comprehensive list, it is noteworthy, that the 1960s produced the recommendation that stabilising pillars and / or backfill are the two main methods of combating rockbursts. The rapid yielding prop and the theoretical basis for MINSIM (a computer programme to compute mining induced stresses and energy release which is capable of analysing the complex layout of goldmines) were also developed in this period. The 1970s saw the development of new mine cooling technologies. Progress in the use of hydro-power began in the 1980s. At the same time, disappointingly slow progress was made in the development of mechanised stoping methods and in other important areas. Also, work in the human resources area made uncertain progress, mainly because white South Africa at the time was unclear as to the direction in which development in the sensitive area should progress. Generally, however, COMRO was producing exciting advances and became the envy of the rest of the mining world. However, as time went on the rate of progress slowed, the price of gold declined and the profit margin of mines was eroded by price cost inflation. As a result of these developments the industry's enthusiasm for research dwindled. The disillusionment was aggravated by increasing efforts by some mining groups to do their own research, which inevitably led to differences of opinion concerning the direction in which research should proceed. At about the same time the then GME, facing a deteriorating safety situation, began to consider the extension to the whole industry of the CMRCC type of approach to safety research. Thus, at the beginning of the 1990s the scene was set for a fundamental change in the approach to research and to the formulation of research policy.

7.1 RESEARCH POLICY

The developments described in the previous section eventually led to major changes in the organisation and management of mining research in South Africa. The mining industry, after much internal debate and external negotiation, has decided that it can no longer afford to maintain a large research organisation. Consequently, the COM, after severely curtailing its research staff and infrastructure, has relinquished the control of COMRO. Thus, by the end of 1992 COMRO ceased to exist and its personnel, together with its resources, were merged with the CSIR. The remnants of COMRO re-emerged at the beginning of 1993 under a new name and management as Mining Technology, CSIR.

More or less in parallel with these arrangements the GME, after extensive negotiations, added a regulation to the Minerals Act (Act 50 of 1991). This regulation (Chapter 35) authorises the Director General of the DMEA to establish a safety research account to which income from three sources is to be credited. The sources of funds are firstly, research

Levies paid by mines in terms of regulation 35.2(a)(iv), secondly fines imposed in terms of regulation 35.3 for failure to pay or late payment of the levy, and thirdly, any income accrued from investment of the money in that account. It is important to note that all sections of the industry are required to pay levies in terms of this new regulation. The new levies have two features that are important to the Commission's business. Firstly the funds accumulated in this manner are to be ".. used for research and surveys regarding, and for the promotion of, industrial safety at mines and works". Secondly, the magnitude of the levy for each mine is defined in terms of a safety risk which is determined annually. The important points to observe here are that apparently the research levy is neither influenced by health risk nor is it to be used for research into the alleviation of health hazards.

On the basis of this newly established framework, SIMRAC was established in 1992. According to the Annual Report of SIMRAC for 1993, the Committee has 14 members. These include four representatives of the DMEA, one of which is the GME who chairs the Committee, one representative from the COM and nine representatives from major mining houses. None of the members appear to have any connection with health in the mining industry.

It would appear even from this short survey that two important principles were adopted when the SIMRAC system was organised. Both of these principles reflect the past and probably came about because of the long isolation of South Africa from developments in the rest of the world. Firstly, the composition of these committees gives the impression that the management side of the mining industry was meant to dominate the processes involved in the formulation of research policy and the definition of the research programme. No involvement of any representative of the mine workers was planned. Secondly, safety and health issues were to be separated and SIMRAC was to deal with matters of safety only. This latter issue however, is not dealt with consistently since some of the protects formulated by the committees do, in fact, impact indirectly on human health.

When this issue was raised during the presentation of evidence, the explanation given was that committees consist of technical experts and they are not forums for industrial disputes. This explanation is unacceptable on several grounds. There was not at the time a forum which provided an opportunity for input, comment or guidance from the representatives of workers or mine officials on research priorities or any other relevant matter. The presumption that the labour force, because it is largely under-educated, cannot provide an input into research discussions is not tenable. On questions of priority workers have opinions which should not be ignored and trade unions can employ experts who can make useful contributions to the debates of technical committees. This matter is discussed further in Chapter 10.

The reason for separating health issues from safety considerations is not entirely clear. Considerable benefit could result from the consolidation of these two sides of the problem into a single system of control.

7.2 EXTENSION OF RESEARCH TO HEALTH ISSUES

It appears that insufficient funds are made available to sustain credible research into occupational health problems associated with mining. As was discussed in Chapter 4, these health problems fall into a number of categories or groups. The first includes those that are directly associated with work in the mining environment, such as dust causing lung disease,

noise induced hearing loss, and vibration induced diseases. The second group involves diseases that may be associated with problems of inadequate living conditions and unnatural social environment on the mines, such as AIDS and sexually transmitted diseases. The third category may be termed hybrid diseases in which the origin of the disease may be unclear and may even be unrelated to mining, but working in the mining environment may aggravate the condition.

The prevention or alleviation of ailments in any of these categories may involve various activities and give rise to various costs. In this Chapter only the research costs are considered. It is a complex and unresolved socio-economic question whether the industry should be held responsible for the full burden of the costs associated with health problems. It seems reasonable to take a pragmatic view of the matter and suggest that in the present circumstances, mining should accept responsibility for research costs associated with medical conditions that are directly attributable to employment.

Diseases in the first category seem to satisfy this criterion of responsibility. The clarification of the possible aggravating effects of the mining environment and ailments in the third category could also be claimed to be the responsibility of the mining industry. However, the diseases in the second category occur commonly in the non-mining world and create a significant burden on society as a whole. The same comment can be applied to the non-compounding effects of the diseases in the third group. In the case of these diseases the mining industry can expect to be treated as a tax payer and pay its contribution towards the cost of research into these diseases through the tax system.

If the health problem is subdivided in this manner, it is reasonable to include health related research in the portfolio of SIMRAC. If this is done then the research levy should be calculated on the basis of both health and safety risks at every mine. The health and safety risk factors would determine the distribution of health and safety levies respectively.

Naturally, the implementation of this suggestion would necessitate the development of a system of record keeping that would facilitate the estimation of the health risk factor. This task should be approached in a simple and pragmatic way since the goal is merely to estimate a risk factor and not to collect moneys to fund compensation in the future.

The COMMISSION RECOMMENDS that:

-research conducted to promote the prevention of accidents and occupational diseases, directly attributable to the mine environment should be funded by research levies. This principle should also cover those diseases that are aggravated by the mining environment. Such research should be initiated only when the need for and utility of the expected results are firmly established;

-the oversight of research in these categories should be the responsibility of SIMRAC;

-the health research envisaged should be financed from a levy collected from the mines on the basis of a health risk factor; and

-a data collection system should be established to facilitate the mine by mine calculation of the health risk factor.

7.3 MANAGEMENT OF RESEARCH

It is in the interests of the employees, the employers and the State to maintain acceptable levels of health and safety in one of the most important industries of the country. The tripartite principle of joint control of certain issues affecting all concerned in the industry has been generally accepted by all parties giving evidence before the Commission. Clearly, research aimed at improving health and safety falls into the category of issues in which the tripartite principle should apply.

The effective management of research involved decision making at two levels. First, it is important to formulate a clear policy with regard to the research objectives, targets and priorities. The decisions in this regard must be made on the basis of full understanding of the health and safety conditions in the industry and should involve risk assessment and the analysis of the importance of making improvements in certain areas (the aim is not to do cost-benefit analysis which is not a realistic undertaking in this type of research.) This level of decision making should be the responsibility of SIMRAC. This central Committee would also decide such issues as the method of initiating research, the system for finalising the research programme, the process of reconciling available funds with the requirements of proposed research projects, contractual arrangements with research bodies and so on.

The second level of decision making is the technical level. Once the objectives, targets and priorities are approved, it is the technical committees responsibility, inter alia, to formulate the announcements calling for project proposals, the evaluation of the proposals received and the assessment of research progress.

It should be realised that the responsibilities of the technical committees include highly specialised tasks. No one questions that the management of a mine requires specialist knowledge and considerable experience. Surprisingly, it is often overlooked that the management of research is an equally specialised occupation and demands considerable experience. The membership of the current subcommittees appears to consist mostly of mining and other types of engineers with some experience in the management of mines or plants. It is unfair to expect such groups to control and guide to the best advantage research conducted by outside bodies whose interests do not entirely coincide with those of the three parties involved in mining. To overcome this problem the subcommittees need to be reinforced by independent technical or expert advisers (see Ch. 7.5).

The SIMRAC should remain the main co-ordinating body which advises the DMEA on the conduct of mine health and safety research. The composition of the Committee should, however, be changed drastically so as to reflect the tripartite basis of all mining operations. The DMEA should have three members on the Committee, with the GME as Chairperson, employers and employees should each nominate three representatives. One representative should be nominated by the mine officials. They should be appointed by the Minister for a period of four years, and the Minister should provide SIMRAC with its terms of reference.

Since many mining companies are not members of the COM, there is no single body that can claim to represent employers, and it should be incumbent on the Chamber to agree a mechanism for selecting representatives from the whole industry. Similarly the NUM is the largest trade union, but there are others and these organisations between themselves should come to an agreement on a list of representatives. It is recognised that this system will not ensure direct representation for those who are not members of any trade union or association.

In the event of disagreement between the parties on names to be put forward, the DMEA should request each sector representing 5% of the employers or employees to nominate not more than three persons to SIMRAC. In the case of employers the size could be measured by revenue generated, and in the case of employees by the size of membership. The final selection of representatives should be left to the Minister, acting on the advice of the GME. In terms of the above arrangements SIMRAC should have ten voting members. As the Committee would not necessarily involve only technical or medical persons, it would be essential to have in attendance one or two experts. These experts would advise SIMRAC on the technical and medical aspects of research. This responsibility would require that these experts have a thorough knowledge and understanding of research needs, monitoring the progress of research projects and operation of the relevant technical sub-committees. Probably the most appropriate way of ensuring that such expertise is available to SIMRAC is to appoint one or two research advisers for health and safety. These advisers would have a significant role in ensuring the effective operation of the system. The research advisers would either be serving in a full time capacity on the GME's staff or would be recruited on a part time basis from elsewhere.

The existing sub-committee system of SIMRAC could be retained with some modifications and an addition. These sub-committees would be technical bodies, where membership would not depend so much on representativeness but on technical background and experience. Consequently, persons not employed in the industry could also be nominated for membership. Nominations to each sub-committee would be presented to SIMRAC by each party represented on the Committee. SIMRAC would then select and appoint the membership and chairmen of its sub-committees. The chairmen of the sub-committees should attend SIMRAC meetings in a non-voting capacity.

In view of the earlier recommendation that SIMRAC's research programme should be enlarged to include certain health issues the formation of a health sub-committee is suggested. As the prevention of many occupational diseases is wholly or partly in the domain of mining and other engineers, the formation of an independent health sub-committee may not appear to be the appropriate solution to some. It is therefore important to ensure that there is cross-fertilisation between committees in this regard. This can be achieved partly by overlapping membership and partly by the use of independent advisers.

The COMMISSION RECOMMENDS that:

-the existing established system of a main committee, SIMRAC, and its sub-committees be retained. SIMRAC should be responsible for advising on research policy and the sub-committees would be technical bodies which, in general would look after sectional problems;

-SIMRAC should consist of ten members, reflecting the tripartite nature of the mining industry. Each of the three main parties should be represented by three persons, and the mine officials by one person with the GME as chairperson ex officio. The details of the nomination and appointment procedures should be as described above;

-SIMRAC's sphere of responsibility should be enlarged to include relevant health research matters;

-the current list of sub-committees should be extended by adding a further sub-committee to look after health research issues;

-the sub-committee should be technical bodies, where membership reflects technical background and experience rather than sectional interests. SIMRAC should appoint its sub-committees, based on nominations from the interested parties;

-one or more research advisers should be appointed to assist in the administration of the programme and advise SIMRAC and its sub-committees on research issues; and

-the research advisers and chairmen of sub-committees should attend SIMRAC meetings as non-voting members.

7.4 RESEARCH PROGRAMME

As SIMRAC's Annual Report for 1993 states quite correctly, the research programme of the Committee should be "needs driven". While this goal is easy to formulate it is not so easy to implement. The first hurdle is to define the needs. If this has been achieved, the next step is to define specific objectives and then to formulate the research and development programme to work towards the defined goals. It may be noted in passing that the discussion of SIMRAC's affairs seem to have been restricted so far to research. It is inevitable, that sooner or later, unless an alternative solution is proposed, the scope will have to be enlarged to include development as well.

Of necessity, the industry's needs must be defined at two levels. First, on the basis of a detailed risk assessment, the most burning safety and health problems need to be identified and must be assigned appropriate priorities. Once this step has been accomplished, the second task is to pinpoint the reasons why these problems exist, and the impediments that prevent their mitigation. Some of the reasons or the causes will be controllable, some will not. Some of the impediments to improvements will be technical or medical, but many will fall into other fields, such as management etc., hence fall outside the research field. A simple illustration may held to clarify the principles involved.

For example, it was identified some time ago (Chapter 3.1) that one of the most significant sources of fatalities in gold mining are rockbursts. Hence SIMGAP recommends and SIMRAC assigns high priority to the task of alleviating the rockburst hazard. Thus, the alleviation of rockbursts is recognised as a research need with high priority. Rockbursts are a sub-group of a much greater set of events, namely that of seismic events. Hence SIMGAP could propose that one of the possible ways of reducing the rockbursts risk is to diminish the frequency and intensity of seismic activity. Thus the reduction of seismic activity becomes the objective. The sub-committee may also conclude that the primary reasons for the high seismicity are the depth of mining; the narrow tabular shape of the stoping excavations; convergence of the walls of the excavations; geological disturbances such as faults or dykes; spread of stoping in plan and so on. Among these reasons are depth, shape of stopes, prevalence of geological disturbances, which are not subject to human influence, while the extent of mining is an economic necessity. However, the convergence of the stopes and the conditions on some faults are alterable.

For the purpose of the example, we focus now on convergence management only. Thus, the reduction of convergence becomes a sub-objective or target. Now postulate that it has been established that the magnitude of convergence can be influenced significantly by the presence of stabilising pillars and by the application of backfill. At this point the sub-committee should question the validity of the earlier conclusions concerning the efficacy of pillars and/or backfill. Supposing for the present that efficacy is confirmed, next the sub-

committee should look for impediments that prevent the wider and / or more effective use of these counter measures. Such series of inquiries eventually may or may not lead to research projects. If they do the initiation of projects is accompanied by a reasonable assurance that the resulting research is truly needs driven.

After studying SIMRAC's Annual Report for 1993, the Commission has not been reassured that such a rigorous process of planning has been pursued in formulating the research programmes for 1993 and 1994. For example the programmes of SIMGAP for these years seems to contain only one project entitled "Develop Improved Strategies, Layouts and Seismic Monitoring Procedures for Safer Mining in Very Highly Stressed Areas", that targets the rockburst problem in ultra deep mines. The progress report for 1993 refers to a literature review, some 20 questionnaires completed by rock mechanics practitioners and a computer programme developed for the automatic location of seismic sources. Of the points on which progress was reported, the questionnaires could be of value, the literature survey is a surprising venture after several decades of rockburst research in South Africa and the seismic location programme is virtually irrelevant to the solution of the main problem.

Similarly, the research programme for SIMCOL for 1994 refers to pillar design, but not to general strata control. This is so despite the fact that rockfalls represented the second largest source of coal mining fatalities in 1993. There does not appear to be an attempt to identify the types of rockfall accidents encountered in collieries.

At the same time, there are indications that the programmes devote significant efforts to matters for which acceptable but not perfect solutions already exist (e.g. pillar design in SIMCOL's programme), or to projects that are not defined in the most appropriate way. In the case of pillar design there may be some doubt concerning the research priority assigned to the investigation. An example of the second shortcoming is the project in SIMRAC's programme entitled "Develop Seismic Techniques for Predicting Rockburst Risk and Strategies to Reduce Rockburst Induced Fatality and Injury Rates". The description of the project suggests that an entirely seismic approach to the research is envisaged. This seems a premature objective, as the primary need at this stage is to relate the seismic observations to mining layouts and to regional support systems. Progress in this field is urgently needed, while the current project probably becomes relevant only when the interrelationship between mining and seismicity has been established.

The COMMISSION RECOMMENDS that:

-a research planning procedure should be developed that will drive the research and development programme in the most appropriate direction in the light of the above discussion.

7.5 INDEPENDENT REVIEW OF RESEARCH PROGRAMME AND PROGRESS

At present none of the parties involved in the proposed new management of the research and development programme has an in house research organisation or research staff. The situation will improve marginally if and when the research advisers discussed earlier are in place. Due to a lack of research expertise, SIMRAC could run the risk that its programme becomes superficial, misdirected and amateurish.

To avoid these problems and ensure that the public is satisfied that everything is being done to deal with the burning health and safety issues of the industry, it would be prudent to make independent review a formal part of the modus operandi of SIMRAC. Such review would be conducted by a group of three to five eminent researchers who have an understanding of the technical problems of the South African mining industry.

The members of the group would be selected for their knowledge of one or more important aspects of the research spectrum of SIMRAC. The appointments would be made for a minimum of three years to ensure continuity.

The tasks of the expert group would include the review of research objectives, priorities, annual research programme and progress and any other matter that would be assigned to it by SIMRAC. Members of the group would operate in close collaboration with the pertinent sub-committees and with the GME and would provide advice in the formulation of calls for research proposals and assessment of progress in particular projects.

The COMMISSION RECOMMENDS that:

-SIMRAC should adopt the principle that it will operate using independent reviewers to assist in the more effective and more transparent execution of its tasks;

-a group of three to five eminent and experienced researchers, preferably with an understanding of the South African mining problems, should be selected and appointed for a period of three years; and

-the group should assist the GME and SIMRAC, inter alia, in the definition of objectives, the assignment of priorities, the evaluation of the proposed research programme and the assessment of research progress in the previous year.

that there should be a distinct statute for health and safety in mining, with certain provisions incorporating some of the desirable features of the Occupational Health and Safety Act 1993. (Cameron p 2 449 10-20, Chamber Closing Submissions para 16).

8.3.2 The Occupational Diseases in Mines and Works Act No 78 of 1973

As amended this Act still sets the basis of the determination of health risk in mines and works and for determining which mines or works are controlled. The original Act was ethnically orientated, but there have been extensive amendments.

The Act sets up the MBOD and its Director is charged with the direction and control of medical examinations, and can direct medical practitioners to perform such examinations, and controls the issue of certificates of fitness, and has other extensive powers.

A major change in the statutory position occurred when the Minister responsible for the Act was changed from the Minister of Mineral and Energy Affairs to the Minster of Health. The GME continues to advise on which mines or works should be designated "controlled", and is chairperson of the Risk Committee for Mines and Works. The GME, in his capacity as chairman of the Risk Committee has extensive powers of investigation, and the committee has to determine the risk at controlled mines and works, expressed as a percentage. The measurements taken by the GME's staff and calculations which determine the SIMRAC levy are provided under the terms of this Act, but this information is not yet in the public domain. Its publication could be useful in evaluating the extent of the respirable dust problem in mines. (Raath p 1 962 6-23)

The Commission did not hear a great deal of evidence concerning the operation of this Act. The Act was introduced to deal with compensation matters, which are outside the powers of this Commission, but the operation of the Act, in the way it determines procedures for medical examinations; issues certificates of fitness; defines diseases associated with mines and works; requires registers and statistics to be kept; and involves the GME in much of this work, has considerable relevance to the issue of health of mineworkers. (Raath pp 2 023/4) In making recommendations designed to improve the regulation of the health of mine-workers an improved relationship between the GME's Office and the MBOD is essential, and the NUM proposal that the Mines Inspectorate should participate in a National Health and Safety Policy Council (NUM para 22, Closing Submissions) has much to commend it in this regard.

8.3.3 The Nuclear Energy Act 1999, as amended

This Act, under which the Council for Nuclear Safety operates, provides that the authority responsible for radiation protection in South Africa is the Council. This matter was discussed in Chapter 4.10.2 and Chapter 6.8.

The Commission does not find any reason to suggest an amendment to that Act, but there is a strong case for closer co-operation between the Council and the GME, and this would be to the benefit of the health of the workforce in the mining industry.

10.3.9.1 Medical Examinations and Surveillance

Medical examinations of new entrants, re-entrants, persons leaving the industry, and periodic examinations should be required in accordance with the regulations.

Medical surveillance (as described in Appendix 7) should be carried out by the owner of the mine in order to detect and treat any occupational disease that may become apparent.

Records of all medical examinations and their findings should be recorded in a data base for the mine, and the findings made available to the GME's office.

Medical records: including radiographs, should be preserved by the Owners for a period of about 40 years, and deposited with the GME's office after that period.

10.3.9.2 **Medical Centres and First Aid**

The manager should ensure that a medical centre, manned by a trained occupational health nurse is available at the mine to deal with accidents and cases of ill health whenever persons are employed at the mine and that transportation facilities are available to hospitals for cases that cannot be treated at the mine.

The manager should ensure that first aid equipment is available at suitable places, and in prescribed quantities at and in the mine, and that a sufficient number of trained first aiders are available in the workings as prescribed by regulations.

10.3.9.3 **Substances Hazardous to Health**

The manager of a mine should be required to make a suitable and sufficient assessment of the risks created by work involving hazardous substances, and the assessment should be reviewed when the situation changes.

The result of the assessment and the measures to be taken to eliminate, reduce or mitigate that risk, as required by regulations, should be recorded.

Suitable protection should be provided without the need for personal protection, but if this is not reasonably practicable, suitable personal protection to control the exposure adequately should be provided.

Exposure to substances should be monitored and should not exceed the limits set in regulations.

The manager of the mine should ensure that a monitoring system is in place for substances hazardous to health and that the results of the monitoring are recorded. Records of monitoring should be preserved for at least 40 years.

10.3.9.4 Ionising Radiation

The manager of the mine should be required to define on a plan of the mine and by notices within the mine, the parts of the mine where radioactivity measured on an area basis by hand held instruments in such as to indicate that persons working there regularly would be exposed to doses exceeding the annual dose limits set by the CNS.

The manager of the mine should be required to record this information and return it to the inspectorate office.

The manager should take all reasonably practicable steps to reduce the level of exposure to ionising radiations.

The GME and the Mines Inspectorate should work closely with the CNS to assist in the licensing procedure, to monitor the conditions attached to licenses, to provide advice to mines on how to reduce exposure, and to ensure that records of doses received by individuals are properly recorded, preserved and made available to the MBOD.

10.3.10 Safety

10.3.10.1 Support of Strata

The manager of the mine should have the duty to ensure that in every working place and travelling road, steps are taken to control the movement of strata, and that the roof or hanging wall is supported and kept secure. The manager should ensure that he has all necessary information to enable him to discharge this duty.

Where accidents occur due to falls of hanging wall the manager should specify the systematic support that should be used at that place in his Code of Practice. The code should be specific and specify the type of support to be used and the support density.

Support materials should be made available at all times when work is being done at a working place.

When supports are to be withdrawn the operation should only be done from a position of safety, using appropriate devices.

10.3.10.2 Ventilation and Environmental Control

The manager should have a duty to ensure that ventilation is constantly provided in all parts of the mine where men work or pass, sufficient to dilute noxious and inflammable gases, and respirable dust, to concentrations below the maximum levels stated in the regulations. The ventilation must be adequate to provide sufficient oxygen.

The manager should have a duty to secure conditions that are reasonable as regards temperature and humidity, as prescribed by regulations.

When the ventilation falls below acceptable standards as specified in regulations the manager should ensure that the place is fenced off.

In fiery mines, where a goaf is formed by extracting coal by pillar extraction, or longwall methods, the manager should ensure that adequate ventilation is constantly produced in that goaf, or that steps are taken to minimise emissions of noxious or inflammable gas from that goaf.

In fiery mines and mines where flammable or noxious gas can be a hazard and where there is a goaf, barometers should be provided on the surface.

10.3.10.3 Lightning and Contraband

The manager should have the duty to provide lighting on the surface and underground to enable persons to work in safety as prescribed by regulation.

In fiery mines only approved lights should be lawful, and within a distance prescribed by regulations of a working face electrical equipment should be flameproof or intrinsically safe.

A person who takes smoking materials or matches or lighters below ground at a fiery mine should be guilty of an offence. Searching procedures should be in place at fiery mines as prescribed by regulations.

Articles designed to produce unprotected flames or sparks should only be used underground in a fiery mine with express permission of an inspector, or in accordance with regulations allowing such practice.

10.3.10.4 Shafts and Exits

It should not be lawful for persons to be employed below ground unless there are two sheaves available for exit purposes which are connected underground to provide alternate exits, and are not less than 10 m apart.

One exit from the mine should be readily available for use when persons are below ground.

There should be two ways out of working places underground, each leading to a different exit, except where no more than 9 persons work in the place, or 30 persons if the place is a shaft in the course of being sunk.

The manager should ensure that suitable barriers to prevent inadvertent entry into any place in the mine which is not safe, including shafts, are provided and maintained.

10.3.10.5 Underground Roadways

It should be the duty of the manager of the mine to ensure that roadways used underground by persons, vehicles or conveyors are maintained in a secure state, and his code of practice on transport systems should specify the minimum clearances required between vehicles, conveyors and the sides. Pedestrians should as far as reasonably practicable be separated from vehicle

routes. Where pedestrians are allowed adequate precautions for their protection should be prescribed in the code.

10.3.10.6 **Winding Engines, Rope Haulage Apparatus, Free Steered Vehicles and Conveyors**

No winding or haulage engine should be used for winding persons unless a permit has been issued by an inspector. The driver should be competent and certified, and be appointed by the manager. A driver should be available whenever persons are below ground.

Winding operations should only be conducted in accordance with regulations and shaft signals should all comply with the Code of Signals specified in the regulations.

Haulage apparatus and conveyors should be under the supervision of competent persons, trained and appointed for the purpose, and should be operated according to the regulations. Effective means of transmitting signals should be provided along the whole length of conveyors, and in lengths of roads where rope haulage apparatus is in use.

10.3.10.7 **Explosives and Initiating Devices**

The manager should ensure that explosives and initiating devices are only use by persons competent and qualified to do so, and that transportation and control is supervised by competent persons, appointed for the purpose. They should only be used in accordance with the regulations.

10.3.10.8 **Fire Precautions, Rescue and Self Rescue Provisions**

Materials and equipment used in roadways along which intake air passes to working faces and stopes should be of fire resistant material, and should not contain mineral oil.

The manager of the mine should specify arrangements for fire fighting in his code of practice, which should comply with regulations.

10.3.10.9 **External Dangers to Workings**

When mine workings approach within 40 m of any old working that has not been examined at that time, or that contains water or other fluid material, or approaches within 40 m of the surface or a body of water, the manager should take suitable steps to prevent a possible inrush of water or other fluid material, in accordance with the regulations. His proposals should be communicated to the workforce involved and their health and safety representatives, and discussed beforehand at the Mine Health and Safety Committee.

10.3.10.10 **Dust**

The manager should ensure that no significant amount of airborne dust enters the mine from surface activities, and that underground work is conducted in such a way as to minimise the production of dust. He should ensure that dust

suppression arrangements are provided as required by regulation, and the sampling for respirable dust, and for flammable dust in roadways is in accordance with the regulations.

10.3.10.11 **Noise**

The manager should ensure that in selecting, maintaining and using all the equipment at the mine the emission of noise is minimised. He should arrange for noise surveys to be undertaken by competent persons to identify zones where exposure may exceed the maximum dose for the shift prescribed by regulations. The manager should consider alternative methods to reduce this exposure and provide effective hearing protection where exposure might exceed the maximum set in regulations.

10.3.10.12 **Withdrawal of Workmen in Cases of Danger**

If it appears to shift boss, overseer, or other person in charge of a section of the mine or a working place, that there exists a danger in that section or working place, he should require all persons in the place or section affected to leave for a place of safety and should not allow them to return until the place is made safe.

In a fiery mine, a concentration of 2% of flammable gas in the general body of the air, or the occurrence of a detectable layer of flammable gas in the explosive range, should constitute a danger requiring men to be withdrawn.

10.3.10.13 **Training**

The manager should ensure that no person is employed at the mine unless he is trained and competent to do the work given to him without supervision, other than for the purposes of training him to be competent. Training should be given to all workmen in accordance with the regulations.

10.3.10.14 **Notification of Accidents and Diseases**

The manager should notify the inspector if any accident, non-casualty accident or disease occurs at a mine, in accordance with the regulations.

Notice should also be given to the workmens' health and safety representative for the part of the mine where the accident occurred, or the full time representative should one be available.

The site of the accident should be left undisturbed until an inspector, or the health and safety representative, or both have completed their investigations, or a period of three days has elapsed.

10.3.10.15 **Inquiries into Accidents**

In the event of an accident being reported the inspector should conduct an inspection in loco but such inspection in loco should not be carried out unless the workmens' health and safety representative and anyone else involved with or related to the person killed or injured is present.

-the GME's guidelines should be based on the advice of a small tripartite team of experts with adequate local knowledge;

-these guidelines should be distributed to all managers for information within the three months; and

-if a mine fails to submit an acceptable code to the inspectorate by the expiry of the deadline, the GME's guideline should become automatically the mine's code of practice.

The COMMISSION RECOMMENDS with respect to coal mines that:

-the accident records should be analysed, by the Inspectorate to determine the cause of rockfalls with the view to deciding what immediate action to ameliorate the problem is warranted.

The COMMISSION RECOMMENDS that when an accident occurs due to rock failure attributable to an inadequate support system the mine's code of practice should be automatically reviewed by the GME without delay to ensure that an adequate support system is installed.

10.5.2 Accidents from Haulage and Transport Underground

Although this is the second largest category of accidents in mines, second only to falls of strata accidents, the Commission was not provided with detailed evidence as to the location or cause of this large group of accidents. This information is urgently required in order that sensible regulation of these operations can be prescribed.

The COMMISSION accepts the suggestion of the National Union of Mineworkers that an investigation into this matter should be undertaken and RECOMMENDS accordingly. This investigation should be made as soon as possible by the staff of the GME, assisted by one nominee of the owners and one nominee representing the workers and one representing mine officials. As soon as possible after the completion of this study the group should draw up proposed regulations for controlling these hazards, for consideration by MRAC and establishment as soon as possible.

10.5.3 Occupational Health

Much has already been said concerning the lack of attention in the regulatory system to health issues, and the poor record of the industry in controlling occupational disease. The Commission heard evidence that medical interventions should be possible at each mine to detect certain diseases (pneumoconiosis, asbestosis, silicosis, hard metal disease, chronic obstructive airway disease, tuberculosis), and that this would be possible by the companies, with the facilities already available. (White pp 500, 503, 506). Regulations should be promulgated as soon as possible dealing with occupational health in mines and require, inter alia:

-that the GME be given express powers to control occupational health hazards;

-that the owners of mines provide medical surveillance for the diseases that may occur at the mine; and

-that the manager of the mine be required to ensure that the owner's surveillance scheme is properly operated, and that adequate records are kept, and supplied, subject to medical ethics, to the GME.

10.5.4 **Coal Mine Explosions and Respirable Dust**

Coal mine explosions continue to occur regularly in South Africa, the most recent large explosion claiming 53 lives in 1993. Evidence given by Chamber of Mines witnesses suggested that we could not expect significant improvement based on current codes of practice (Phillips p 20 Chamber submission, Coal mine Explosions). One of the points of greatest hazard in the explosion context is the board in which a continuous miner operates. The large number of picks rotating in the cutting head can cause frictional heat and ignitions. In the period 1990 to 1992, 25,5% of the ignitions came from this source, but in 58,5% the investigation had not determined the ignitions source. A large number of continuous miners or similar machines are now used in South African coal mines. Another Chamber witness said that the method used to ventilate continuous miners in South Africa was the subject of considerable debate and research in the industry at the moment. The system may have to be changed completely (Thornton p 1 665 16-30). The same witness said that average levels of respirable airborne dust measured at continuous miners was 6 milligrams per cubic metre, much higher than the prescribed statutory level. The level of respirable dust produced by these machines is known to be high, and could produce disease after a fairly short period of exposure.

High levels of airborne dust also contribute to the levels of flammable dust that may be available in the bords to convert a small methane explosion into a coal dust explosion which is usually more violent and disastrous. (Raath Exhibit C28).

The Commission heard that the American regulations on coal mine ventilation, where the use of continuous miners is common, which were revised in May 1992, required ventilation control devices (ventilation ducting or line brattices) to be installed to a position not more than three metres from the area of deepest penetration to which the face has been advanced. Similar regulations in the United Kingdom were also brought to the attention of the Commission. This is not the standard of ventilation found in some cases in South Africa where the ventilation may be as much as 24 metres from the coal face (Thornton p 1 665 8-13). This leaves an excavated volume around the continuous miner which is not ventilated, and where concentrations of methane and dust can accumulate. Until these ventilation standards are improved, ignitions of methane will continue from time to time in continuous miner headings, respirable dust levels will be high, and disastrous explosions will occur. To reduce respirable dust levels exhaust ventilation is required and light, rigid, quick fitting plastic ventilation ducting is readily available to facilitate this. Conveyors are used to convey the coal out of the mine and the coal lying on these conveyors, even in well stone dusted roadways, can act as a fuse to transmit a coal dust explosion. Stone dust or water barriers set over the conveyor can prevent the progress of an explosion.

The COMMISSION RECOMMENDS that the Minister should promulgate regulations as soon as possible to provide that:

-the manager of a coal mine should include in his ventilation code of practice arrangements for:

-the delivery of ventilating air by ducting to within 3 metres of the coal face in bords or headings;

-the volume of air delivered should be sufficient to produce a velocity of 0,4 metres per second over the cutting machine;

-where respirable dust samples taken in the heading exceed the maximum allowed by regulation, this ventilation should be in the exhaust mode to ensure that the dust is taken out via the ducting from the bords or headings, with fans situated on the return side of the headings. Irrigated filters should be fitted to these exhaust fans to prevent the dust extracted contaminating other parts of the workings on the return side of the bord or heading; and

-approved stone dust or water barriers to the extension of flame should be made mandatory in roadways where coal conveyors are used, set in positions recommended in international practice.

Mine plans are very important in the health and safety context, but their provision and accuracy are the responsibility of the owners and managers of mines, and the appointment of a mine surveyor is a statutory appointment made by the owner of the mine. When owners and managers discharge their statutory duties properly the enforcing authority should have no need for a survey capability for health and safety needs. At times an inspector may suspect that plans are inadequate or inaccurate. In this event the GME's office will need to have access to facilities for a check survey, at the expense of the owner of the mine. For normal operation of a health and safety inspectorate there should be no need for a permanent survey department, but the inspectorate should have access to a survey capability when required.

The surveys made during 1993 were for State assistance and valuation purposes, matters not connected with health and safety (GME Exhibit C11 para 8.2). If a survey department is required by the DMEA for optimal exploitation or land reclamation purposes it should be located in another part of the organisation, so that the GME is not burdened with its organisation and can devote more of his time to health and safety matters.

In earlier sections of this report the Commission has said that it feels that rehabilitation of land only bears marginally on health and safety issues in underground mining, and that it should not be allowed to detract from the very important work of improving health and safety in the mines. We consider therefore that the Rehabilitation Directorate, now part of the GME's office, should be moved to a more suitable location in the government service so that the efforts of the MHSI can be concentrated on health and safety issues.

The COMMISSION RECOMMENDS that the existing Survey and Rehabilitation Directorates should not form part of the new MHSI.

The terms "Director" and "Chief" should be avoided in the new MHSI as they invite the question as to who and what is directed and of what one is chief, and the numbers involved are usually small. More suitable terminology for the grades in the new MHSI would be GME, Deputy GME, Principal Inspector, Senior Inspector, Inspector, Assistant Inspector, Sub-Inspector. More comment will be made on these proposed grades later.

The Mine Environmental Control Directorate is a large centrally located unit. There is a need for a central facility for analysing samples of respirable dust, flammable dust, mine air and pollutants, but this need not be part of the MHSI but could be part of an independent support and sister organisation, which will be considered later. Mine sampling activity would be better controlled by the Principal Inspectors in charge of the districts. The work involved in calculating the risk levy by this department should be simplified so that it consumes less technical manpower. (McGinn Submission p 4)

These changes will still leave, in the GME's Headquarters Branch, in addition to the three Chief Directors, two Directors, one Deputy Director, three Chief Regional Mining Engineers, and one Regional Mining Engineer. For the sake of this commentary no distinction is made between mining and machinery inspectors and administrative and clerical staff are not considered.

In the existing regional organisations, assuming all vacancies are filled, there are:

9 Regional Directors
8 Chief Regional Mining Engineers
102 Regional Mining Engineers

As stated some Regional Directors, if they have had recent experience as managers or deputy managers, and have degrees and certificates of competency, may be qualified for the Principal Inspector posts. Some may wish to remain in the administrative cadre of the DMEA for optimal utilisation or land rehabilitation, and some may wish to become senior inspectors or inspectors in the new MHSI depending on their qualifications. For this commentary it is assumed that five may become available for redeployment in the MHSI. This would give a figure of 125 mining engineers available for deployment in the MHSI. Fourteen would be required for the lower tier of quarry inspectorate, leaving 112 available for the underground inspectorate.

11.1.10 Structure of the new Mine Health and Safety Inspectorate

The new inspectorate will be able to devote itself exclusively to improving the health and safety of the workforce, to reducing the currently unacceptable level of fatal and serious injuries, and to investigating non-casualty accidents so that the lessons learnt can be used to prevent recurrences. As the accident rate reduces it will be able to devote an increasing amount of its resources to proactive work, so that prevention will be more to the fore, and not remedial action following disasters and accidents. It will have a new Act and Regulations to enforce which will be devoted exclusively to health and safety matters. As its expertise increases it will be able to concentrate on its role as adviser, to those who operate and work in the mines.

At headquarters, where the GME is charged with the responsibility for the health and safety of the five to six hundred thousand persons employed in the mines, there should be three Deputy GME's to assist him. These deputies will share the line management of six inspection districts, each containing about 30 underground mines, and the second tier of the inspectorate responsible for surface mines or quarries. They will also have responsibility for policy on specified subjects such as electrical and mechanical engineering, civil engineering including tips and lagoons, research, annual reports, statistics, incident reports, accident investigation reports, ionising radiation, underground transport, external dangers to workings, surface accidents at underground mines, health, noise, vibration, respirable dust, risk assessment, relationships with outside bodies such as the ILO, arrangements for tripartite committees, explosives, strata control, seismic monitoring, ventilation, ignitions and explosions, fires and fire fighting, substances hazardous to health, occupational hygiene, first aid, rescue and self rescue, training in mines, training of the inspectorate and continuing professional development.

This list is not intended to be exhaustive. This will enable individuals to specialise in particular subjects and provide advice to the GME when preparing instructions to inspectors, guidance to the industry, and drafting regulations.

They should be assisted by three of the newly appointed Principal Inspectors who will have recent senior management experience, and have the highest qualifications in the industry. These in turn will be assisted by three Senior Inspectors and three Inspectors.

The COMMISSION RECOMMENDS that the headquarters staff of the MHSI should consist of the GME, three Deputy GME's, three Principal Inspectors, three Senior Inspectors and three Inspectors to replace existing staff, together with administrative and clerical support.

The COMMISSION RECOMMENDS that the grades in the Mines Health and Safety Inspectorate should be:

Grade 1 Government Mining Engineer
Grade 2 Deputy Government Mining Engineer
Grade 3 Principal Inspector
Grade 4 Senior Inspector
Grade 5 Inspector/Senior Inspector of Quarries
Grade 6 Assistant Inspector/Inspector of Quarries
Grade 7 Sub Inspector

Existing remuneration packages are inadequate to attract candidates of the right quality and calibre in adequate numbers.

The COMMISSION RECOMMENDS that to ensure that suitable staff can be appointed to these grades the remuneration packages for these grades should be related to remuneration in the industry. The reference point should be at Principal Inspector level. He should be offered 90 per cent of a typical mine manager's package.

The following levels of remuneration are recommended:

POST	**PERCENTAGE OF MINE MANAGERS REMUNERATION PACKAGE**
Government Mining Engineer	110%
Deputy Government Mining Engineer	100%
Principal Inspector	90%
Senior Inspector	65%
Inspector/Senior Quarry Inspector	45%
Assistant Inspector/Quarry Inspector	30%
Sub Inspector	15%

The COMMISSION further RECOMMENDS that these relative remuneration positions should be adjusted annually to allow for changes in industry remuneration packages.

The requirements for appointment to these grades should be as follows:

Senior Inspector - the holder of this post should have a Degree in Engineering, or the equivalent thereof, have a Certificate of Competency in mine management, and two years experience, within the last five years, as a shaft manager at a large mine.

Inspector - the holder of this post should have a Higher National Diploma, a Certificate of Competency as Mine Manager and 2 years experience in the last 5 years as an overseer at a large mine.

As is always the case when a major reorganisation occurs which aims at improving the standard and status of an organisation, there are problems in fitting existing staff into the new framework, and some latitude is required in transferring existing personnel into the appropriate posts commensurate with their ability and experience. Most present incumbents will find an improvement in their terms of service for which they may not be fully qualified. The new MHSI should strive by all methods available to provide opportunities for individuals to improve their qualifications. Improving the levels of experience in senior posts in industry is a more difficult matter, as it involves movement, on secondment, between industry posts and the inspectorate. The cooperation of the industry is called for in this respect, as it is in the industry's interests to have a well trained, qualified and expert inspectorate. The International Labour Organisation would also be able to help in this respect as it takes an active interest in establishing good standards in inspectorates. For example, in recent years it has done much to establish an inspectorate in the emerging coal industry of Indonesia.

In the six new districts, each containing some 30 underground mines, the Principal Inspector in charge will be able to divide the underground mines into groups, allowing for the size and severity of problems at the mines. Each group of mines should be supervised by a Senior Inspector, with a mix of mining and machinery inspectors in each group. The numbers of Senior Inspectors and Inspectors available for allocation following the reorganisation should be about 125. Allowing for 14 inspectors to be deployed in the second tier quarry inspectorate, about 11 would be available for deployment in the six underground mine districts, giving a total of about 18 inspectors to work with each Principal Inspector supervising about 30 underground mines. If the emphasis on the work of each inspector is placed on underground inspections, this should allow a far higher rate of inspection of these workplaces which have the highest risk.

11.1.11 **The Need for the Mine Health Safety Inspectorate to be more Proactive**.

The current organisation has been swamped with the need to investigate accidents and hold inquiries and inquests (a total of 4 086 investigations are recorded for 1993/94 GME Exhibit C11 para 4.2). Inadequate resources remained for pro-active work, including the issue of notices/ prohibitions, prosecutions, the collection for analysis of incombustible and respirable dust samples and samples of atmospheric gases, and investigation of diseases and occupational ill health. This position should improve as the industry reduces the level of death, injury and disease. A pressing need at present is to increase the rate of sampling for dust, gasses and other pollutants. Most of the sampling activity up to now has been done by the central environmental control unit, and it would be far better done in the inspection districts.

Sampling does not require a high level of understanding of mining problems, and persons who are interested in mining can be task trained for these duties.

The Commission was told that the present staff is not representative of the South African population. This is unsatisfactory in a democratic society, particularly when the bulk of those involved in mining accidents or who suffer industrial ill health are black. This is a legacy of the past, and although there are some holders of manager's certificates among the black population who also have experience in management, none has so far come forward as applicants for the inspectorate (Raath pp 2 081/ 215-2).

The COMMISSION RECOMMENDS that a group of Assistant Inspectors, and Sub-Inspectors should be recruited who could be purpose trained, initially, as audit samplers for respirable dust, flammable dust in roadways, mine gas and pollutant samples. They could also do noise surveys in working places using hand held instruments. This is a very necessary and important function of any inspectorate. At present reliance is placed mainly on the results of sampling done by the owners and management of mines and this is very unsatisfactory for an enforcing authority. This group of inspectors should be recruited from among those interested in careers in mining, or from the ranks of shift bosses, miners and team leaders. They should be encouraged to study for higher qualifications so that they can move up in the Inspectorate's structure. They should be located in the districts, and arrangements should be made for samples to be sent to a central point for independent analysis. The Commission considers that initially twelve Assistant Inspectors and twelve Sub-Inspectors should be recruited and trained for sampling purposes, and located in the six underground mining districts. They should form a valuable adjunct to inspectorate teams led by the Principal Inspector, as well as providing an opportunity for advancement in the MHSI.

11.2 STRENGTHENING OF THE ENFORCEMENT AGENCY

The Commission heard evidence concerning the need to strengthen the enforcement agency by the addition of specialist skills to assist the office of the GME, and by adopting the latest information technology methods to improve communication, reduce administrative and clerical costs, and provide quick access to statistical records.

11.2.1 Additional Specialists to Advise the Government Mining Engineer

The COMMISSION RECOMMENDS that the Government Mining Engineer should have on his staff:

-a Medical Inspector of Mines with expertise in occupational health.

-two attorneys to specialise in processing mining prosecutions and inquiry / inquests.

-an expert in safety management in the mining industry, who need not be qualified in mining. Persons of this background gave very important evidence to the Commission.

The COMMISSION RECOMMENDS that there should be specialised scientific back up available to the GME, and that a group could be conveniently located at the G P Badenhorst facility, which already has a measure of expertise in some subjects.

The COMMISSION RECOMMENDS that consideration be given to transferring this facility to the direct control of the GME. It should be suitably expanded to provide analytical facilities for dust, gas and pollutants, and the special expertise required for investigations into mining accidents and diseases. Some of the experts already available in ventilation and gas detection, in the Environmental Control Directorate, could be attached to this group.

The COMMISSION RECOMMENDS that the GME be encouraged to employ consultants with expertise that is not currently accessible to the inspectorate. This will be particularly important in the transition to a new legislative framework and the new MHSI. The GME already has this power but via an elaborate tendering procedure. Funds should be made available to enable him to commission outside consultants quickly, especially when emergencies occur, subject to appropriate control procedures.

The appointment of these experts will serve many purposes. The Commission heard complaints concerning the lack of activity by the inspectorate on health issues. The employment of a Medical Inspector will provide the GME with expert advice and a leader in discussions on the tripartite Mining Occupational Health Advisory Committee (MOHAC). He would help to upgrade the inspectorate's knowledge and understanding of occupational health issues, and be part of the internal training function of the inspectorate. He would supervise the medical surveillance system that mines should adopt, and ensure that adequate health records are kept. He would make these available to MBOD and serve as a liaison with the Bureau and the National Centre for Occupational Health. He would assist the GME in deciding policy on health, hygiene and first aid matters at mines.

The appointment of attorneys to the GME's staff would serve to improve the legal understanding of inspectors and their knowledge of procedures, and part of their function would be in internal training of inspectors. At the same time the attorneys would gain from inspectors a close understanding of mining matters. They would relieve inspectors of much of the paper work involved with prosecutions, although inspectors would, in terms of the Commission's proposals, be entitled to initiate prosecutions. In time they would develop special expertise in dealing with mining cases and be able to give expert instruction to Counsel in inquiries/inquests and prosecutions or conduct them themselves. The Commission has made no recommendation on administrative penalties, but the attorneys employed could pursue the advisability of such a system, and advise the Mine Health and Safety Council.

Representations were made to the Commission by consultants who were expert in many aspects of safety management in the mining industry, and who had undertaken safety audits which were of great value, although they were not themselves qualified to be inspectors of mines, as they have qualified in non-mining disciplines. The Commission felt that the appointment of persons of such calibre and background to advise on safety management, would enhance the expertise of the Inspectorate.

11.3 PROVISION OF EQUIPMENT FOR INSPECTORS

The inspectorate is currently looking at the provision of computers and data acquisition and retrieval systems for individual inspectors. This method of working has become standard in many inspectorates. The individual inspector, in addition to the provision of the personal

protective equipment he needs to be independent of the mine, should be provided with a computer and a modem transmission facility which would enable him to write his report as soon as he has left the workplace, either in his vehicle or at home, and transmit the report instantly to the office of the Principal Inspector, or to the GME's office. He could also retrieve any information he needs concerning the mine or workplace from the data base of the inspectorate.

He could also call up exemption forms, print them and issue them at the mine where necessary. This method of working, which is becoming increasingly used in all walks of life worldwide, has many advantages. It is very fast, can cope with a large amount of data and make it instantly available. It obviates much of the need for office accommodation and clerical support staff. These economies offset the cost of the electronic equipment and the essential training required.

Individual inspectors should also be supplied with all the instruments they need to measure, gas, ionising radiation, dust, pollutants, and ventilation survey instruments. The scientific back-up facility that the GME should have, should provide for the servicing and calibration of this equipment.

The COMMISSION RECOMMENDS that the GME be encouraged to make this investment in electronic and scientific equipment and that the necessary training to enable inspectors to work in this modern way be provided.

11.4 THE MINES SAFETY AND HEALTH INSPECTORATE (MSHI)

The adoption of these recommendations should result in the establishment of a new inspectorate with this approximate complement:

At Headquarters -	
Government Mining Engineer	1
Deputy Government Mining Engineers	3
Principal Inspectors	3
Senior Inspectors	3
Inspectors	3
Specialists - Medical	1
Legal	2
Safety Management	1
Total	17

The GME should have access to a small scientific investigatory and laboratory service under his control which will act as a back up for the inspectorate and enhance its expertise.

In the six underground mining districts
For each district -

Principal Inspector	1
Senior Inspectors	3
Inspectors	15
Assistant Inspectors	2
Sub-Inspectors	2
Total	23 x 6 = 138

regulations for controlling these hazards, for promulgating as soon as possible.

C Occupational Health

Much has already been said concerning the lack of attention in the regulatory system to health issues, and the poor record of the industry in controlling occupational disease. The Commission heard evidence that medical interventions should be possible at each mine to detect certain diseases (pneumoconiosis, asbestosis, silicosis, hard metal disease, chronic obstructive airways disease, tuberculosis), and that this would be possible by the companies, with the facilities already available (White pp 500, 503, 506). Regulations should be promulgated as soon as possible dealing with occupational health in mines and require, inter alia, that:

-the GME be given express powers to control occupational health hazards;

-the owners of mines provide medical surveillance for the diseases that may occur at the mine; and

-the manager of the mine be required to ensure that the owner's surveillance scheme is properly operated, and that adequate records are kept, and supplied, subject to medical ethics, to the GME.

D Coal Mine Explosions and Respirable Dust

Coal mine explosions continue to occur regularly in South Africa, the most recent large explosion claming 53 lives in 1993. Evidence given by the Chamber of Mines' witnesses suggested that we could not expect significant improvement based on current codes of practice (Phillips p 20, Chamber Submission, Coal Mine Explosions). One of the points of greatest hazard in the explosion context is the bord in which a continuous miner operates. The large number of picks rotating in the cutting head can cause frictional heat and ignitions. In the period 1990 to 1992, 25,5% of the ignitions came from this source, but in 58,5% of the cases the investigation had not determined the ignition source. A large number of continuous miners or similar machines are now used in South African coal mines. Another Chamber witness said that the method used to ventilate continuous miners in South Africa was the subject of considerable debate and research in the industry at the moment. The system he said, may have to be changed completely (Thornton p 1 665 16-30). The same witness said that average levels of respirable airborne dust measured at continuous miners was 6 milligrams per cubic metre, much higher than the prescribed statutory level. The level of respirable dust produced by these machines is known to be high, and could produce disease after a fairly short period of exposure.

High levels of airborne dust also contribute to the levels of flammable dust that may be available in the bords to convert a small methane explosion into a coal dust explosion which is usually more violent and disastrous (Raath Exhibit C28).

The Commission heard that the American regulations on coal mine ventilation, where the use of continuous miners is common, which were revised in May 1992, require ventilation control devices, ventilation ducting or line brattices, to be installed to a position not more that three metres from the area of deepest penetration to which the face has been advanced. Similar regulations in the United Kingdom were also brought to the attention of the Commission. This is not the standard of ventilation found in some cases in South Africa where the ventilation may be as much as 24 meters from the coal face (Thornton p 1 665 8-13). This leaves an excavated volume around the continuous miner which is not ventilated, and where concentrations of methane and dust can accumulate. Until these ventilation standards are improved ignitions of methane will continue from time to time in continuous miner headings, respirable dust levels will be high, and disastrous explosions will occur. To reduce respirable dust levels exhaust ventilation is required and light, rigid, quick fitting plastic ventilation ducting is readily available to facilitate this. Conveyors are used to convey the coal out of the mine and coal lying on these conveyors, even in well stone dusted roadways, can act as a fuse to transmit a coal dust explosion. Stone dust or water barriers set over the conveyor can prevent the progress of an explosion.

The COMMISSION RECOMMENDS that the Minister should promulgate regulations as soon as possible to provide that the manager of a coal mine should include in his ventilation code of practice arrangements for:

-the delivery of ventilating air by ducting to within three metres of the coal face in bords or headings;

-the volume of air delivered should be sufficient to produce a velocity of 0,4 meters per second over the cutting machine;

-where respirable dust samples taken in the heading exceed the maximum allowed by regulation, this ventilation should be in the exhaust mode to ensure that the dust is taken out via the ducting from the bords or headings, with fans situated on the return side of the heading. Irrigated filters should be fitted to these exhaust fans to prevent the dust extracted contaminating other parts of the workings on the return side of the bord or heading;

-approved stone dust or water barriers to the extension of flame should be made mandatory in roadways where coal conveyors are used, set in positions recommended in international practice.

12.2 RECOMMENDATIONS CONCERNING THE RESTRUCTURING OF THE ENFORCING AGENCY

12.2.1 The COMMISSION RECOMMENDS that a restructured Mine Health and Safety Inspectorate (MHSI), should be a separate administrative agency within the Department of Mineral and Energy Affairs, and should be separated from the Regional Organisation set up by the Minerals Act of 1991 (see Ch. 11.2.2).

12.2.2 The COMMISSION RECOMMENDS that the Mine Health and Safety Inspectorate should have a structure at two levels one to deal with the inspection of opencast and quarry operations, and the other to deal with underground mines. The lower tier of the inspectorate should be formed from within the current staff as soon as possible, so that it can concentrate on opencast and quarry inspection, and develop its expertise in this specialised area (see Ch. 11.1.7).

12.2.3 The COMMISSION RECOMMENDS that a new position be created in the Mine Health and Safety Inspectorate, to be called the Principal Inspector. Persons who occupy this position should be well qualified, as experienced as, and of as good a calibre as the managers with whom they will have to deal. To attract persons of this calibre it is obvious that the conditions offered to induce them to join the inspectorate, by way of salary and remuneration packages must be as attractive as those which they can expect in the industry (see Ch. 11.1.8).

12.2.4 The COMMISSION RECOMMENDS that the grades in the Mine Health and Safety Inspectorate should be:

Grade 1 Government Mining Engineer
Grade 2 Deputy Government Mining Engineer
Grade 3 Principal Inspector
Grade 4 Senior Inspector
Grade 5 Inspector/Senior Inspector of Quarries
Grade 6 Assistant Inspector/Inspector of Quarries
Grade 7 Sub Inspector (see Ch. 11.1.10).

12.2.5 The COMMISSION RECOMMENDS that to ensure that suitable staff can be appointed the remuneration packages for these grades should be related to remuneration in the industry. The reference point should be at the Principal Inspector level. He should be offered 90 per cent of a typical mine manager's package (see Ch. 11.1.10).

12.2.6 The COMMISSION RECOMMENDS that these relative remuneration positions should be adjusted annually to allow for changes in industry remuneration packages (see Ch 11.1.10)

12.2.7 The COMMISSION RECOMMENDS that the GME be encouraged to make an investment in electronic and monitoring equipment and provide the necessary training to enable inspectors to work in a modern way (see Ch. 11.3).

12.2.8 The COMMISSION RECOMMENDS that action be initiated as soon as possible to recruit 9 persons for the position of Principal Inspector, on the conditions described (see Ch. 11.1.8).

12.2.9 The COMMISSION RECOMMENDS that a group of Assistant Inspectors, and Sub-Inspectors be appointed who could be purpose trained, initially, as audit samplers for respirable dust, flammable dust in roadways, gasses, and pollutant sampling. They could also do noise surveys in working places using hand held instruments. The Commission considers that initially twelve Assistant Inspectors and twelve Sub-Inspectors should be recruited and trained for sampling purposes, and located in the six underground mining districts. They should form a valuable adjunct to inspectorate teams led by the Principal Inspector, as well as providing an opportunity for advancement in the MHSI (see Ch. 11.1.11).

12.2.10 The COMMISSION RECOMMENDS that the Headquarters staff of the MHSI should consist of the GME, three Deputy GME's, three Principal Inspectors, three Senior Inspectors and three Inspectors to replace existing staff, together with administration and clerical support (see Ch. 11.1.10).

12.2.11 The COMMISSION RECOMMENDS that the Government Mining Engineer should have on his staff:

-a Medical Inspector of Mines with expertise in occupational health;

-two attorneys to specialise in processing mining prosecutions and inquiry/inquests; and

-an expert in safety management in the industry who need not be qualified in mining. Persons of this background gave very important evidence to the Commission (see Ch. 11.2.1).

12.2.12 The COMMISSION RECOMMENDS that the GME be encouraged to employ consultants with expertise that is not currently accessible to the inspectorate (see Ch. 11.12.1).

12.2.13 The COMMISSION RECOMMENDS that there should be specialised scientific back up available to the government Mining Engineer, and that a group could be conveniently located at the G P Badenhorst facility, which, already has a measure of expertise in some subjects. The COMMISSION RECOMMENDS further that consideration be given to placing this facility under the direct control of the GME (see Ch. 11.7.1).

12.2.14 The COMMISSION RECOMMENDS that the existing Survey and Rehabilitation Directorates should not form part of the new MHSI (see Ch. 11.1.9).

12.2.15 The COMMISSION RECOMMENDS that the inspectorate be made more accountable in the manner set out in Chapter 11.6.

12.3 OTHER URGENT SAFETY RECOMMENDATIONS

12.3.1 The COMMISSION RECOMMENDS the restoration of the position of the shift boss in the line management to that which is firmly required in existing South African law, should be pursued by the inspectorate without delay (see Ch. 6.7.3).

12.3.2 The COMMISSION RECOMMENDS that:

-all reports of accident inquiries be published and be made available throughout the mining industry, and that the regulations be amended to include this requirement (see Ch. 9.2 and 11.6).

-an inquiry be made into the evidence given by Ms Hermanus that there had been no inquiries into matters other than accidents (see Appendix 7).

12.3.3 The COMMISSIONER RECOMMENDS that the Act and Regulations be amended so as to ensure that all interested parties, including the NUM, be given due and proper notice by the inspectorate of the time and place of all inspections in loco which are held in connection with accident inquiries (see Ch. 9.1).

12.3.4 The COMMISSION RECOMMENDS that Regulation 25 (4) should be amended so as to ensure that inspections in loco are conducted in the manner set forth in Chapter 9.1 hereof (see Ch. 9.1).

12.3.5 The COMMISSION RECOMMENDS that accident inquiries be conducted in the manner set forth in Chapter 9.1 and that the recommendations made by the Marais Commission in this regard be incorporated into regulations (see Ch. 9.1).

12.3.6 The COMMISSION RECOMMENDS that relevant provisions of US Code of Federal Regulations, Mineral Resources, Title 30 (Part 75 - Mandatory Safety Standards - Underground Coal Mines, Sub part D, ventilation, para 75.3) should be studied in detail (see Ch. 3.2.2).

12.4 OTHER URGENT HEALTH RECOMMENDATIONS

12.4.1 The COMMISSION RECOMMENDS that immediate attention be given to amalgamating and reconciling the disparate data bases, to ensure that as much data as possible be made freely available in the public domain, and that mining companies be required to publish an annual health and safety report (see Ch. 4.1.1).

12.4.2 The COMMSSION RECOMMENDS that all mines be required to measure a range of airborne contaminants at specified intervals according to a written sampling strategy designed to quantify the exposure of the most heavily exposed worker (see Ch. 9.3).

12.4.3 The COMMSSION RECOMMENDS that provision should be made in regulations for regular health inspections of facilities on the surface of all mines by the responsible public health authority (see Ch. 7.5).

12.4.4 The COMMSSION RECOMMENDS that a renewed effort to control the spread of tuberculosis among mineworkers is urgently required (see Ch. 4.6.8).

MATTERS TO BE REFERRED TO MRAC FOR TRIPARTITE DISCUSSION

12.5.1 The COMMSSION RECOMMENDS that:

-a Mine Health and Safety Council be established by the new Act to advise the Minster through the GME on all matters relating to health and safety in mines, the relevant legislation and enforcement thereof;

Chapter 4 (Workmen) includes provision for access to potable water in the workplace (4.2), for the provision and maintenance of change houses (4.3.1) and for the control of working clothes (4.32). These clearly have important health implications. Nowhere in the regulations is there any mention of housing or hygienic standards, despite the fact that these are known to play a crucial role in promoting health and preventing disease.

The complaint book provided for in Regulations 4.4.1 - 4.4.6 is clearly an important source of information about adverse working conditions.

The requirements of Sections 4.9, 4.10 and 4.11 for latrines in underground workings, for the disinfection of working places and for the prevention of pollution of workings raise the question as to inspection and enforcement of the regulations. The expertise required is that of a health inspector, or environmental health officer, and it is unlikely that inspectors of mines are competent in this field.

Section 4.17.1 - 14.17.4 make provisions for the control of noise and the introduction of a hearing conservation programme where workers are exposed to levels in excess of 85 dB (A) and for the provision of personal protective equipment. Nowhere in the regulations is there a requirement to measure noise levels, or to demarcate areas in which noise levels exceed 85 dB (A).

It is clearly appropriate that in terms of Section 6.3.2.1 work necessary to ensure health and safety should take precedence over all other work.

Chapter10 (Ventilation, Gasses and Dust) deals with critical issues in the prevention of occupational diseases.

Section 10.1.1 prohibits entry into "Any place in which the air contains harmful smoke, gas, fumes or dust perceptible by sight, smell or other senses" without respiratory protection. This ignores the well established and absolutely fundamental fact that injurious dust is not visible, and that dangerous gases are often odourless and colourless. Where a dangerous atmosphere is likely there is no substitute for prior sampling or mandatory respiratory protection. The regulation as written may be said to be not only scientifically unsound but to encourage dangerous act. Section 10.1.2 prohibits work in areas in which the level of dust, noxious fumes or harmful gases exceeds concentrations laid down from time to time by the Director General. There is an evident inconsistency here as subsequent regulations lay down specific limits for a number of gases, and for cyanide in the effluent from tailings used for backfill, but there are no regulated limits for airborne particulate matter.

Viewed as a whole Chapter 10 of the regulations may be seen as the occupational hygiene component of the entire body of regulations. The major defect throughout the Chapter is a failure to incorporate the process of hazard identification, measurement, control and subsequent monitoring. The COMMISSION CONCLUDES that unless the basic principles of occupational health inform the regulatory process remedial action will not follow unsatisfactory measurements. The drift towards an uncritical acceptance of the principle of loss control, as opposed to the well established principle of the practice of occupational health have no doubt led to this situation.

To make the requirement to measure dust (Section 10.5.1) contingent upon the appointment of an environmental control officer in terms of Section 2.16.1.1 (the reference to 2.16.1 is incorrect) or dependent on the opinion of the Regional Director supports the opinion put forward in evidence that small mines are neglected.