COMMISSION OF THE EUROPEAN COMMUNITIES

Safety and health commission for the mining
and other extractive industries

17th REPORT
of the safety and health commission for the mining and other extractive industries

YEAR 1979

LUXEMBOURG - MAY 1980

FOR OFFICIAL USE ONLY

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SECTION I

1. INTRODUCTION

This report contains:

- a summary of the work of the Safety and Health Commission for the Mining and other Extractive Industries and its 11 working parties in 1979;
- lessons to be learned from recent mining disasters;
- common accident statistics for coalmines for the whole Community, country by country.

The annexes include the usual information, updated to 31 December 1979, on the terms of reference and the composition of the Safety and Health Commission and its working parties, the recommandations or proposals made to the Member States' Governments, opinions and a bibliography of the work of the Safety and Health Commission.

As in previous years, there then follows a brief socio-economic review of the coal industry as a background to the safety and health aspect of the industry, together with a general survey of underground accidents in coalmines. It is hopes that this general survey will be supplemented next year by data on the victims of occupational diseases.

As in the last two reports, this review includes a survey of activities in the other extractive industries. These figures are again for 1978, but have been revised in several details to include statistics which were not available in time for the previous report. It is hoped that harmonized accident statistics will also be available for the other extractive industries, at least in summary form.

1.1. COAL MINING ACTIVITIES

The statistics given below are drawn from the bulletin published by Eurostat on 30 January 1980 and from information supplied by the national mining authorities (see Tables 1 and 2 below).

1.1.1. The situation in the coal mining industry in 1979 was characterized by:

- a substantial rise in overall demand for coal (16 million tonnes), mainly for power stations and coking plants;
- stabilization in production levels (238 million tonnes or + 0.2 %) due to increased productivity (1.2 %) and the continuing decline in underground personnel (353 600 or
- the result of the above was an appreciable decline in stock levels (- 17.6 %) to 26.4 million tonnes and a 24.5 % rise in imports from third countries, which amounted to 58.2 million tonnes.

COAL MINING ACTIVITIES

		EUROPE IX	F.R.G.	France	Belgium	U.K.
Production (Mio t)	1977	240,4	91,3	21,3	7,1	120,7
	1978	238,1	90,1	19,7	6,6	121,7
	1979	238,6	93,3	18,6	6,1	120,6
Variation 1978/1977 in %		- 1,0	- 1,3	- 7,5	- 6,8	+ 0,8
1979/1978 in %		+ 0,2	+ 3,5	- 5,5	- 7,1	- 0,9
Output in kg/man-hour, underground	1978	417	533	322	281	376
	1979	422	546	337	276	374
Variation 1979/1978 in %		+ 1,2	+ 2,4	+ 1,5	- 1,8	- 0,5
Underground personnel on books (1000's of persons) mean for year	1978	362,9	121,0	35,7	17,6	188,0
	1979	353,6	119,1	33,0	17,1	184,0
Variation 1979/1978 in %		- 2,6	- 1,6	- 7,6	- 2,8	- 2,1
Number of mines operating at:	end 1978	297	41	24	9	223
	end 1979	298	39	23	8	219
Stock of coal at mines (Mio tons)	end 1978	32,1	13,8	4,8	0,3	13,1
	end 1979	26,4	12,6*	3,9	0,2	9,7
Variation 1979/1978 in %		- 17,6	- 8,9	- 18,4	- 41,5	- 26,0
Percentage of output power loaded	1977	92,6	98,6	87,0	100,0	93,8
	1978	95,1	98,8	87,6	100,0	93,4
	1979	98,3	99,0	88,8	100,0	99,1
Percentage of output produced from faces with powered supports	1977	87,4	89,6	42,1	61,1	95,2
	1978	88,8	91,0	46,8	61,3	95,5
	1979	92,2	94,1	48,4	68,4	98,6

* plus 10,000,000 tons of National Reserve Stock

1.1.2. General review of underground accidents in coal mines.

For three years now it has been possible to present this analysis for the Community of Nine in the same form, including the four principal producer countries: the United Kingdom, the Federal Republic of Germany, France and Belgium. The number of hours worked was 557.13 million hours, as compared with 557.16 million hours last year.

1.1.2.1. The total number of accidents resulting in three or more days' absence from work, or in death, was 77 586, as compared with 84 033 in the previous year. The frequency rate (number of accidents per million man-hours worked) was 139.26, as compared with 150.82, which is equal to a decrease of 7.66 %, statistically significant at 95 % confidence level. As is explained below, this decrease is observable in all the categories of accident.

1.1.2.2. Accidents resulting in an absence from work of between 4 and 20 days numbered 51 042, giving a frequency rate of 91.62, representing a decrease of 7.42 % as compared with the figure 98.97 for the previous year (a statistically significant difference).

1.1.2.3. Accidents resulting in an absence from work of between 21 and 56 days numbered 20 421, giving a frequency rate of 36.65, representing a decrease of 8.35 % compared with the figure 39.99 for the previous year (a statistically significant difference).

1.1.2.4. Accidents resulting in an absence from work of more than 56 days numbered 5 992, giving a frequency rate of 10.76, a decrease of 7.4 % as compared with the figure of 11.62 for the previous year (a statistically significant difference).

1.1.2.5. There were 131 fatal accidents, with 3 group accidents resulting in 22 fatalities. The figures for the previous year were 138 fatal accidents including 1 group accident involving 7 fatalities.

The frequency rates were respectively :

- including the group accidents, 0.235, a decrease of 5.24 % as compared with the 0.248 for the previous year

- excluding the group accidents, 0.201, a decrease of 15.19 % as compared with the 0.237 for the previous year. These decreases are not mathematically significant at a 95 % confidence level.

1.1.2.6. A more detailed analysis, taking account of the figures for the last four years and the main causes of the accidents, may be found in section IV.

1.2. ACTIVITIES OF ALL THE EXTRACTIVE INDUSTRIES

1.2.1. Appended to **this** report are tables covering the same items as last year, brought up to date and completed with further information. Given the difficulty of collecting this information for certain industries, the previously published figures omitted some details which have subsequently been added:

- (1) a set of minerals selected last year as a suitable basis for initial comparison
- (2) a second class, not standard throughout the Community, comprising a wider variety of minerals which account for a substantial volume or value of production in the country in question.

1.2.2. The number of sites or companies, production and unit of production are given opposite each product.

1.2.3. A distinction is drawn between the three methods of extraction (deep mining, opencast mining and quarrying, or boreholes).

Wherever possible, the manpower figures for these various methods of extraction do not include administrative and commercial staff nor the work force employed in mineral processing; they do, however, include workers employed in preparation (crushing, concentration, cleaning, loading).

1.3. THE COMMUNITY'S DEPENDENCE ON ENERGY

The statistics in the following table are taken from the Statistical Office of the European Communities' Bulletins on "Hydrocarbons" of 30 January 1980 and "Coal" of 14 February 1979.

1.3.1. Trends in the coal market have already been discussed in 1.1. Summing up, it may be said that in 1979 production stabilized, there was a substantial rise in consumption with a resultant fall in stocks and an appreciable increase in imports from third countries.

1.3.2. There was an appreciable rise in lignite production in the Federal Republic of Germany.

1.3.3. There was a large increase (almost 40 %) in petroleum production as a result of a rise of almost 46 % for the United Kingdom.

Nevertheless, imports of oil increased by 2.2 % and were slighly higher than in 1977.

1.3.4. Gas production increased by 3 % in 1979, but failed to reach the 1977 level; there was a 2.4 % rise in imports from third countries.

COMMUNITY ENERGY PRODUCTION AND IMPORTS (X)

		Eur. 9	D	F	I	NL	B	L	UK	Ir	Dk
Coal in Millions of Tons											
	1977	240,4	91,3	21,3	-	-	7,07	-	120,7	0,05	-
	1978	238,1	90,1	19,7	-		6,6		121,7	0,03	
	1979	238,7	93,3	18,6	-		6,1		120,7	0,06	
Imports from Non Community Sources	1977	46,0	5,6	15,6	12,3	3,8	3,2	0,1	2,1	0,67	4,6
	1978	45,3	5,7	15,9	9,9	3,4	2,7	0,2	2,0	0,32	5,04
	1979	58,2	6,2	19,5	11,3	3,9	5,9	0,2	4,0	0,35	6,5
Lignite											
	1977	127,9	122,9	3,1	1,9	-	-	-	-	-	-
	1978	128,2	123,6	2,7	1,9	-	-	-	-	-	-
	1979	135,1	130,6	2,4	2,1	-	-	-	-	-	-
Liquid Petroleum Products in Millions of Tons	1977	47,2	5,4	1,1	1,1	1,6	-	-	37,5	-	0,5
	1978	62,2	5,1	1,1	1,5	1,5	-	-	52,6	-	0,4
	1979	86,6	4,8	1,2	1,7	1,5	-	-	77,0	-	0,4
Imports	1977	485,1	95,3	115,7	105,4	56,1	35,4	-	68,7	2,2	6,3
	1978	475,5	90,6	114,0	110,4	54,1	32,7	-	66,3	2,2	5,2
	1979	486,3	97,3	123,0	114,7	52,9	33,1	-	57,9	2,2	5,2
Natural Gas (XX)											
	1977	6491,5	673,0	298,5	526,1	3407,4	1,3	-	1584,8	-	-
	1978	6192,6	719,9	307,1	526,0	3120,2	1,3	-	1517,6	0,4	-
	1979	6375,8	741,9	301,5	500,0	3308,8	1,3	-	1498,0	24,3	-
Imports	1977	802,2	232,8	123,6	354,9	10,2	10,3	-	70,4	-	-
	1978	1410,8	505,5	185,8	403,4	61,9	54,9	-	199,3	-	-
	1979	1735,7	615,3	199,5	395,5	98,4	80,0	-	347,0	-	-

(X) Extracted from "Eurostat" of 31.1.80.

(XX) 35.17 Mega Joules/m^3 at 8.500 Kcal/m^5 ór 1.000 Tera Joules = t 28.4 x 10 $^6m^3$

1.4. GENERAL ACTIVITIES OF THE SAFETY AND HEALTH COMMISSION FOR THE MINING AND OTHER EXTRACTIVE INDUSTRIES

1.4.1. Meetings held

The Safety and Health Commission for the Mining and Other Extractive Industries met on 27 March, 12 June and 7 September 1979, preparatory meetings of the Restricted Committee being held on 26 March, 11 June and 6 September.

The working parties met 22 times; 5 of which, on the occasion of visits to mines. Committees of experts met on 39 occasions to prepare for the meetings of the working parties.

An information symposium was held on 27 and 28 November 1979 for officials of miners' trade unions.

The Safety and Health Commission also took part in a symposium on new technologies for exploration and exploitation of oil and gaz resources, which was organized in Luxembourg from 18 to 20 April 1979 by the Commission's Directorate-General for Energy.

1.4.2. Group accidents (i.e. accidents resulting in the death or injury with eight weeks' absence from work of at least five victims):

- on 19 February 1979, a rockburst in the Haus Aden Mine in North-Rhine Wesphalia resulted in the death of 5 people;
- on 18 March 1979, a firedamp explosion at Golborne Colliery resulted in the deaths of 3 people and serious injuries to 8 others, 7 of whom subsequently died of their injuries;
- on 22 March 1979, 7 people were killed by an explosion in the Hansa Mine.

1.4.3. Decisions of the Safety and Health Commission for the Mining and Other Extractive Industries

The Safety and Health Commission approved the following:

1.4.3.1. Information report on the maintenance of safety standards and improvement of the Safety of highly-worked friction winding ropes of stranded construction (meeting of 27 March 1979 - see 2.2.).

This study was appended as Annex IV to the 16th Report to speed up distribution.

1.4.3.2. Information report on the use of filter self-rescuers in European coalmines - Part III - Possibilities of improvement (meeting of 27 March 1979 - see 2.1.).

1.4.3.3. Information report on the construction of gateside packs of long-wall faces
(meeting of 27 March 1979 - see 2.10.).
This report was appended as Annex VIII to the 16th Report.

1.4.3.4. Report on the study of measures relating to the safety training of workers employed in the coalmines of the European Community (meeting of 12 June 1979 - Doc. No. 4372/3/77, available as an offprint in e, f, d - see 2.7.).

1.4.3.5. Proposal by the Safety and Health Commission to the Governments on control of the firedamp risk arising during drivage and following the abandonment of cul-de-sac and other old workings (meeting of 7 September 1979 - see 2.8. and Annex IV).

1.4.3.6. Proposals the Governments on the exploration and exploitation of offshore petroleum and gas deposits entitled "Production well completion offshore".

1.4.3.7. Workover programme offshore
(meeting of 7 September 1979 - see 2.11. and Annex V and VI).

1.4.4. Information symposiums for officials of miners' trade unions held on 27 and 28 November 1979

Some 70 delegates, representatives of the workers, the Safety and Health Commission, the Member States' governments and the employers took part in the symposium. The first day was devoted to visits in the Saar and Lorraine coalfields, and the subject chosen for the second day in Luxembourg was "Improving conditions of work in underground mines", a matter of great current importance in terms of safety, health and the humanization of working conditions, and one which directly affects the indispensable recruitment of young workers.

The subject matter of the symposium was restricted to the problems of respirable dusts, climate and noise. They were the subject of 9 papers and discussions which reflected not only the state of the art of certain research work but also the situation in mines as regards these three health-impairing factors.

The exchange of views prepared the ground for the recommencement of work by the Working Party on Health in Mines, which met on 19 December 1979 (see 2.6.).

1.4.5. Consultation of the Safety and Health Commission for the Mining and Other Extractive Industries in preparation for Council directives.

1.4.5.1. As was mentioned in 1.4.1. of the 16th Report, the Safety and Health Commission has taken a stand on Council directives which would have applied to mines and which would have been at variance with its terms of reference. Discussion on these questions continued in 1979, and in expressing its views, the Safety and Health Commission took into account the following:

1.4.5.2. Some directives provided from the outset for coal mines to be exempted from their provisions. This was the case, for instance, which Council Directive 76/117/EEC of 18 December 1975 on the approximation of the laws of the Member States concerning electrical equipment for use in potentially explosive atmospheres, and Council Directive 79/196/EEC of 6 February 1979 which contained provisions for the implementation of the 1975 Directive.

The Working Party on Electricity, in conjunction with CENELEC, drew up a draft directive on the same line as the Council Directive, but applying to gassy mines and harmonizing with the 500 or so rules applying to specific mining conditions.

On 1 December 1978, the Safety and Health Commission approved this document, which was then communicated by the Commission to the Council of Ministers on 14 January 1980, the SHCMOEI acting in a consultative capacity. This approach somewhat unconventional in view of the terms of reference of the SHCMOEI, was adopted to standardize the rules for construction, marking and certification as far as the safety of apparatus for use in gassy mines and in potentially explosive atmospheres on the surface is concerned.

1.4.5.3. On the other hand, the draft directive on safety signs at the place of work did not exclude mines. At the request of the ECSC Consultative Committee and the SHCMOEI, it was agreed that coal mines would not be subject to the provisions of this directive. An ad hoc committee appointed by the SHCMOEI draw up a document adapting the provisions of the Council Directive to coal-mining conditions. The SHCMOEI adopted this document on 1 December 1978 (Doc. No. 3040/3/78) and submitted it to the Member States' Governments as a proposal designed to improve safety in mines in accordance with Articles 1 and 4 of its terms of reference (see Annex VII of the 16th Report of MSHC).

In effect, this document - which has been accepted by all the Member States' Governments - differs very little from the terms of the Council Directive and in fact has taken over the directive's objectives in their entirety.

1.4.5.4. Work arising from the European Community action programme on safety and health. Draft directive on lead and other chemical, physical and biological agents regarded as a health hazard.

These draft directives, drawn up by the Safety and Health Directorate (of which the SHCMOEI forms part), do not provide for any exemption for mines.

The draft directive on lead was submitted to the SHCMOEI at its meeting on 12 June 1979 in the form of an internal document numbered VF/Lux. 78/73-7.

Later editions of this document very largely took account of these amendments, but had not been resubmitted to the SHCMOEI by the time it re-examined the question on 7 September 1979. Lead in mines seemed to have only a marginal effect, but the level of lead in the air and blood which would make the directive - or at least its provision on monotoring - applicable might be unattainable in most lead mines.

The SHCMOEI conceded that there was no reason why mines should not be subject to the same biological criteria as those provided for all industries in the draft directive. It was felt, however, that monitoring arrangements should take account of the special nature of underground work in mines.

Some members were insistent that mines should be excluded from the scope of the directive.

The following motion was adopted unanimously:

'Having regard to the fact that the hazards to the safety and health of personnel in the extractive industries and other industries very often differ from each other, and that this difference necessitates preventive measures specific to the extractive industries, the Safety and Health Commission is of the opinion that measures relating to the safety and health of personnel in the European Community should where appropriate be drawn up and adopted separately for the extractive industries and other industries'.

1.4.6. Radon measurement campaign in mines (other than uranium mines)

A study has been subsidized by the Commission of the European Communities to collect information on the radiation levels suffered by persons thought to be not-exposed to a radon hazard, e. g. in the environment, buildings or in foodstuffs.

Against this background, the Commission is organizing a measurement campaign in mines throughout the Community, with the exception of uranium mines. The question of the possible danger of radon in mines had been brought up - inter alia - by the Italian Delegation at several meetings of the Safety and Health Commission and at the congress to mark the 20th anniversary of the Safety and Health Commission (Doc. No. 1664/2/77).

As a first stage, the Health and Safety Directorate in Luxembourg has, in conjunction with the French Atomic Energy Commission as the contracting party, worked out what apparatus should be used and what would be the most representative method of evaluating the amount of radon inhaled by miners.

In a second stage, a certain number of coal and other metalliferous non-uranium mines would be selected for measurement of the amount of inhaled radon.

The assistance of the Safety and Health Commission and more particularly of the Restricted Committee was requested to select these mines and to authorize implementation of the tests, this being entirely within the jurisdiction of the heads of the national mining authorities.

As agreement was divided on the need for this study and its degree of priority, a meeting was organized on 28 May 1979 (Doc. No. 3922/79) of the representatives of the Restricted Committee, experts from the French Atomic Energy Commission and the Commission's Health and Safety Directorate to explain to the SHCMOEI the new method to be used (i.e. portable dosimeters) to measure the doses of radon inhaled by each worker at his place of work, which was thought to be more meaningful than simply taking global dose samples from the return air.

At its meeting on 12 June 1979, the SHCMOEI took note of the results of this meeting. The Secretariat undertook to use its good offices to facilitate implementation of the measurement campaign.

The choice of the most representative mines for the tests will be based - for Belgium, France and Italy - on a questionnaire drawn up by the contracting party. Measurements will not be carried out in the United Kingdom, the Federal Republic of Germany, Ireland and Denmark because - as a result of measurements which have already been taken in varying degrees - these countries believe that the radon content in the mines does not constitute a substantial risk to miners.

The results of these tests will be discussed by the Safety and Health Commission.

1.4.7. Examination of the 16th Report of the Safety and Health Commission, Lack of activity of the Working Party on Health in Mines

At its meeting on 7 September 1979, the Safety and Health Commission approved the 16th Report, and adopted a clear position with regard to the Working Party on Health in Mines: 'The Working Party again did not meet in 1978 as the Secretariat lacked the necessary staff.

The Safety and Health Commission deeply regrets this lack of activity in a field of such importance. It urgently insists that the situation be rectified as quickly as possible and demands once more that sufficient staff be provided for the Secretariat'.

The Working Party resumed its activities on 19 December 1979 - see 2.6.

1.4.8. Revision of the terms of reference of the working parties and committee of experts.

1.4.8.1. At its meeting on 7 September 1979 (Doc. No. 3313/79), the Safety and Health Commission resumed its periodic review of the terms of reference of its working parties and committees of experts with a view to rationalizing their work and taking into account new priorities.

1.4.8.2. The amended terms of reference are set out in Annex II to this report.

The amendments made included the following:

- a reminder of the convention of holding meetings of working parties in coalfields, where the members are able to study new developments at first hand (for reasons of economy, the Commission has cut back drastically on meetings held away from the headquarters of the Secretariat);
- the production of statistics (if necessary in summary from) on occupational diseases;
- consideration of the concept of 'humane working conditions' (known as 'Welzijn' in Dutch) along with health and safety at the place of work by the Working Party on Health in Mines and the Working Party on Human Factors affecting Safety;
- in the Working Party on Health in Mines, consideration be given to nuisances other than dust, such as climate, noise, vibrations, lighting, gas and materials which are dangerous to inhale or handle;
- the terms of reference of the Working Party on Human Factors affecting Safety were reviewed and amplified by the Working Party on 31 October 1979 (approved by the Safety and Health Commission on 7 May 1980).

1.4.9. Safety campaigns

As a result of the decision taken by the Safety and Health Commission at its meeting on 11 July 1978 to give a fresh boost to safety campaigns, part of the financial aid of 1.5 million Belgian Francs set aside for this purpose in the budget was spent in 1978 on safety on quarries in the Tuscany region of Italy. Money was spent in 1979 on opencast lignite mines (stumbling or falling) and opencast quarries in the Federal Republic of Germany (safety of mobile equipment) and opencast working in the United Kingdom (coal mines and quarries) with the theme of transport safety.

SECTION II

Activities of the working parties

CHAPTER A

Rescue arrangements, mine fires and underground combustion

2.1.1. The full Working Party met three times on 11 May, 19 September and 22 November 1979. There were 21 meetings of committees of experts, as follows:

- on Fire-resistant conveyor belts and other long items of plant	3
- on Fire-resistant fluids	11
- on Filter self-rescuers	4
- to prepare reports on mining disasters	3

(11 of these meetings were intended only for study and editorial purposes and involved only 3 or 4 experts).

2.1.2. Work examined by the Safety and Health Commission in 1979

On 27 March 1979, the Safety and Health Commission approved an "Information report on the use of filter self-rescuers in European coal mines - Part III - Possibilities of improvement".

At the request of the Safety and Health Commission, this report was published as Annex IX to the 16th Report to speed up distribution. This part defines the limited possibility of improvement of this type of apparatus, which is now considered to be fully developed. Attention is drawn to self-contained self-rescuers providing oxygen - see 2.1.6.

2.1.3. Work completed

Sections I and IV (dealing with health) of the 6th Report of fire-resistant fluids (see 2.1.5.).

2.1.4. Fire-resistant conveyor belts and other long items of plant

Following the Safety and Health Commission's approval, on 6 April 1978 (Annex VI to the 16th Report), of the proposal on tests for

(4)

the quality control of conveyor belts with fabric carcasses, these tests - planned to extend over 3 years from 6 April 1978 - are now underway in the testing centres, using the Barthel burner and critical oxygen index texts: two simple tests which should make it possible to check that delivered belts exhibit similar fire-resistant properties as when type approved. Final recommendation is anticipated for 1981.

2.1.5. Fire-resistant fluids

2.1.5.1. The numerous meetings of this committee of experts were devoted to the preparation of the 6th Report on the specifications and test conditions for fire-resistant fluids.

Revision of the 5th Report was justified by the progress which had been made in standardizing tests since the publication in 1975 of the 5th Report where the British tests and the tests used by the Community of Six were simply juxtaposed. More than 400 requests for this document had been received from the oil and capital goods industries throughout the world and had prompted this standardization.

2.1.5.2. The fire-resistant test will be standardized on the basis of work carried out at the Safety in Mines Research Establishment (SMRE) in Buxton, whereby the length of flame produced by the jet of fluid atomized at 35 bars in measured when the igniting flame is held in the jet; this permits graduated assessment and hence classification of the fire resistance of all fluids.

The flammability tests described in the Parts III and VI of the 5th Report could be used as before until all the Member States have had a chance to familiarize themselves with the new test.

Complementary tests - propagation of flame in a mixture of oil and coal dust or the wick test - will continue to be used.

2.1.5.3. The tests described in the 5th Report have been reviewed by the National Coal Board; the board's proposals have in turn been examined by the committee of experts, which has reached agreement on this section.

2.1.5.4. Finally, the health criteria have been reviewed by the committee of medical experts, and have been amended to enable them to be implemented more quickly without affecting their quality. The Working Party added another amendment at the request of the British delegation, whereby if a widely-used fluid whose characteristics are well-known undergoes no more change than the addition of known, non-toxic components in isolation or as a mixture, no new tests are necessary.

This section of the health criteria will be submitted to the Safety and Health Commission at the beginning of 1980 *.

2.1.5.5. A study of the toxicity by intra-muscular injection fluids has been undertaken with the financial assistance of the Commission of the European Communities as a result of two accidents (one fatal), one in conjunction with an A Type fluid and the other, in a surface industry, with an non approved phosphate ester. The conclusion reached was that the health tests mentioned above are sufficient and there was no need to include an intra-muscular injection test.

2.1.6. Self-contained self-rescuers operating on oxygen produced by chemical reactior

The committee of experts completed its proposals for the design and monitoring of self-rescuers operating on oxygen produced by chemical reaction (known in France as self-contained evacuation apparatus).

This document is along the same lines as the one drawn up for filter self-rescuers (Annex X to the 13th Report and Annex VIII to the 14th Report) and Annex IX to the 16th Report (Doc. No. 3919/79) reproduces the three parts of the report in all the Community languages. The new document will be submitted to the Working Party and subsequently to the Safety and Health Commission at the beginning of 1980 **.

These self-contained apparatus have the great advantage of guaranteeing protection to the wearer in low-oxygen atmospheres. Their

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* Adopted by the Safety and Health Commission on 26 March 1980.

** Adopted by the Safety and Health Commission on 7th May 1980. (See Annex VIII).

drawbacks include their weight (more than 3 kg) and the high cost for a self-contained apparatus with an effective life of between 1 1/2 and 4 hours. Devices weighing less than 1.5 kgs do exist, but can only operate independently for a very short period (around 15 minutes).

2.1.7. As to the rescue aspects of its terms of reference, the Working Party took note of the circumstances surrounding the two explosions at Golborne Colliery, where there was no problem with the rescue arrangements, and in the Hansa Mine, where the high temperature, the high concentration of CO (4 %) and the configuration of the workings made it difficult to remove the bodies of the 7 victims (documents 3828/79 and 4273/79).

2.1.8. A study and editorial committee set up by the Working Party completed its report on the lessons to be learnt from the accidents at Merlebach on 30 September 1976 (16 dead) and at the Schlägel and Eisen Mine on 27 October 1977 (7 dead). The report, which was submitted to the Working Party and the Safety and Health Commission at the beginning of 1980, goes into the early detection of fires, fire-righting and rescue operations: it is reproduced in extenso in Section III of this Annual Report.

2.1.9. Stabilization of ventilation in the event of fires in shafts

A committee of experts devoted its attention to the stabilization of ventilation in the event of mine fires. Work on this subject started in 1960 and was last put in concrete form in document 708/3/74 (offprint) and in the "Notes for guidance on the measures to be taken to stabilize ventilation in the event of open fires underground (except in shafts)", published as Annex IX to the 14th Report. The study of fires in shafts was omitted because of its highly specific and complex nature, and the Commission subsidized a study on this subject, the importance of which was hightlighted by the Bois du Cazier (Marcinelle) disaster of 8 August 1956.

The study was commissioned from Messrs Champagnac, Schubert and Stenuit, who played an active part in the work of the above committee of experts.

Consideration of the effects of fire on ventilation and the spraying of ventilation airways concentrated on typical cases and was verified by computer computations carried out at the Westfälische Berggewerkschaftskasse in Bochum.

The experts' report was received by the Secretariat of the Safety and Health Commission (on behalf of the Commission of the European Communities) at the end of 1979. The full Safety and Health Commission will take note of the report in 1980.

CHAPTER B

Winding ropes and shaft guides, winding engines and winches

2.2.1. Number of meetings 4

- two full meetings on 16 May 1979 in Sheffield and on 15 October 1979
- two meetings of an editorial committee.

2.2.2.1. On 15 May 1979, the Working Party visited the Safety in Mines Research Establishment (SMRE) in Sheffield to take note of the results of a study - carried out with the financial assistance of the Commission of the European Communities - on new means of electromagnetic rope testing.

Comparative tests were carried out on devices from the United Kingdom, France, Belgium, the Federal Republic of Germany, Switzerland and Poland. Devices from Japan and South Africa had not been dispatched on time. Tests were carried out on six ropes, mostly of locked-coil construction, one of which had artificial defects. The others were used ropes which had been discarded; one of these was a cable belt support rope which contained a splice. In every case, corrosion was correctly detected, but the extent of the corrosion was not always correctly assessed. However, the limits of detection of defects by these devices had been extended since the earlier comparative tests requested by the Safety and Health Commission in 1965 (3rd annual report). Higher standards were attained thanks to the four-pole DC Hall generator used for the British device (described in document 4106/79 available in d/e/f from the Secretariat of the Safety and Health Commission).

The final report will be published as an offprint.

2.2.2.2. Again during the visit to the United Kingdom, the Working Party was able to see a pneumatic installation for the shaft transport of coal in operation at the Shirebrook Colliery. This installation, which was constructed with the financial assistance of the Commission, can increase the colliery's extraction capacity by between 10 and 15 %. 600 tons of fines ($<$ 25 mm) are brought up every day from a depth of 350 m by means of a low pressure blower equipped with two 560 kW motors (300 m^3 air per m^3 coal).

2.2.2.3. The Working Party also inspected the new drum winding engine at the Markham No 1 shaft which had been built to the new standard established after an accident occurred in the No 3 shaft of this mine where 18 people were killed on 30 July 1973 in a cage fall resulting from the failure of an element in single brake rod.

Both sides of the new winding engine are equipped with post brakes which provide guaranteed 50 % braking power in the event of the total failure of one of the brakes, and with other multiple safety devices which will be discussed by the Working Party.

2.2.3. Minimum safety regulations for winding ropes and cappings (doc. no. 5379/3/78), existing in Community countries.

This document, containing proposals to the Member States' Governments, should be ready for presentation to the Safety and Health Commission in 1980.

2.2.4. Studies and research

2.2.4.1. Electromagnetic rope testing.

The results of the Sheffield tests will be published in the near future.

2.2.4.2. Rope guides

The Working Party has not yet had an opportunity to discuss a memorandum on the study requested by the Versuchsgrube Tremonia, for which financial assistance has been obtained from the Commission (doc. no. 4704/78).

2.2.4.3. The Working Party reviewed three research projects, which were in turn submitted to the Commission of the European Communities:

a) Federal Republic of Germany (WBR): "Research into the affect of intermittent shock loading on the fatigue strength of load-bearing elements in winding and haulage installations in mines";

b) United Kingdom (MRDE Bretby): "Improved monitoring of shaft winding apparatus";

c) Charbonnages de France (Nord-Pas-de-Calais): "Development of procedures to increase the effectiveness of winding engine braking devices". (This follows on from the research undertaken in France, the Federal Republic of Germany and the United Kingdom as a result of the Markham disaster - see 2.2.2.3.).

The amount of assistance and the deadlines requested were upheld after discussion, with the exception of project a), where only problems specifically relating to winding were approved.

CHAPTER C

Electricity

2.3.1. Number of meetings 6

- 2 meetings of the full Working Party on 1 March and 2 June 1979
- 4 preparatory meetings on 31 January, 7 June, 12 October and 7/8 November 1979

2.3.2. As was mentioned in section 2.3.2.3. of the 16th Report, the Safety and Health Commission met on 1 December 1978 and approved a "Proposal for a Council Directive on the approximation of the laws of the Member States concerning electrical equipment for use in potentially explosive atmospheres in gassy mines and by way of derogation from the scope of the Council Directive 76/117/EEC of 18 December 1975".

The Secretariat of the Safety and Health Commission prepared this document for transmission to the Council by the Commission of the European Communities.

This unusual procedure on the part of the Safety and Health Commission has already been referred to in paragraph 1.4.5.2. of this report.

The German delegation voted against the draft proposal on the grounds that paragraph 14.2.1. of European standard EN 50.014, which formed part of the proposal, did not include the particle-proof testing of flameproof enclosures as was practised in the Federal Republic of Germany.

The first two meetings of 1979 were devoted to the quest for a compromise which would enable the Member States' delegations to vote unanimously for the draft proposal. An exception was requested for the Federal Republic of Germany, but the Legal Service delivered an adverse opinion on the matter.

The draft proposal underwent certain modifications at the request of the Commission's Legal Service and Directorate-General for the Internal Market and Industrial Affairs.

The written procedure to enable the document to be adopted by the Commission was successfully completed on 18 January 1980. The document has now been passed on the Council, and the deadlines fixed for consultation of the Economic and Social Committee and the European Parliament are 30 June 1980 in both cases, and 30 September 1980 for a decision from the Council.

2.3.3. As part of its programme of future activities, the Working Party decided to conclude point 9.4. of its terms of reference (Annex II) which provides for comparison of the rules covering the installation and use of electrical equipment in gassy underground mines in the Community.

As was mentioned in paragraph 2.3.5. of the 15th Report, preparatory work was done by a study carried out by Mr Loynes of the National Coal Board, which was subsidized by the Commission of the European Communities (Doc. no. 4367/77, available in d/e/f). The resultant document - some 80 pages long - compares national regulations on this subject.

Proposals for uniform regulations are contained in Chapter E of the document, and this section is currently being examined by an editorial committee.

2.3.4. The Working Party will also be following the work of the working party appointed by the Commission's Directorate-General III to look into the "Elimination of technical barriers to trade - Electrical equipment for use in an explosive atmosphere - Experimental laboratories". This should eventually enable the Working Party to comply with point 9.3. of its terms of reference: "To suggest the means by which harmonization of the certification procedures and reciprocal acceptance of the test methods and test certificates could be achieved".

CHAPTER D

Flammable dusts

2.4.1. 2 full meetings of the Working Party on 8 June in Merlebach (France) and 25 October 1979.

2.4.2. Work completed

On 25 October 1979, the Working Party approved the proposals drawn up by a committee of experts concerning the monitoring of dust neutralization by calcareous dust in the underground workings of coalmines *.

The document is concerned not with the proportion of diluent dust, which remains under the jurisdiction of the Member States, but the monitoring of dust neutralization where this is achieved exclusively by means of calcareous dust.

In an attempt to achieve some degree of harmonization, a thorough analysis was carried out of the procedures used in each of the Member States to monitor the proportion of diluent dust with a view to establishing legal provisions and ensuring practical implementation of those provisions.

Consensus was reached on a number of points which were formulated as "recommendations", such as:

- a very general distinction between two types of mine workings depending on their situation vis-à-vis the dust deposition. Classification of mine workings into these two types is the task of the national authorities;
- certain aspects of monitoring procedures, such as frequency and sampling;
- preparation and analysis of samples.

As regards other aspects of sampling, each of the countries concerned has its own principles and its own methods which esta-

* This report was approved by the SHCMOEI on 25 March 1980 and is included in the present Annual Report as Annex VII.

blished after many years of practical experience; these are set out in a separate annex.

2.4.3. The Working Party visited the Simon Colliery run by the Houillères de Lorraine, which has an annual output of 2.1 million tonnes, and whose 60 km of roadways, covering a very wide range of geological conditions, can be readily stonde-dusted using MSA equipment, which does four bouts of treatment per year, involving the transport and distribution of 4 800 tonnes of calcareous dust by train and pipeline and which enables dust to be neutralized throughout the roadway network with suitable regularity. The general conditions are laid down in the decision of 3 September 1976 * in which the Mines Safety and Health Commission, after taking very detailed note of the information on the disaster at Luisenthal (2.2.62 - 298 dead) and Lens-Liévin (27.12.74 - 42 dead), recommended neutralization by dust binding using hygroscopic salts, but regarded stone-dusting as a suitable alternative provided it was applied over the whole periphery of roadways and was regularly and properly applied.

2.4.4. As regards dust explosions, the Working Party took note of the results of the "XVIIIthe international conference on scientific research in the field of occupational safety in the mining industry", which was held at Cavtat near Dubrovnik in Yugoslavia. This was the meeting of heads of testing stations from all parts of the world, and every four years it is open to other interested parties. This time, the conference was attended by some 20 members of the Safety and Health Commission and its working parties.

2.4.5. The Working Party also examined its future programme of work which will be submitted to the Safety and Health Commission.

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* see Annex V of the 14th Annual Report.

CHAPTER E

Common accident statistics

2.5.1. The Working Party met on 20 December 1979.

2.5.2. It took note of its extended terms of reference decided on by the Safety and Health Commission on 6 September 1979 (see Annex II) as regards:

- the possibility of introducing into the table of coalmining activities featured in the first chapter of the annual report other technical elements which may affect the frequency of occupational accidents;
- the practical aspects of drawing up a socio-economic table for all the extractive industries;
- the collection of certain data on occupational diseases, with special reference to pneumoconiosis and deafness.

2.5.3. The Working Party examined its planned programme of work in the light of its extended terms of reference.

CHAPTER F

Health in mines

2.6.1. The Working Party met on 19 December 1979.

2.6.2. The background for this meeting was the information symposium for miners' trade union officials held on 27 and 28 November 1979 (see 1.4.4.).

The only subjects dealt with in the field of safety, health and the humanization of work (known in Dutch as "Welzijn") were respirable dusts, climate and noise.

Other factors which could lead to an improvement in working conditions will be discussed at an information symposium for mining engineers to be held in Luxembourg on 13 and 14 May 1980. The subjects on the agenda are noise, human factor, ergonomics, reduction of physical effort, vibrations and lighting.

2.6.3. The members of the Working Party also took part in a seminar held in Luxembourg on 4 and 5 October 1979 on "Epidemiology and technical and medical prevention of coal miner's pneumoconiosis". The aim of this seminar was to make available the results of research carried out in this field and administered by other sections of the Commission's Health and Safety Directorate.

2.6.4. At its meeting on 19 December 1979, the Working Party heard the conclusions drawn from this seminar as regards respirable dusts.

2.6.4.1. The research started in July 1975 on comparison of devices used for measuring dust has been completed, the conclusion being that, even if the Member States continue to use their present measuring devices, it should still be possible to make a valid comparison of the dust concentrations measured, which would enable coalmines to comply with point 2 of the Working Party's terms of reference: "... where necessary establishing a scale of comparison of the various methods employed".

2.6.4.2. A research report will be officially submitted to the Safety and

Health Commission in mid-1980, and it will then be up to the SHCMOEI to make whatever arrangements are necessary to establish a uniform method of measurement in this field (to be applied where different apparatus is used) which it will submit as a proposal to the Member States' Governments in accordance with Article 1 of its terms of reference.

2.6.4.3. As regards ambient health hazards to workers in the extractive industries, point 4 of the Working Party's terms of reference provides for priority to be given to the study of climate, noise, vibration, visibility and noxious gases.

The Working Party took note of the draft directives which were being drawn up by other sections of the Commission's Health and Safety Directorate as part of the Directorate's programme of action (see 1.4.5.4. of this report).

In addition to the draft directive on lead, other proposals in the pipeline concern noise, asbestos, cadmium and mercury.

The Working Party will give its opinion on the specific problems which mines would face; the opinion will be transmitted to the Safety and Health Commission.

CHAPTER G

Human factors affecting safety

2.7.1. Number of meetings 4

- two meetings of the full Working Party on 14 February and 31 October 1979
- two preparatory meetings.

2.7.2. Work completed

As was mentioned in 2.7.2. of the 16th Report, the study subsidized by the Commission of the European Communities on "Measures relating to the safety training of mine workers employed in the mines of the European Community" was examined by the Working Party, and was subsequently approved by the Safety and Health Commission on 12 June 1979. Although the study related specifically to coal mines in the Community, it was thought that the points made therein were equally applicable to all mines.

Because of its size (118 pages) this document cannot be appended to the 17th Report; it is available in English, French and German from the Secretariat of the Safety and Health Commission (Doc. no. 4372/3/77). Editions in the other Community languages will follow in due course.

Following on from one of the conclusions of this study the Working Party has drawn up a programme for a study of "Training from the point of view of behaviour - selection and evaluation of training methods which might influence the attitude of experienced miners with a view to improving occupational safety and health".

Financial assistance for this study was granted by the Commission in 1979. The project will be coordinated by the National Coal Board and carried out in conjunction with Charbonnages de France and Ruhrkohle A.G. At the request of the Safety and Health Commission, workers' representatives will be consulted.

2.7.3. Workmen's inspectors

At the information symposium held in Luxembourg on 28 and 29 September 1978 (see 1.4.5. of the 16th Report), the desire was expressed by the workmen's inspectors to continue these exchanges of views, with a view to working, if in the long term, towards approximation of the present rather different systems for monitoring safety conditions in mines by the workers' own delegates. The Secretary of the Safety and Health Commission suggested that these exchanges of views should take place in an ad hoc committee attached to the Working Party on Human Factors affecting Safety, and this point was brought up before the Safety and Health Commission on 1 December 1978. The SHCMOEI in turn referred the question back to The Working Party, which did not go ahead with the creation of an ad hoc committee involving workmen's delegates, but decided instead to compare national reports and then to draw up a summary report and table and to set out conclusions which might bring out the advantages and disadvantages of the different systems.

It was thought that the ways and means of bringing about a long-term approximation of the different systems could only be studied at a later stage.

2.7.4. Terms of Reference

Revised terms of reference for the Working Party were studied and will be submitted to the Safety and Health Commission at its first meeting in 1980.

2.7.5. The Working Party took note of the progress made in Safety campaigns in opencast mines and quarries in Italy, the United Kingdom and the Federal Republic of Germany.

CHAPTER H

Ventilation, firedamp and other mine gases

2.8.1. Number of meetings 7

- three full meetings of the Working Party on 2 February, 20 March and 23 October 1979 at the Duisburg mines
- four meetings of a committee of experts.

2.8.2. The Working Party completed the work mentioned in 2.8.2. of the 16th Report with which it had been charged by the Mines Safety and Health Commission following the accidents at Lens-Liévin (27.12.74 - 42 dead), Houghton Main (12.5.75 - 5 dead) and Luisenthal (21.7.76 - 2 dead, 5 seriously injured).

The document dealing with minimum requirements for the control of the firedamp risk arising during drivage and following the abandonment of cul-de-sac and other old workings was adopted by the Safety and Health Commission on 7 September 1979 as a proposal to the Member States' Governments for the improvement of safety and health conditions in coalmines, in accordance with Article 1 of its terms of reference. This document is appended as Annex IV to this report.

2.8.3. The Working Party continued its work on the additional remit handed down by the Safety and Health Commission on "Ventilation aspects of the use of heading machines with dedusting equipment".

2.8.3.1. The Working Party also studied the document entitled "Auxilliary fans and partial air recirculation in auxilliary ventilated places equipped with air coolers" by Mr Graumann (Doc. no. 3326/79 available in d/e/f from the Secretariat of the Safety and Health Commission).

2.8.3.2. A visit was also paid to inspect examples of the practical application of this technique in three collieries run by the Bergbau A.G. Niederrhein near Duisburg.

2.8.4. Firedamp monitoring instruments

A committee of experts has continued its work of drawing up minimum requirements for the design and use of portable methanometers.

This document, which could be adopted as a proposal to the Member States' Governments in accordance with Article 1 of the Safety and Health Commission's terms of reference, will be completed in 1980.

CHAPTER I

Mechanization

2.9.1. Number of meetings 2

including one meeting of the full Working Party on 5 September 1979.

2.9.2. At the above meeting, the Working Party examined a report on the safety of transport by belt conveyor (document no. 2193/6/77) drawn up by a restricted group of persons, a study and editorial committee. Examination of the report will be completed in 1980.

2.9.3. Study groups have drawn up proposals on the subjects to be studied in the vicinity of the face and in roadways and with regard to haulage chains and ropes.

Examination of these proposals will continue in 1980.

CHAPTER J

Strata control and stability of ground

2.10.1 Number of meetings 5

- three meetings of the full Working Party on 8 February (at the Zolder Mine in Belgium), 18 May and 21 November 1979;
- two meetings of a committee of experts.

2.10.2. At Zolder Mine the Working Party members saw and took note of a process which had been developed there to mechanise drivage of the tail gate of the face with elimination of the stable and mechanisation of support setting in the roadway in line with the face to eliminate the need for miners to be present in this dangerous zone.

2.10.3. On 27 March 1979, the Safety and Health Commission adopted an information report on "Construction of gateside packs for longwall faces".

At the request of the Safety and Health Commission, this report was appended to the 16th Report (Annex VIII), and summarized in paragraph 2.10.2. of that report.

2.10.4. The Working Party examined a report on the rockburst on 19 February 1979 at the Haus Aden Mine in North-Rhine Westphalia which resulted in the deaths of 5 persons (see Section III).

2.10.5. The information report on rockbursts mentioned in 2.10.3.1. of the 16th Report is almost complete.

It draws attention to the fact that the detection of dangerous zones is nearly always based on the empirical measurement of the coal expelled during the drilling of test holes. A research institute has been commissioned to produce a study of other means of detecting increased tension on a coal seam. The Commission of the European Communities is providing financial assistance for the project.

2.10.6. The Working Party also examined all the delegations' reports on the possibility of reducing accidents caused by falling material at the roadhead.

2.10.7. A small committee of experts was set up to produce a report on the stability of tips during tipping and during any subsequent exploitation of a mineral from the tip.

CHAPTER K

Oil, gas and other materials extracted by borehole

2.11.1. Number of meetings 5

- two meetings of the full Working Party on 16 May and 30 October 1979;
- three meetings of committees of experts.

2.11.2. The Working Party completed two of a total of five proposals which the Safety and Health Commission had asked it to draw up following the blow-out on the Bravo platform in the Ekofisk field on 22 April 1977. The actual drafting of these proposals was made the responsibility of a committee of experts on the prevention of blowouts.

The two documents - "Production equipment offshore" and "Workover programme offshore" - were approved by the Safety and Health Commission on 7 September 1979 and transmitted to the Governments of the Member States "for the improvement of safety and health conditions", pursuant to Article 1 of the SHCMOEI's terms of reference on offshore oil and gas wellhead installations which come under its jurisdiction.

2.11.3. The committee of experts completed the last part of this series on blowout prevention training for personnel employed on platforms.

2.11.4. At its meeting on 12 June 1979, the Safety and Health Commission reviewed the activities and programmes of the working parties, with special reference to the Working Party on Oil, Gas and other Materials extracted by borehole. The options presented to the Safety and Health Commission concerned the formation of an ad hoc committee to examine accident statistics in the drilling sector, study of the rescue of men who have fallen into the sea and the evacuation of offshore platforms.

These options gave rise to a wide-ranging discussion, in the course of which mention was made of collaboration and work-sharing between the Working Party and the London Conference. The link between two organisations has been strengthened by the nomination of Mr de Korver, the Chairman of the Working Party, as Chairman of Group III of the London Conference, which is concerned with the safety of personnel.

The Safety and Health Commission attaches great importance to the planned work and will review the terms of reference to be submitted by the Working Party in 1980

2.11.5. On 18 and 19 September 1979, the Committee of Experts on Well Control visited the Groningen gas field run by the Nederlandse Aardolie Maatschappij (NAM), which produces 85 billion m^3 natural gas per annum or 17 % of the total primary energy production of the Nine. The 28 clusters (groups of 8 to 10 wells) in this field are worked centrally. The wellhead equipment and other installations and safety measures designed to cope with sudden spurts of gas during drilling, production or maintenance were regarded as optimal by the experts.

The experts also had an opportunity to check the applicability, at onshore installations, of the two proposals the committee had worked out on offshore wells. They visited the training centre which included a training well and a "Sintran" simulator, where maintenance and drilling personnel practise techniques for controlling a sudden spurt of gas which would otherwise result in a blowout, with all its dramatic repercussions. This idea is reflected in the proposal which will be submitted to the Safety and Health Commission in 1980.

Finally, the Committee of Experts inspected the large stock of equipment which was maintained and tested regularly for use in the event of a blowout or similar incidents. As the control of such incidents is not specifically mentioned in the Working Party's terms of reference, the latter will be reviewed with a view to studying the means of tackling a blowout, when preventive measures have failed.

SECTION III

LESSONS TO BE LEARNED FROM RECENT MINING DISASTERS.

COMMISSION OF THE EUROPEAN COMMUNITIES

SAFETY AND HEALTH COMMISSION FOR THE MINING AND EXTRACTIVE INDUSTRIES

Working Party

on

Rescue Arrangements, Mine Fires and

Underground Combustion

Editorial Committee

"Schlägel und Eisen and Merlebach"

POINTS IN COMMON
AND
AN INDICATION OF THE ASPECTS
FOR FURTHER CONSIDERATION

SUMMARY REPORT
on
THE ACCIDENTS WHICH OCCURRED
at
MERLEBACH MINE
on
30th September 1976
and
SCHLAEGEL UND EISEN
on
27th October 1977

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Adopted by the Safety and Health Commission
on 7 May 1980
and sent to Governments and interested parties
as an information report in accordance with art. 3 and 6 of its Terms of Reference

Doc. 5983/8/78 E LUXEMBOURG - JULY 1980 Tiré-à-part 1980

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PART I

1. INTRODUCTION

1.1. During its meeting on 11th July 1978, the Safety and Health Commission for the Mining and other Extractive Industries gave the working party on "Rescue Arrangements, Mine Fires and Underground Combustion" the task of studying the reports of the above accidents, (viz. doc. 3620/78 and 2712/78, etc..), and assembling therefrom the general lessons common to the two incidents, and then drawing conclusions from them. The working party entrusted this work to experts from the countries affected, and the results of this are set out in the enclosed report.

The conclusions listed in this report take account of the findings from these two accidents. They are not intended to be a complete list of fire fighting and rescue requirements, but they contain such important basic points that it is considered that they should be made available to interested parties in ful detail.

Also contained in the report is a list of research projects, studies and information which were considered relevant and necessary during the evaluation of the conclusions and which should be followed up.

1.2. The report is therefore submitted to the Safety and Health Commission for the Mining and other Extractive Industries for approval and presentation to the Governments of Member States and other interested parties, in accordance with art. 3 of the terms of reference of the M.S.H.C.

PART II

BRIEF ACCOUNT OF THE TWO INCIDENTS

2.1. MERLEBACH

2.1.1. At about 11.30 a.m. on 30 September 1976, a fire was discovered at the base of the rise heading conveying return air from the southern wing of the double unit steep face in seam 2 A, which was being worked by single rising slices between levels 1036 and 826 from the second cross-cut north-west at 1036.

2.1.2. The first means used to fight the fire (extinguishers) proved to be ineffective. Shortly afterwards, a roof fall created a passage between the southern end of seam 2 A and an adjacent air raise, forming a second source of air at the base of the rise heading where the fire was located.

2.1.3. From the outset, it was decided that if necessary, the fire would be fought using hydraulic stowing, and the necessary pipe connections were made at the 545 and the 686 levels, but at about 2.30 p.m. a rescue brigage wearing apparatus was unable to enter the return on the 825 level to make the last connections, due to the amount of smoke.

2.1.4. Meanwhile, the fire was fought - apparently with success - with a number of hoses ; however, the firefighters only realized around 3 p.m. that they were faced with a fire which was not spreading at the face end, but in the return air raise itself.

2.1.5. The heat and the dense smoke made it impossible to get to the top end of the fire-stricken return air raise and it became obvious that the fire could no longer be brought under control by direct means.

2.1.6. So while the hoses were still played on the lower end of the return air raise, work began on closing the top of the tubbing-lined central raise in seam 2A to enable the face to be stowed hydraulically from the air raise serving as a return for the northern unit.

2.1.7. At 4.20 p.m. an ignition of combustible gas occurred at the base of the raise, propagating the flame in the direction of the rescue workers fighting the fire at the foot of the raise, but without causing any serious accident. The face was then hurriedly evacuated and the hoses abandoned, but water was left on.

2.1.8. It was not until about 5 p.m. that preparatory work aimed at closing the central raise in seam 2A was resumed, without any steps being taken to check on the spread of the fire at the end of the southern unit approximately 400 m away. 1) The leader of the team engaged in the capping operations, however, was equipped with an anemometer so that he could check the stability of the airflow in the southern unit.

2.1.9. When work on preparing the cap at the top of the central raise in seam 2A was at a very advanced stage, a violent explosion occurred at the face at about 6.30 p.m., resulting in the death of 16 men.

2.2. <u>Schlägel und Eisen</u>

2.2.1. At about 6.45 a.m. on 27th October 1977, miners working in the lower part of a 1200 m long return/belt incline in the South Field noticed the smell of burning. They proceeded against the ventilating current and, about 70 m above the lowest point of the incline, found a smouldering fire under the belt conveyor, on which a 1.2 m wide steel cord belt was in operation. Sparks were coming from the mounting of a bottom belt roller, and under the roller a patch of slack was glowing over an area of approximately 1.2 x 0,5 m. One of the miners went to the nearest telephone

1) Because direct firefighting had been discontinued

(about 20 m away on the intake side of the fire) and informed an official (senior electrician). The other miners stopped the conveyor by means of the emergency switch and began preparations for fighting the fire by hosing it with water from the water supply network. The official took charge of the firefighting operations and informed the surface control room.

2.2.2. Before spraying could begin, a length of about 5 m of the bottom belt burst into flames. The fire spread immediately to the upper belt and rapidly propagated.

2.2.3. At about 6.45 a.m. the alarm was given in the control room via the CO-analyser at the top of the incline. Shortly afterwards this apparatus ceased to function because the electricity supply cable was cut by the fire. At about 7.05 a.m. the colliery management alerted the rescue service. Despite the attempts to extinguish the fire by spraying, it could not be brought under control, and at 7.30 a.m. evacuation of the whole mine was ordered. All except one of the miners managed to reach the surface safely. At about 7.45 a.m. it became apparent that a miner who was working as a salt paster was missing. His position was thought to be between the top of the belt incline and the two adjacent return shafts 3 and 4.

2.2.4. A six-man rescue team descended upcast shaft 3 at 7.50 a.m. to look for the missing paster, and at about 8.00 a.m. another team descended downcast shaft 7. When the team which had descended the smoke-filled return shaft had not reported back by about 9 a.m., further rescue teams were sent to look for the missing team from the intake side. The members of the missing rescue team were later discovered dead in shaft 3, in the cage and on the landing at the shaft 3 bunker horizon. The body of the missing paster was found near the landing of shaft 4.

2.2.5. On the evening of 30th October 1977 (approximately 85 hours after the outbreak of fire) the two stoppings on the intake sides were completed. About 23 hours after the outbreak of fire, i.e. before the intake stoppings were completed, operations began to inject large quantities of nitrogen (approx. 500 m^3/min) into the fire area in order to reduce the rate of combustion and eliminate the risk of explosion. These measures made it possible to construct the return airway stopping in the incline between 31st October and 2nd November 1977, thereby completely sealing off the South Field of the mine from the rest of the ventilated workings.

2.2.6. The South Field was subsequently recovered section by section, the injection of nitrogen to the burning area of the dip being continued until 6th December 77 and a residual fire area being flooded on 10/11th January 1978, i.e. in the twelfth week after the outbreak of fire. All operations to contain the fire and to recover the South Field were carried out without further incidents or casualties. The paster and the six miners in the rescue team had died soon after the outbreak of fire.

PART III

Comparative study of the two accidents and conclusions

Although the two fires occurred under very different circumstances, they do reveal certain common factors. These will be discussed under the following headings.

3.1. Detection of the fire

3.2. The alarm

3.3. Immediate appreciation of the situation and initial reactions of underground personnel

3.4. The development of the two fires

3.5. Various aspects of fire-fighting operations

3.5.1. Withdrawal of men

3.5.2. Voice communications

3.5.3. Fire-fighting

3.5.3.1. direct action

3.5.3.2. indirect action

3.5.4. Operating conditions for the fire and rescue personnel

3.1. Detection

3.1.1. Both fires were first detected by the personnel underground close to the source of the fire.

At Schlägel und Eisen
by a team of miners about 25 m downwind of the fire in an air flow of about 100 m^3/s, who noticed "a smell of burning" ;

At Merlebach
initially by a workman in the southern unit of the face, a few metres from the bottom of the raise, upwind of the fire in an air flow of about 5.3 m^3/s, who noticed a "glimmering" at the bottom of the raise; but also by workmen in the return airway at the 826 level, downwind of the fire, in an air flow of about 30 m^3/s, who noticed a "smell of burning wood".

3.1.2. There was no early detection by automatic means.

At Schlägel und Eisen
there were UNOR single-channel continuous analysers

a) in the upper section of the incline, in an air flow of about 100 m^3/s, about 1000 metres downwind of the fire ; and

b) at the top of the upcast shaft serving the South Field, in an air flow of about 150 m^3/s.

The fire could have been detected from the CO concentration charts at the surface 30 minutes before it was discovered underground if there had not been hourly intervals between checks on the reading.

At Merlebach,
there was as yet no CO analyser in the return from the southern unit.[1)]

1) Work was in progress on installing the equipment in the colliery's return airways.

3.1.3. Conclusions with regard to fire detection

Smoke, steam and smell are all indications of a fire or heating which can be observed by the personnel on the spot. It is, however, preferable for early detection of fires - and of spontaneous combustion, which is an easier task - to be possible when no personnel are present and if possible such detection should be faster than that depending on the observable early indications mentioned above or on regular patrolling.

It should be noted that at Schlägel und Eisen the increase in the CO concentration was indicated by the two UNOR analysers monitoring the return air before the workmen underground had noticed the "smell of burning".

The following points are important for improved continuous early detection systems for fires and to a still greater extent for spontaneous combustion.

3.1.3.1. CO is currently the most convenient indicator for such early detection.

3.1.3.2. CO meters at fixed points should be used for continuous sampling of the air in the main and secondary return airways and in the circuits which are particularly at risk (e.g. certain trunk conveyor roadways).

3.1.3.3. The CO concentrations measured by these instruments should be transmitted to the surface, recorded or stored in a memory, and kept under constant observation. Such observation may be carried out by a "processing system" with sufficient capacity to deal with the amount of information received.

3.1.3.4. Instructions for control room staff or data processing programs should, in the light of the conditions obtaining in each colliery, lay down alarm values for the parameters characterising the progress of CO emission (e.g. threshold, trend study etc.).

3.1.3.5. In order to differentiate between the various sources of Carbon monoxide it is necessary to determine the rate of emission of CO in for example litres per minute.

3.1.3.6. The existence of an automatic detection system must not result in

a) reduced vigilance on the part of personnel ;

b) a reduction in the attention given to systematic checks.

Research into improving the quality of portable fire detectors should be increased.

3.1.3.7. The speed of detection largely depends on the frequency with which the CO level at a measuring point is checked.

3.1.3.8. Detection of a fire by personnel observing smoke or steam will be made easier by better roadway lighting.

3.2. <u>The alarm</u>

3.2.1. <u>In both cases the alarm could have been given more quickly</u> :

<u>At Merlebach,</u>
There was an interval of 45 minutes between the time when the miners on level 826 noticed the first smell of charred wood and the moment when they gave the alarm (Doc. 3620/78 e - p. 7, par. 3.2.4.1.).

<u>At Schlägel und Eisen,</u>
the rise in the CO readings for the air in the belt dip "was not noticed in the colliery control room. Besides an optical and acoustic alarm when the pre-se t limit (in this case about 15 ppm) was exceeded, there was an instruction to the duty man to read the recorder charts every hour" (Doc. 2712/78 e - p. 21, par. 9).

In the first case, the delay was caused by a cautious reaction on the part of the personnel and in the second by the hourly frequency specified for checking the recorder readings.

3.2.2. <u>Conclusions with regard to giving the alarm</u>

3.2.2.1. The personnel must be periodically reminded of this problem.

The prime consideration is that the alarm must be given <u>promptly</u> as soon as the existence of a fire (or spontaneous combustion) is established or presumed.

<u>Ways and means of giving the alarm</u> must be carefully laid down.

3.2.2.2. When <u>automatic CO monitoring</u> facilities are available, greater speed and reliability in giving the alarm should result provided exclusive reliance is not placed on human alertness, especially if a large amount of information is displayed, and the alarm is triggered by a data processing system which automatically interprets the data as described in par. 3.1.3.3.

3.2.2.3. If all persons underground are to be able to give the alarm rapidly, the primary requirement is for an extensive and very reliable telephone network.

3.2.2.4. In order to enable a duly authorized person to order withdrawal of men from any given district with the minimum loss of time, a study should be made of a system for transmitting a specially modulated alarm signal (along the same lines as an air-raid siren). The use of an intercom could also be useful.

3.3. Immediate appreciation of the situation and initial reactions of the personnel underground

3.3.1. Identification of the seat of the fire

At Merlebach,

the first person to notice the fire in the southern unit of the face was unable to determine the exact source of the "glimmering"; after fetching an extinguisher and returning to the spot the persons present decided that the fire was starting in the pile of coal at the foot of the raise whereas in fact -according to the hypothesis identified by the enquiry as the most plausible - the fire was also taking hold in the raise itself.

"The firefighters only realized around 3 p.m. that they were faced with a fire which was not spreading at the face end, but in the return air raise itself" (Doc. 3620/78 e, p. 1, par. 1).

The disposition of the workings and the pile of debris resulting from the fall between the raises in seams 2A & 2W, largely account for this faulty appreciation of the situation : access to the foot of the raise soon became impossible.

At Schlägel und Eisen,

the first person to discover the fire clearly identified its initial seat : "A bottom roller on the east side was sparking, with the sparks falling to the floor" (Doc. 2712/78 e, p. 6, par. 3); "In the vicinity of the roller there was glowing material partly covered by a thin white layer" (Doc. 2712/78 e, p. 6, par. 3).

3.3.2. Initial reactions

At Merlebach,
the first person on the scene went to fetch an extinguisher from further along the face instead of immediately connecting a hose to the available water range. However, the extinguisher "proved to be inadequate" (Doc. 3620/78 e, p. 1, par. 1), to suppress the fire.
Thus precious minutes passed before the seat of the fire was identified and taking immediate action to combat it.

At Schlägel und Eisen,
the first reaction was to stop the belt, thus initiating propagation of the fire. On coming in contact with the glowing debris "the rubber of the belt was hissing and bubbling" so that "before the firefighting could begin the glowing area suddenly sprang into flame ..." (Doc. 2712/78 e, p. 6-7, par.3).

3.3.3. Conclusions

The immediate reactions of persons discovering a fire or incipient fire may be of critical importance. In order to render such immediate action more effective one must, inter alia, bear the following principles in mind.

3.3.3.1. Provision of means for immediate action

Extinguishers (for incidents involving live electrical apparatus), but above all pressurised water mains providing a high flow rate throughout the district especially for automatic fire-fighting installations and hoses.

3.3.3.2. <u>To inform or train underground personnel on what should be done</u>

a) to fight fire

- recognition of the type of fire
- use of nearest appropriate firefighting equipment
- avoidance of certain actions which might have adverse effects. (While it is not possible to establish detailed instructions to cover all eventualities, a list of Do's and Dont's in the event of fire should be drawn up for non-specialised staff).

b) to send for assistance wherever possible

c) to rapidly notify the senior official at the mine of the outbreak of fire, its site and extent

d) to withdraw only if unable, using the fire-fighting equipment to hand to control the incipient fire discovered.

3.4. Development of the fires

3.4.1. Although they occurred under very different circumstances, the initial fuel for both fires was coal ignited by different initiating sources.

At Schlägel und Eisen,
the ignition was caused by sparks from a bottom belt idler which fell on a heap of fines.

At Merlebach,
the ignition, in the opinion of the Administration, was most probably due to spontaneous combustion in the fissured roadway side at the base of the return air raise.

3.4.2. The initial rapidity of propagation differed.

At Schlägel und Eisen,
the seat of the fire grew rapidly in the space of a few minutes under the eyes of the first fire-fighters. The main reasons were as follows :

- the delay in detecting fire ;
- the large flow of ventilation ;
- the decision to stop the conveyor ;
- the properties of the belt.

At Merlebach,
the men on site believed that the initial propagation was slow, and even reported that they had it under control.

3.4.3. Once discovered, neither of the fires could be brought under control by direct means.

The following were particularly important factors :

the exceptional rate of propagation at Schlägel und Eisen, despite the availability of automatic fire-fighting systems ;

the very unusual layout of the workings at Merlebach, which made it difficult to gain access to the initial seat of the fire with the fire-fighting equipment available.

The time spent in fetching the nearest extinguisher, at least at Merlebach, delayed immediate action to fight the fire, when water was readily available.

3.4.4. In both cases, the return airways downwind of the fires rapidly became impassable for rescue teams.

3.4.5. Both fires started in ascensionally ventilated roadways (belt dip at a gradient of 15 g at Schlägel und Eisen, return air raise at a gradient of 60-65 g at Merlebach).

The considerable buoyancy effects generated by the heat of the fires did not affect the direction of the ventilation in the fire zones. The personnel initially fighting the fire from the intake side had no need to take precautions against reversal.

3.4.6. Conclusions

3.4.6.1. Without attempting to cover all aspects of precautions for conveyors, we would like to draw attention to the following.

3.4.6.1.1. Conveyors should be designed and maintained underground so that installations and workings are kept as clean as possible and that cleaning and maintenance work can be carried out without difficulty. Fines beneath the intermediate structure of belt conveyors should be regularly removed.

3.4.6.1.2. As far as present technology allows, existing belts must progressively be raplaced by self-extinguishing types (see proposals in the MSHC First Report, 15th November 1974).

3.4.6.1.3. It is desirable that non-combustible supports and lagging should increasingly be used in belt conveyor roadways.

3.4.6.1.4. High airflows favour the rapid development of fire and fire precautions must receive especial attention in roadways where such airflows obtain.

3.4.6.1.5. More than any other body of workers, conveyor patrolling and maintenance staff must be trained in accordance with the recommendations made in par. 3.3.3.2.

3.4.6.2. The buoyancy effect of fires can exercise a considerable influence on the distribution of the air currents and can thus endanger fire-fighters, rescue workers and other personnel.

Steps must therefore be taken in advance to ensure that the persons responsible for fire-fighting operations are informed on this subject.

To this end, case studies of specific situations must be carried out, full-scale experiments must be conducted if possible, the methods of calculating buoyancy effects ought to be improved and lists of their orders of magnitude drawn up.

In particular, where there are ascensionally or descensionally ventilated roadways in certain mines, it is desirable to assess in advance the aeromotive forces of a fire and to preplan for the essential regulators which may be required to maintain stable air flows. The requisite equipment can be stocked underground.

3.4.6.3. <u>In both cases, the fire-fighters were faced with exceptional situations</u>.

The magnitude of the fires at the time of detection, and the unfavourable layout of the workings rendered ineffective or inadequate the fire precautions and fire-fighting action taken, although these were well conceived.

If, because of a particular layout, the possibility of such situations cannot be discounted, it would be necessary

- either to use more adequate fire-fighting equipment (e.g. suitable spraying installations where the airflows are high),
- or to make advance preparation for indirect fire-fighting (e.g. by preplanning sites for stoppings).

3.5. Fire-fighting operations in the two collieries

3.5.1. Withdrawal of men

3.5.1.1. In both cases the fires broke out in return airways or air raises, i.e. downwind of the workings occupied by large numbers of men.

This facilitated orderly withdrawal of most of the workforce.

- At Schlägel und Eisen, the decision to withdraw the entire workforce was taken immediately (doc. 2712/78 e, p. 1, par. 1).
- At Merlebach, men were immediately withdrawn from the district affected and other parts of the mine were evacuated in due course.

3.5.1.2. However, some members of the workforce were on the return side of the fire.

- At Schlägel und Eisen, a salt paster who had used a CO self-rescuer, died of anoxia and heat.
- At Merlebach, in the return airway on the 826 level, some workmen who were not carrying self-rescuers managed to escape quickly to a non-contaminated zone.

3.5.1.3. Conclusions

The foregoing remarks naturally draw attention to the general problem of withdrawal of men and more specifically to the following points.

3.5.1.3.1. If the effects of temperature are disregarded, a higher standard of protection is afforded for miner on the return side of a fire by self contained oxygen content is insufficient to support life.

However, many other factors must be taken into account in the selection of apparatus.

3.5.1.3.2. Group protection by 'refuge chambers' may be considered as a principal or secondary means of protection provided local conditions permit.

3.5.1.3.3. Consideration must also be given to the length and condition of escape routes.

3.5.2. Voice communications

3.5.2.1. Breakdowns in telephone communications occurred.

At Schlägel und Eisen,
the fire progressively destroyed the telephone link with the South Field because the main telephone cable ran through the roadway and upcast shaft downwind of the fire. 'It was put out of commission section by section through the effect of heat' (Doc. 2712/78 e, p. 23, par. 35). In the belt incline the telephone cable was cut less than half an hour after the alarm was given and the connection was completely cut in the shaft four hours later.

At Merlebach,
'direct communication between the rescue station and the rescue workers broke down at a crucial moment'. (Doc. 3620/78 e, p. 3). The team working at the top of the central raise had a direct telephone link with the surface plus two telephones 15 m. below the cross-cut ; there was a temporary breakdown of the set in the central raise.

3.5.2.2. Conclusions

3.5.2.2.1. In order to prevent a breakdown in surface to underground voice communications a number of main telephones below ground should be connected to the surface by parallel circuits if their normal circuit passes through a return airway.

3.5.2.2.2. When a rescue team has to operate under difficult conditions, an extension line must be provided to establish constant communication with its base telephone, which in turn must be connected with the surface via the normal telephone network. A second link between the base telephone and surface should be established as soon as possible.

3.5.2.2.3. In general terms, reliable channels of communication must be established between the fire-fighting and rescue teams, their 'base' telephones, incident control and the main mine control room (see also 6.2.2.4.).

3.5.3. Fire-fighting operations

3.5.3.1. Direct action against the seat of the fire

3.5.3.1.1. The failure of direct fire-fighting measures has already been noted and the reasons analysed.

3.5.3.1.2. Conclusions

3.5.3.1.2.1. Water is the most effective medium for fighting open fires except where electricity is involved and even here once the power has been switched off.

3.5.3.1.2.2. Rapid use of water is possible only if the following requirements are satisfied :

- reliable supply by a mains system, (e.g. by closed loop or duplicate range extending to all working areas and consisting of piping of adequate bore, especially where there are automatic installations;

- speed of operation, to be attained by :

  . suitable siting of hydrants with quick-acting manually operated valves, instantaneous couplings and fire hoses with couplings of the same type ;

  . fixed spray installations sited at certain points on heavy duty conveyors, possibly controlled automatically or from the intake side of major installations, and related to the water flow available (See Part V, 5.1.10.) as to form water barrages in return airways adjacent to such major installations.

3.5.3.1.2.3. The importance of making provision for these fire-fighting arrangements well in advance, during the planning of the mining operations, and the need for research work to improve the performance of automatic fire-fighting installations are stressed.

3.5.3.1.2.4. Adequate numbers of portable extinguishers must be located at key points.

3.5.3.1.2.5. The effectiveness of all these fire-fighting appliances depends on the extent to which the entire workforce, and more specifically the personnel responsible for conveyor patrolling and maintenance, is familiar with the method of use of equipment and on very clear indication of its location.

3.5.3.2. Indirect action

3.5.3.2.1. After the failure of direct action against the fires, it proved necessary to seal off the districts affected by erecting stoppings on the intake and return sides.

In both collieries, it proved impossible to take simultaneous action to seal the intake and return airways.

(II)

3.5.3.2.2. The overall approach differed in the two mines.

<u>At Schlägel und Eisen</u>
the fire area was sealed off with stoppings and an inert atmosphere created by injecting nitrogen.

<u>At Merlebach,</u>
the area was sealed off with stoppings and the fire was smothered with hydraulic stowing material.

The stoppings were also of different types :

<u>At Schlägel und Eisen,</u>
the stoppings were of conventional design, built in slightly inclined roadways on the intake side of the fire zone ;

<u>At Merlebach,</u>
the first barrier which was partly completed, was of very unusual design ; a permeable cap to plug the top of a tubbing-lined raise which was virtually vertical and constituted the first mode of the ventilation network upwind of the fire ; subsequent stoppings were of more conventional design and were built in level roadways.

3.5.3.2.3. In both cases, the <u>decision to seal off</u> the fire zone was <u>taken rapidly</u> once it had been realized that the fire could not be fought directly.

This was achieved :

- in six days at Schlägel und Eisen ;
- in four weeks at Merlebach.

3.5.3.2.4. The essential difference in the <u>final</u> result was that at Schlägel und Eisen the roadways which had been sealed off were usable after some months while at Merlebach they had been stowed.

3.5.3.2.5. Conclusions

Without embarking on a detailed technical discussion, one may draw attention to some aspects of the two fire-fighting methods employed.

3.5.3.2.5.1. Creation of an inert atmosphere (in the present case, by injection of nitrogen). The following points should be emphasized.

- The use of this method cannot be improvised. (Arrangements have to be made for the location of the equipment to generate inert gas, its operation, nitrogen supply, stocks of light flexible piping, procedure for using existing pipe ranges etc.)
- The method is effective only if the airflow can be reduced to a level which should if possible be lower than the available flow of inert gas.

3.5.3.2.5.2. Hydraulic stowing, which can both block the air circuits and flood the seat of the fire.

This method, too, cannot be improvised. The following specific points should be noted.

- It is preferable that means of transporting the stowing material should be available on the return and/or intake sides of the fire.
- Placement of the stowing material often involves the use of special stoppings known as "filter stoppings". These must be built by specialist workmen whose training must not be neglected.

3.5.3.2.5.3. Without wishing to lay down fire-fighting instructions in detail, one may mention the following main points which should be borne in mind in order to reduce operational delays and hence the period during which the fire-fighters and rescue workers are at risk.

- Suitable sites for the erection of stoppings must be identified.

- Special permanent fixtures must be developed to allow the air supply to be sealed off rapidly at certain specific points - such as the top of tubbing-lined raises serving faces in steep seams.

3.5.3.2.5.4. The two methods described are not the only techniques available. Selection of the most suitable method depends on local conditions and must be left to the discretion of the incident controller.

3.5.4. Operating conditions for the fire and rescue personnel

3.5.4.1. In the two accidents the victims were in different positions in relation to the seat of the fire.

At Schlägel und Eisen
the victims were rescue brigadesmen equipped with their breathing apparatus and conducting a search downwind of the fire for a single workman, who was also killed, in that part of the ventilation circuit.

At Merlebach,
the victims were brigadesmen, workmen, officials and engineers engaged in the capping operations at the top of the central raise upwind of the fire.

3.5.4.2. At Schlägel und Eisen
'the missing miner was killed by lack of oxygen, the rescue men by hot fire gases and by fall in the shaft'. (Doc. 2712/78 e, p. 20, par. 1).

At Merlebach,
'a violent explosion occurred at the face at 6.30 p.m. resulting in 16 deaths' (Doc. 3620/78 e, p.2, par.1).

3.5.4.3. The general context of the two accidents differs as follows.

At Schlägel und Eisen

'there was no evidence of a fire gas, methane or coal dust explosion as a result of the fire or in connection with it' (Doc. 2712/78 e, p. 21, par. 6).

At Merlebach,

'at 420, an ignition of combustible gas occurred at the base of the raise in the direction of the rescue workers fighting the fire at the foot of the raise'. (Doc. 3620/78 e, p. 2, par.1). The explosion mentioned in the foregoing paragraph occurred at about 6.30 p.m. and there were several subsequent explosions inside the zone which was in the process of being sealed off.

3.5.4.4. The foregoing observations emphasize how difficult it is to determine the nature of the atmosphere in the immediate vicinity of the fire and downwind. The main factors to be considered are :

- temperature ;
- toxicity : CO and O_2 concentrations ;
- explosibility of gases.

3.5.4.4.1. It should be noted that in the area immediately downwind of a major fire the usual telemetering instruments are rendered inoperative either because the transmission lines are damaged or destroyed or because tar deposits coat the transducers or block the inlet orifices.

Only sensors at some distance from the fire, generally in a zone where the fire gases have been diluted, can continue to provide usable information on CO and CH_4 levels and possibly on temperature.

3.5.4.4.2. As a general rule the temperature, toxicity and explosibility of the atmosphere can be determined only by measurements or samples which are taken below ground if the returns are accessible.

3.5.4.4.3. Conclusions

3.5.4.4.3.1. Monitoring fo the chemical composition and the temperature of the gases downwind of the fire must start as soon as possible after the detection of an open fire or spontaneous combustion.

More rapid analysis is required - hence the importance attaching to the improvement of mobile laboratories operating at the pithead.

3.5.4.4.3.2. The explosion hazard must be assessed by methods which take account of the variation in explosibility as the gases travel throughout the whole of any air circuit affected by the fire.

3.5.4.5. Observations on the problem of escape routes especially for fire-fighters and rescue workers.

3.5.4.5.1. As has already been mentioned, the withdrawal of men posed no problems in either colliery as there were few workers directly, downwind of the fire.

At Schlägel und Eisen,
however, the brigadesmen were unable to escape. Although they had reached a shaft landing they could not use the signalling apparatus or the telephone probably because of heat and water vapour.

3.5.4.5.2. Conclusions

3.5.4.5.2.1. Attention is drawn to the importance of existing national and local recommendations or regulations concerning escape arrangements in the event of a fire or spontaneous combustion, with particular reference to advance planning of routes, signposting if necessary, means of communication with the workforce, avoidance of obstacles on escape routes etc.

3.5.4.5.2.2. The two fires studies demonstrate the importance of deploying only such fire and rescue personnel as are strictly necessary. Withdrawal would be easier if the existing means of mechanized transport remained or were made available to fire and rescue workers.

3.5.4.5.2.3. Rescue brigadesmen should not enter a return shaft downwind of a fire where they may be exposed to heat or dense fumes, unless they have at their disposal some means whereby they can have themselves wound to the surface at any moment, e.g. direct speech communication with the winding engineman or controls installed in the winding cage.

3.5.4.6. Observations on safety at the place of deployment of fire-fighters and rescue workers.

3.5.4.6.1. The primary concern is that the effects of an explosion initiated near the seat of a fire may be propagated towards the fire-fighters or rescue workers.

The factors to be taken into account in assessing the risks involved in working at a given location include 'the condition of the workings', 'the state of the ventilation' (stability of ventilation) and 'the composition of the ventilating air', especially explosibility near the seat of the fire.

3.5.4.6.2. Conclusions

3.5.4.6.2.1. Assessment of the degree of safety of the place of deployment of fire-fighters and rescue workers involves a 'synthesis of information' which must be carried out by a 'trained and experienced decision-maker'.

We therefore again emphasize the following points.

3.5.4.6.2.2. <u>Care must be taken to ensure that there is as full a flow of information as possible from underground to surface and surface to underground</u>, e.g. by telephone, telemotering, remote alarms, manual sampling and testing etc.

3.5.4.6.2.3. As soon as a fire or spontaneous combustion becomes apparent, the direction of operations should be organized as quickly as possible. The incident controller should, in a preselected headquarters, assemble a staff of the most appropriate specialists e.g. the superintendent of the Central Rescue Station, a ventilation specialist, etc.

3.5.4.6.2.4. In order to ensure a 'rapid and reliable flow of information', particular attention must be paid to the standard of voice communication between :

- incident control,
- the fire-fighting and rescue teams (the forward team and the fresh-air base),
- the mine control room.

3.5.4.6.2.5. In view of the complexity of the problem to be solved by the incident controller, we urge that there should be more intensive <u>comparison of experiences</u> of such incidents - both large and small - not only among the mining areas within a given country, but also among mining countries on a Community-wide and world-wide basis so that all can benefit as quickly as possible from the experience of each. (This is the ongoing task of the Working Party on Rescue Arrangements, Mine Fires and Underground Combustion).

3.5.4.6.2.6. At all events one of the most important factors in ensuring safety is SPEED ;

- speed in giving the alarm ;
- speed in organizing direct action against the fire ;
- speed in withdrawal of the men from the districts at risk ;
- speed in the flow of information ;
- speed in the setting up of the incident control room ;
- speed in the erection of seals and stoppings.

PART IV

Summary of the Conclusions

4.1. Preliminary remarks

In this section it is assumed that the MSHC's general recommendations for fire protection underground, fire-fighting and stabilization of ventilation (Annex V of the 13th Report 1975), are known to the reader. Therefore this summary contains mainly new findings concerning open fires. The question of heatings is not treated in the consideration of these two incidents. However, previous experience which has again proved very important has been included. The conclusions and the reasons underlying them are set out in detail in Part III.

4.2. Human Factors

4.2.1. Initial and Further Training of the Workforce

In mine fires, the behaviour of the personnel working or arriving at the seat of the fire can be of decisive importance to the success or failure of firefighting. It is therefore imperative that the entire underground workforce should be given some instruction in the detection of mine fires, giving the alert and firefighting procedure. In this connection, it should also be pointed out that persons who discover an incipient fire should only withdraw if the fire cannot be controlled with the available firefighting equipment.

Members of the workforce in key positions such as belt attendants machine operators and electricians should be given special training in what to do in the event of fire. This applies especially to supervisors and team leaders or charge-hands, so that they are capable of taking charge of the initial extinguishing operations in the event of a fire. In this context it should be pointed out that alterations to the ventilation may only be carried out on instruction of the incident controller. This also applies to firedamp drainage.

The training sessions, for which audio-visual teaching methods are to be recommended, should be repeated at regular intervals and accompanied by films, the issue of leaflets to all participants, indicating 'what to do in the event of a fire'.

4.2.2. Withdrawal of the Workforce

When an assessment is made of the effects of a fire on the workforce, priority must be given to withdrawal as a precautionary measure. Escape routes to be used in the event of fire must therefore be kept clear and miners must know any alternative routes for their particular district. Furthermore the workforce must be informed of the availability of self rescuing units and equipment and be instructed in their use. For special cases where escape might be difficult, the possibility of using appropriate self rescuers might be investigated (for example underground engine drivers for manriders) or ventilated chambers.

4.2.3. Engineers and the firefighting control team

The planning of mines must include all the necessary firefighting measures. Firefighting operations should be prepared and carried out on the basis of alert plans (possibly with the inclusion of check lists) which should be available to every engineer at all times to serve as guidelines. Engineers should also be informed about the effects on ventilation stability of buoyancy forces caused by mine fires and the accompanying risks for the workforce as a whole. In the event of a minefire, the firefighting control team should be formed immediately. It consists of a firefighting supervisor with appropriate training and experience, and suitable experts, such as the main rescue station supervisor, a ventilation engineer etc. The success of firefighting operations and the safety of the firefighting team are very much dependant on an early alert being given, early commencement of direct firefighting, prompt establishment of the control centre and finally, speed of communication.

4.2.4. Exchange of information

The information on unusual occurrences exchanged between mining districts and countries of the Economic Community should be increased so that the general rules drawn up after mining accidents may be utilised by all as early as possible (the permanent terms of reference of the Working Party on Rescue Arrangements, Mine Fires and Underground Combustions apply).

4.3. Technical Factors

4.3.1. Early detection of fires and alerting systems

Carbon monoxide (CO) is currently the most reliable indicator for early detection of mine fires. Other means are being investigated and this should continue. All return air currents in shafts and from ventilation districts as well as from main (wide) belt conveyors should be continuously monitored by automatic CO recording units with threshold indicators. The CO value can also be monitored by process control computers with trend assessment to indicate incipient danger.

The use of monitoring systems should not preclude the performance of systematic checks in mines. The typical signs of a fire are easier to detect in roadways with good lighting.

The means of alerting the men at the surface and the endangered persons underground can be improved by the installation of more telephones within the network, as well as the use of intercom systems and special visual, odour or acoustic signals.

4.3.2. Prevention and Limiting of fires

Belt conveyors should be designed and maintained in such a way that deposits of dirt on equipment and in the workings are largely prevented, and cleaning up and sevicing work can be carried out without difficulty. Any coal which may accumulate on roadway floors and components of belt conveyors should be removed regularly.

Roadways with fast air currents should be subject to particularly stringent standards of fire prevention.

The conversion of conveyor belts to fire resistant self extinguishing types should be continued. In mines with belt conveyors, the supports, including lagging, should in future be made of incombustible material.

Stationally automatic fire extinguishing equipment should be installed at all belt drives and return drums, and if possible in the adjacent return airways also to act as 'fire barriers'.

4.3.3. Firefighting

4.3.3.1. Water being the most effective means of fighting open fires, adequate quantities of it should be available as quickly as possible. The water supply network (e.g. duplicate or loop circuits if possible) should therefore reach all working areas and have a sufficiently large diameter to supply the automatic extinguishing equipment in particular. In order to ensure that extinguishing work can be started quickly, an adequate number of draw off valves, fire hoses with couplings, and spray nozzles must be provided. Furthermore, a sufficient number of portable fire extinguishers should be available at locations in the workings which are more exposed to risks (e.g. belt drives, return drums, tensioning units etc.). All water connections and fire extinguishing equipment must be of easy access and well signposted.

4.3.3.2. Assessments should be made of the buoyancy effects and of the measures required to stabilise ventilation both for ascensionally and descentionally ventilated belt inclines. If necessary, suitable devices for reducing the ventilation should be placed in readiness underground.

4.3.3.3. Neutralisation with nitrogen has proved a very effective means of suppressing mine fires. If the process is to be applied quickly, preparations are required such as the provision of a vapouriser, the supply of nitrogen, the switching of pipelines underground and the use of hose pipes.

4.3.3.4. In access roads of ventilation districts, the zones suitable for placing fire dams should be selected and marked before the winning operations begin. If hydraulic stowing is available for stopping off, it is preferable that it should be introduced via the intake and return roadways of the seat of the fire. Where stopping off presents special difficulties, appropriate equipment should be developed and kept in readiness to allow roadways to be stopped off effectively at short notice.

4.3.3.5. Immediately after a mine fire has been detected, the monitoring of the chemical composition of the return air from the fire must begin. Fast analyses may be provided by improved mobile laboratories. In order to assess the explosion hazard, methods which take account of the variation in explosibility as the gases travel throughout the whole of any air circuit affected by the fire should be used.

4.3.4. Supplementary rules for calling in the Mines Rescue Service

The Mines Rescue Service must not enter an irrespirable atmosphere unless a Fresh Air Base has already been set up or is in the process of being set up.

The rescue team should consist of the minimum number of persons required, and should comply with national regulations. Operations of the Mine Rescue Service on the return side of a fire may involve grave risks. For this reason, apart from regular fire gas analysis and assessment of the explosion risk, the temperature of the return air must be checked before work commences on this side and at regular intervals afterwards. In such cases, and generally where conditions are difficult, a constant communications link must be maintained between the rescue team and the mine control station as well as between the mine control station and the firefighting control team. This also applies during man-riding in air currents containing fire gases. Furthermore, the rescue team must be able to withdraw at all times.

PART V

Research and the exchange of information

5.1. Having evaluated the summary report on the accidents at Merlebach and Schlägel und Eisen mines, the following list of research and study projects has been established.

5.1.1. Monitoring systems for the advance detection of open fires and heatings.

5.1.2. Development and improvement of portable CO measuring units.

5.1.3. Data processing installations for operation in conjunction with a CO monitoring system.

5.1.4. Rapid systems for alerting personnel, development of intercom systems as well as visual, acoustic or odour apparatus.

5.1.5. Design requirements for conveyor systems to prevent ingress of dirt and to facilitate cleaning and maintenance, to reduce the risk of fire.

5.1.6. Study of the buoyancy effect in ventilation, caused by mine fires by simulation or completion of full scale case studies, proposals for the calculation of the buoyancy effect, particularly based on full scale tests.

5.1.7. Development of efficient automatic firefighting installations.

5.1.8. Proposals for the development of mobile underground gas analysis facilities.

5.1.9. Development of testing methods for new materials underground, particularly for assessing their flammability.

5.2. Exchange of information

The Working Party suggests that it is important for the Safety of Mines to have a continual exchange of information on fire prevention, detection, flammability of materials and fire fighting techniques.

SECTION IV : COMMON ACCIDENT STATISTICS

4.1.1. At the end of this chapter there are the following tables :

1a and 1b

Victims of accidents by cause and site of accident and period of incapacity in absolute figures (a) and frequency rates (b).

2a

Victims of accidents by location and nature of injury for periods of incapacity exceeding 56 days and for fatalities in absolute figures (a). The tables of frequency rates, which are not very representative, are not included.

Tables 1 and 2 are given by country and for the whole of the Community and refer to 1979.

They are available from the Secretariat by coalfield.

A and B

Frequency rates for serious injuries (A) and fatalities (B) for each of the countries of the Community of Six since 1958 and frequency rates for fatalities (B) since 1973 and serious injuries (A) since 1977 for the United Kingdom.

C

Group accidents by cause for the Community as a whole.

D

Summary tables for the Community of Six since 1958 and the United Kingdom since 1973.

4.1.2. It is now possible to analyse the figures on the basis of all categories of accidents for the Community of Nine for the last four years. Nevertheless, in order to trace the longer-term trend since 1958 or since 1971, certain tables still relate only to the Community of Six.

4.2. Examination of statistics from 1976 to 1979 (Community of Nine).

4.2.1. Frequency rate trends.

Period of absence from work

Year	4 to 20 days	21 to 51 days	> 56 days	fatalities	total
1976	100.94	42.10	11.74	0.300	155.07
1977	99.60	41.17	11.49	0.201	152.46
1978	98.97	39.99	11.62	0.248	150.82
1979	91.62	36.65	10.76	0.235	139.26

As has originally been pointed out in 1.1.2., the trend between 1978 and 1979 was favourable for all categories of accidents. It is statistically significant for all categories of injuries but it is not statistically significant, in the mathematical sense of the term, for the fatalities.

Over the four years in question the general trend was towards improvement, in spite of a slight non-significant increase in serious injuries and fatalities between 1977 and 1978.

4.2.2. Trend in the absolute figures.

The total number of accidents resulting in more than 3 days' absence from work decreased from 84 033 to 77 856 between 1978 and 1979, the number of man-hours worked being practically the same.

Between 1976 and 1979 the number of accidents fell by 13 532, or 14.58 %, whereas the number of man-hours worked only fell by 5.18 %.

4.2.3. Breakdown of accidents in 1979 by period of absence from work.

	absolute figures	frequency rate
- accidents resulting in between 4 and 20 days' absence from work	51,042	65.79 %
- accidents resulting in between 21 and 56 days' absence from work	20,421	26.32 %
- accidents resulting in more than 56 days' absence from work	5,992	7.72 %
- fatalities	131	0.17 %
TOTAL	77,586	100.00 %

This breakdown is practically identical to that for the three previous years. Nevertheless, it should be subject to further checking since it could denote a change in the exact nature or in the assessment of the injuries as well as in the nature of the treatment provided.

4.4. BREAKDOWN OF ACCIDENTS BY MAIN CAUSES AND BY SERIOUSNESS
(Headings I to V of table 1)

4.4.1. Table with figures given as a percentage of the total of headings I to XII

Causes \ Incapacity	4 to 20 days %	21 to 56 days %	56 days %	fatalities %	total %
I. Falls of ground	21.0 ↓	18.5 ↓	20.7 ↑	(19.1) ↓	20.3 ↓
II. Transport and haulage	9.5 =	10.3 ↓	15.3 ↓	(35.9) ↓	10.2 ↓
III. Slipping, falling and stumbling	26.9 ↑	31.7 ↑	27.5 ↑	(12.2) ↑	28.2 ↑
IV. Machinery, tools etc.	16.2 ↑	14.8 ↓	13.0 ↓	(6.1) ↓	15.5 ↓
V. Falling objects	16.6 ↓	17.4 ↑	18.4 ↑	(9.9) ↑	16.9 ↑
TOTAL	90.2 ↑	92.7 ↑	95.1 ↑	(83.3) ↓	91.2 ↑

Changes compared with 1978 :

Key : No change : =
Increase : ↑
Decrease : ↓

Note : () means not statistically significant or random variation, in the mathematical sense of the term

4.4.2. Comments on the above table.

These five causes of accidents still represent this year approximately 90 % (a very slight increase) of the total number of causes of accidents.

The breakdown of these accidents by period of incapacity for all five headings shows that this proportion increases slightly with the seriousness of the accident (from 90.2 % for 4-20 days' absence from work to 95.1 % for more than 56 days' absence from work). The figures for fatalities do not lend themselves to a valid statistical comparison, since they are mathematically too random.

A comparison of the figures for those injured with the same figures for 1978 shows that, of the various causes of accident, there has been a decreasing trend for falls of ground, transport and haulage and machines, tools and supports. On the other hand, there has been a distinct increase in slipping, falling and stumbling, and a less definite increase for falling objects.

These comments are very similar (with a greater or lesser degree of distinctness) to those made in the previous two reports in which this kind of table was used.

4.5. The general trend in safety in coalmines in the Community of Nine has been favorable over the years, without being spectacularly so.

The increasing mechanization of coal mining, particularly as regards the mechanization of support systems, has brought with it a decrease in accidents arising from falls of ground or from haulage and transport.

It is a source of some comfort to note also that, at the same time, accidents caused by machines, tools and support systems have also declined, which is doubtless the consequence of the efforts that have been made to make equipment safer.

4.6. Chronological trend over several years in the Community of Six.

As was said earlier on, some statistics serve to illustrate the long-term trend for the former Community of Six.

4.6.1. This has been determined for all categories of accidents since 1971 and is included in table E below.

Between 1978 and 1979 the trend was favourable for all categories, as also for the Community of Nine, but was only of statistical significance in the case of less serious injuries.

In the longer term, the trend for those injuries resulting in between 4 and 56 days' absence from work was favourable but with positive and negative fluctuations which were often significant.

4.6.2. In the case of injuries resulting in more than 56 days' absence from work, comparisons can be taken back to 1958 and the relevant data are included in the last column of table D. Having remained stationary at somewhere around a frequency rate of 13 between 1958 and 1967, the rate began to rise up to 1973 and since then has been stable at around a frequency rate of 16 with a low of 14.92 in 1976.

The trend in these figures, which is only just of significance, does not necessarily reflect an increase in the number of accidents, but may simply result from progress in treating persons who otherwise would have died within eight weeks.

4.6.3. The number of fatalities is in fact declining and the frequency rate has fallen by about 40 % since 1958. Since the variations from one year to the other are not of statistical significance, there is no point in giving details of the trend. Nevertheless this trend provides no evidence to undermine the comments made regarding injuries resulting in more than 56 days' absence from work.

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Common Statistics on victims
of accidents underground in coal mines

DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

(absolute figures)

Table 1a

COUNTRY COMMUNITY OF THE IX
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 557.133.186

SITE OF THE ACCIDENT	Production faces 1					Headings excluding shafts and staple-pits 2					Shafts and staple-pits 3					Other places 4					Total of accidents underground 5					Group accidents (2) 6		
CAUSES OF ACCIDENTS / Period of incapacity	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	56 days (3)	Fatal acci-dents	total
I. FALLS OF GROUNDS AND ROCKS	6484	2302	738	10	9534	3073	1096	399	13	4581	49	10	4	-	63	1100	380	102	2	1584	10706	3788	1243	25	15762	0	5	5
II. TRANSPORT, TOTAL	1144	514	228	10	1896	566	253	97	7	923	119	64	51	3	237	3027	1266	543	27	4863	4856	2097	919	47	7919			
a) Continuous Transport	184	131	91	5	411	99	61	26	2	188	2	3	2	0	7	241	103	67	7	418	526	298	186	14	1024			
b) Discontinuous Transport	960	383	137	5	1485	467	192	71	5	735	117	61	49	3	230	2786	1163	476	20	4445	4330	1799	733	33	6895			
III. FALLS AND MOVEMENT OF THE VICTIM, TOTAL	3572	1994	459	4	6029	2456	1236	339	2	4033	264	155	59	6	484	7446	3086	794	4	11330	13738	6471	1651	16	21876			
a) while moving about the mine	521	217	50	0	788	374	139	37	0	550	31	10	7	0	48	3053	1081	262	-	4396	3979	1447	356	0	5782			
b) in the course of other activities	3051	1777	409	4	5241	2082	1097	302	2	3483	233	145	52	6	436	4393	2005	532	4	6934	9759	5024	1295	16	16094			
IV. MACHINES, TOOLS AND SUPPORTS TOTAL	3593	1421	397	4	5415	1915	669	193	3	2780	91	34	8	0	133	2655	895	182	1	3733	8254	3019	780	8	12061			
a) Machines	517	229	103	1	850	195	97	64	2	358	20	11	3	0	34	246	108	42	1	397	978	445	212	4	1639			
b) Tools	870	317	82	0	1269	615	196	55	0	866	42	20	3	0	65	898	321	52	0	1271	2425	854	192	0	3471			
c) Supports	2206	875	212	3	3296	1105	376	74	1	1556	29	3	2	0	34	1511	466	88	0	2065	4851	1720	376	4	6951			
V. FALLS OF OBJECTS	3675	1601	498	4	5778	1862	691	235	4	2792	197	82	27	2	308	2729	1190	344	3	4266	8463	3564	1104	13	13144			
VI. EXPLOSIVES	18	8	1	0	27	5	1	1	0	7	-	-	-	-	-	24	7	3	0	34	47	16	5	0	68			
VII. IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	1	-	1	3	5	1	-	-	4	5	-	-	-	-	-	0	0	1	10	11	2	0	2	17	21	2	17	20
VIII. OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	5	1	0	0	6	6	2	0	0	8			
a) Outbursts of Gas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	-	0	0	0	0	0			
b) De-oxygenation and Poisoning by natural Gases	1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	5	1	0	0	6	6	2	0	0	8			
IX. HEATINGS OR FIRES	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	2	2	0	0	4	3	2	0	0	5			
X. INRUSHES	8	4	1	0	13	-	-	-	-	-	-	-	-	-	-	1	2	1	0	4	9	6	2	0	17			
XI. ELECTRICITY	2	7	1	0	10	5	2	-	-	7	-	1	-	-	1	10	13	2	0	25	17	23	3	0	43			
XII. OTHER CAUSES	1240	346	75	4	1665	710	167	33	0	910	43	17	11	-	71	2948	903	164	1	4016	4941	1433	283	5	6662			
TOTAL	19739	8198	2399	39	30375	10593	4115	1297	33	16038	763	363	160	11	1297	19947	7745	2136	48	29876	51042	20421	5992	131	77586			

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks)
(3) Calendar days

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Common Statistics on victims
of accidents underground in coal mines

DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

(frequency rates)

Table 1b

COUNTRY COMMUNITY OF THE IX
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 557.133.186

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS (Period of incapacity)	Production faces 1					Headings excluding shafts and staple-pits 2				
	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total
I. FALLS OF GROUNDS AND ROCKS	11,64	4,13	1,32	0,02	17,11	5,51	1,97	0,72	0,02	8,22
II TRANSPORT, TOTAL	2,05	0,92	0,41	0,02	3,40	1,02	0,45	0,17	0,01	1,66
a) Continuous Transport	0,33	0,24	0,16	0,01	0,74	0,18	0,11	0,05	0,00	0,34
b) Discontinuous Transport	1,72	0,69	0,25	0,01	2,66	0,84	0,34	0,13	0,01	1,32
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	6,41	3,58	0,82	0,01	10,82	4,41	2,22	0,61	0,00	7,24
a) while moving about the mine	0,93	0,39	0,09	0	1,41	0,67	0,25	0,07	0	0,99
b) in the course of other activities	5,48	3,19	0,73	0,01	9,41	3,74	1,97	0,54	0,00	6,25
IV. MACHINES, TOOLS AND SUPPORTS TOTAL	6,45	2,55	0,71	0,01	9,72	3,44	1,20	0,35	0,00	4,99
a) Machines	0,93	0,41	0,18	0,00	1,53	0,35	0,17	0,11	0,00	0,64
b) Tools	1,56	0,57	0,15	0	2,28	1,10	0,35	0,10	0	1,55
c) Supports	3,96	1,57	0,38	0,01	5,91	1,98	0,67	0,13	0,00	2,79
V. FALLS OF OBJECTS	6,60	2,87	0,89	0,01	10,37	3,34	1,24	0,42	0,00	5,01
VI. EXPLOSIVES	0,03	0,01	0,00	0	0,05	0,01	0,00	0,00	0	0,01
VII. IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0,00	0	0,00	0,01	0,01	0,00	0	0	0,00	0,01
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0,00	0,00	0	0	0,00	0	0	0	0	0
a) Outbursts of Gas	0	0	0	0	0	0	0	0	0	0
b) De-oxygenation and Poisoning by natural Gases	0,00	0,00	0	0	0,00	0	0	0	0	0
IX. HEATINGS OR FIRES	0,00	0	0	0	0,00	0	0	0	0	0
X. INRUSHES	0,01	0,01	0,00	0	0,02	0	0	0	0	0
XI. ELECTRICITY	0,00	0,01	0,00	0	0,02	0,01	0,00	0	0	0,01
XII. OTHER CAUSES	2,23	0,62	0,13	0,01	29,91	1,27	0,30	0,06	0	1,63
TOTAL	35,42	14,71	4,31	0,07	54,51	19,01	7,38	2,33	0,06	28,78

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS (Period of incapacity)	Shafts and staple-pits 3					Other places 4				
	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total
I. FALLS OF GROUNDS AND ROCKS	0,09	0,02	0,01	0	0,11	1,97	0,68	0,18	0,00	2,84
II TRANSPORT, TOTAL	0,21	0,11	0,09	0,00	0,43	5,43	2,27	0,97	0,04	8,72
a) Continuous Transport	0,00	0,00	0,00	0	0,01	0,43	0,18	0,12	0,07	0,75
b) Discontinuous Transport	0,21	0,11	0,09	0,00	0,41	5,00	2,09	0,85	0,03	7,97
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	0,47	0,28	0,11	0,01	0,87	13,36	5,54	1,43	0,00	20,33
a) while moving about the mine	0,06	0,02	0,01	0	0,09	5,48	1,94	0,47	0	7,89
b) in the course of other activities	0,42	0,26	0,09	0,01	0,78	7,89	3,60	0,95	0,00	12,44
IV. MACHINES, TOOLS AND SUPPORTS TOTAL	0,16	0,06	0,01	0	0,24	4,77	1,61	0,33	0,00	6,70
a) Machines	0,04	0,02	0,00	0	0,06	0,44	0,19	0,08	0,00	0,71
b) Tools	0,08	0,04	0,00	0	0,12	1,61	0,58	0,09	0	2,28
c) Supports	0,05	0,00	0,00	0	0,06	2,71	0,84	0,16	0	3,70
V. FALLS OF OBJECTS	0,35	0,15	0,05	0,00	0,55	4,90	2,14	0,62	0,00	7,65
VI. EXPLOSIVES	0	0	0	0	0	0,04	0,01	0,00	0	0,06
VII. IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0	0	0	0	0	0	0	0,00	0,01	0,01
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0	0	0	0	0	0,01	0,00	0	0	0,01
a) Outbursts of Gas	0	0	0	0	0	0	0	0	0	0
b) De-oxygenation and Poisoning by natural Gases	0	0	0	0	0	0,01	0,00	0	0	0,01
IX. HEATINGS OR FIRES	0	0	0	0	0	0,00	0,00	0	0	0,00
X. INRUSHES	0	0	0	0	0	0,00	0,00	0,00	0	0,00
XI. ELECTRICITY	0	0,00	0	0	0,00	0,02	0,02	0,00	0	0,04
XII. OTHER CAUSES	0,08	0,03	0,02	0,02	0,13	5,29	1,62	0,29	0,00	7,20
TOTAL	1,37	0,65	0,29	0,29	2,33	35,80	13,90	3,83	0,08	53,62

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS (Period of incapacity)	Total of accidents underground 5					Group accidents (2) 6		
	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	56 days (3)	Fatal accidents	total
I. FALLS OF GROUNDS AND ROCKS	19,22	6,80	2,23	0,04	28,29	0	0,01	0,01
II TRANSPORT, TOTAL	8,72	3,76	1,65	0,08	14,21			
a) Continuous Transport	0,94	0,53	0,33	0,03	1,84			
b) Discontinuous Transport	7,77	3,23	1,32	0,06	12,38			
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	24,66	11,61	2,96	0,03	39,27			
a) while moving about the mine	7,14	2,60	0,64	0,00	10,38			
b) in the course of other activities	17,52	9,02	2,32	0,03	28,89			
IV. MACHINES, TOOLS AND SUPPORTS TOTAL	14,82	5,42	1,40	0,01	21,65			
a) Machines	1,76	0,80	0,38	0,01	2,94			
b) Tools	4,35	1,53	0,34	0	6,23			
c) Supports	8,71	3,09	0,67	0,01	12,48			
V. FALLS OF OBJECTS	15,19	6,40	1,98	0,02	23,59			
VI. EXPLOSIVES	0,08	0,03	0,01	0	0,12			
VII. IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0,00	0	0,00	0,03	0,04			
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0,01	0,00	0	0	0,01			
a) Outbursts of Gas	0	0	0	0	0			
b) De-oxygenation and Poisoning by natural Gases	0,01	0,00	0	0	0,01			
IX. HEATINGS OR FIRES	0,01	0,00	0	0	0,01			
X. INRUSHES	0,02	0,01	0,00	0	0,03			
XI. ELECTRICITY	0,03	0,04	0,01	0	0,08			
XII. OTHER CAUSES	8,87	2,57	0,51	0,01	11,96			
TOTAL	91,62	36,65	10,76	0,24	139,26			

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme.
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks).
(3) Calendar days.

Explanatory notes - Tables 1

GENERAL DEFINITIONS

1. Accident

Bodily injury resulting from a sudden and abnormal external cause in the course of work.

The Mines Safety and Health Commission's statistics should only cover victims of accidents underground, including accidents which occur when men enter and leave the cages and while the cages are in motion.

2. Fatal accident

An accident causing the death of the victim within 56 days following the accident. Victims dying more than 56 after the day of the accident should not be included in the fatal accident category but in that of accidents resulting in incapacity involving an absence from work of more than 56 days.

3. Persons covered by the statistics

Pit staff and employees of contractor firms who belong to a miners' social security .heme.

The statistics count victims and not accidents, everyone who is the victim of an accident while actually underground as well as during descent and ascent should be included. Victims can therefore only be miners, supervisors, engineers or staff belonging to contractor firms.

4. Shifts and number of hours worked

Shifts and number of hours worked by the persons on the books of the mine and other staff belonging to a miners' social insurance scheme; account should be taken both of extra shifts and overtime.

The period of reference adopted is the period of actual exposure to risk; one therefore counts extra shifts and overtime in terms of time actually worked and not of number of hours paid.

5. Accidents rates

Number of accidents per million hours worked.

The frequency rates are arrived at by dividing the number of accidents of a given category by the total number of hours spent on all types of work underground.

CAUSES OF ACCIDENTS

I. Falls of Ground and Rocks

This category of accidents covers falls of stone or coal from its natural situation

It does not cover accidents caused by falls of ground resulting from one of the factors included under another category, for example the use of explosives, explosion of firedamp or dust, or an outburst. Accidents caused by falls of stone in a caved waste should be included in this category; on the other hand, accidents during the stowing of waste should be classed in category 5 "Falls of Objects". Accidents caused by materials continuing to move after falling from their natural position are included under category I "Falls of ground and rocks", except where it is a case of materials set in motion by some external cause after first coming to rest.

II. Transport

Accidents caused by any means of transport whether stationary or in motion, used to carry men or objects at the face, in other workings, in roadways, in shafts, staple pits, etc., including accidents caused by the engines providing motive power for transport. This category includes, for example, accidents caused by lumps of coal falling from a conveyor belt or blocks of wood from a tub loaded with timber, and even those caused when lumps of coal are projected during their descent down a fixed chute. An accident caused by the gear wheels or the driving mechanism of a transport system should also be included in category II "Transport".

Electrocution caused by a trolley wire should be included in category XI "Electricity".

a) Continuous Transport

Transport equipment which can récéive products along the whole of its length and maintain a continuous flow.

b) Discontinuous transport

All other means of transport.

This category should include accidents caused particularly by skips, cages, kibbles, as well as accidents involving men or objects falling from these cages, skips or kibbles, rope haulages, locomotives, monorails, decking rams and other similar devices.

III. Falls and movement of the victim

a) While moving about the mine

Falls of men into a shaft or staple pit, falls in general, stumbles, slips, knocks and bumps, sprains of limbs, etc., whatever the cause, should be included, as long as the basic cause of the accident is the victim's movement through the mine in the course of or at the place of work and no means of transport is involved; the latter should be included in category II "Transport" or III b "Falls of victim during other activities" respectively.

b) In the course of other activities

Falls of men into a shaft or staple pit, falls in general, stumbles, slips, knocks and bumps, sprains of lims, etc., as long as the fall was caused basically by some particular activity and not by the movement of the victim about the mine, which is covered in III a.

This category should only include accidents caused by the victim falling during his actual work and not during the course of moving about the mine as under category III a "Falls of victim while moving about the mine".

IV. Machines, tools and supports

a) Machines

Accidents caused by engines powering a means of transport should be included in category II "Transport". Category IV covers accidents occurring during the starting up and running of other machines.

Accidents caused by machines falling while being moved will be included in category V "Falls of objects".

b) Tools

Category IV covers accidents caused by the use of tools such as portable drills, drills on stands, hand saws, pneumatic picks, lifting gear, pushers, etc. Accidents caused by falling tools should be put into category V "Falls of objects".

c) Supports

With regard to accidents occurring during the handling of supports only those involving the setting up or removal of this equipment should be included in category IV. If a suport or one of its components falls during transport, the accident should be included in category V "Falls of objects".

Category IV only covers accidents arising from the use and movement of machines, tools and equipment; it is emphasized in the case of supports that only accidents occurring during the setting up and removal of this equipment should be included in this category.

V. Falls of objects

Accidents involving the falling or dislodging of excavated material, and of objects such as frams, timber, tools, props, pipes, materials, etc.

This category includes not only accidents caused directly by falls of excavating material or objects, but also those caused by objects falling while being handled.

VI. Explosives

Accidents occurring during the transport or handling of explosives, the charging of shot-holes, accidental or premature firing of shots, inadequate protection of personnel, unfired explosives being hit by picks or drills, mis-fires, long fires, residues and poisoning by fumes from explosives.

Where the use of explosives sets off an explosion of fire-damp or dust or even a heating or a fire, the accident should be included in category VII or IX respectively.

VII. Ignitions or explosions of firedamp and coal dust

This includes poisoning or suffocation by the gases so produced. An explosion of firedamp or coal dust brought about by the use of electricity should be classified under category VII. As a general rule, if the causes of an accident include the ignition or explosion or firedamp or dust, it should always be included in category VII.

VIII. Outbursts of gas - Deoxygenation, suffocation or poisoning by natural gases (CO_2, CH_4, CO, H_2S)

a) Outbursts of gas

Accidents caused by ejected materials of roof falls caused by sudden outbursts of gas. In accordance with the rule set out for category VII, if the outburst is followed by an explosion of firedamp, any accidents caused thereby should be included in category VII "Ignitions or explosions of firedamp or explosions of coal dust".

b) Deoxygenation and poisoning by natural gases (CO_2, CH_4 ,CO, H_2S)

This includes accidents caused by lack of oxygen, by suffocation (CH_4, CO_2) and by poisoning (CO, H_2S). If suffocation or poisoning is brought about by gas produced by explosives or by an explosion of firedamp or coal dust, or even by a heating or fire, the accident should be classified under those categories. If suffocation or poisoning is caused by exhaust fumes from diesel engines, the accidents should be included in category IV, "Explosives".

IX. Heatings or fires

This includes poisoning or suffocation by the gases produced, injuries from burns, roof falls, falls of objects, etc. following a heating or fire in the mine. A fire following an explosion of firedamp or coal dust should be this category.

In general, if the accident is due to several combined causes including a heating or a fire, it should always be included in category IX "Heatings or fires" unless one of the causes is the ignition or explosion of firedamp or coal dust; in this last case the accident would be included in category VII.

X. Inrushes

Accidents occurring when old workings are broken into or when dead ground is encountered. Injuries from projected material, falls of objects, falls of ground drowning, etc.

XI. Electricity

Accidents caused by electricity - burns, shocks, electrocution. If electricity causes the accidental firing of explosives, an explosion of firedamp or coal dust or a heating or a fire, the resulting accident should be included in those categories in the following order of priority :

1. Explosion of firedamp or dust
2. A heating or fire
3. Explosives

XII. Other causes

This category covers accidents which cannot be classified under categories I to XI, that is to say, accidents of which it is not possibile to establish the exact cause. This category may also be used to record accidents covered by compressed air.

SITE OF THE ACCIDENT

This means the place where the victim was at the time of the accident, which may be different from the victim's normal place of work.

1. Production faces

This comprises the working face including the part between the face or staple hole and the stowed or caved waste but does not include roads of any kind except dummy roads.

2. Headings excluding shafts and staple pits

This also covers the area where loading, timbering and steelwork are carried out immediately behind the face. In the case of slusher packing the curring area extends up to and including the line of props.

Development headings should be considered as drifts.

3. Shafts and staple pits

This also covers the immediate approach to insets especially where mine cars and stores are loaded and unloaded from the cages.

4. Other places

This heading covers all the victims of accidents not included under the three preceding headings.

PERIOD OF INCAPACITY

Accidents should be broken down as follows according to periods of incapacity :

- Accidents involving an absence of between 4 and 20 calendar days
- Accidents involving an absence of between 21 and 56 calendar days
- Accidents involving an absence of more than 56 calendar days
- Fatal accidents.

The day of the accident does not count. The number of days of incapacity to be taken into consideration is defined by the effective absence of the miner from work.

SAFETY AND HEALTH COMMISSION
FOR THE MINING
AND OTHER EXTRACTIVE INDUSTRIES
Common Statistics on victims
of accidents underground in coal mines

Table 2a

DETAILED BREAKDOWN OF VICTIMS ACCORDING TO LOCATION AND NATURE OF INJURY AND PERIOD OF INCAPACITY

(absolute figures)

COUNTRY COMMUNITY OF THE IX
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 557.133.186
533.415.690 without Belgium

URE OF THE INJURY	Amputations and enucleations 1			Fractures with or without dislocation 2			Luxations, twist and sprains 3			Concussion and internal injury 4			Open wounds contusion and muscular abrasions 5			Burns and harmful effects of electricity and radiation 6			Poisoning and suffocation 7			Multiple injuries of those not specified (2) 8			TOTAL				
																									(6)	(6)	(7)	(8)	
PERIOD OF INCAPACITY	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	4 to 20 days	21 to 56 days	> 56 days	Fatal accidents	total
LOCATION OF THE INJURY I Head and neck	0	0	0	73	24	97	12	1	13	31	3	34	170	4	174	1	0	1				4	4	8	3924	1102	290	36	
II. Eyes	5	0	5							1	0	1	80	0	80	4	0	4				17	0	17	2154	254	109	0	
III Trunk	0	0	0	192	13	205	260	0	260	21	6	27	222	4	226	1	0	1				7	3	10	7806	3148	703	27	
IV Upper limbs (excluding the hands) (3)	5	1	6	293	1	294	53	0	53				227	1	228	6	0	6				4	0	4	4755	1573	586	3	
V Hands	102	0	102	882	0	882	33	0	33				688	0	688	4	0	4				7	0	7	11496	7272	1722	0	
VI Lower limbs (excluding feet) (4)	6	0	6	586	4	590	322	0	322				547	0	547	4	0	4				9	0	9	8096	3227	1478	4	
VII Feet	15	0	15	424	0	424	92	0	92				289	0	289	2	0	2				3	0	3	3596	1999	827	0	
VIII Multiple locations	2	1	3	71	14	85	39	8	47	13	5	18	145	7	7	1	0	1				9	4	13	2147	842	269	38	
IX Not specified													-	-	-	1	0	1	0	1	1	7	21	28	201	70	9	23	
TOTAL	135	2	137	2521	56	2577	811	9	820	66	14	80	2368	16	2384	24	0	24	0	1	1	67	32	109	44175	19487	5993	131	

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miner's social insurance scheme.
(2) including complications
(3) The shoulders and the wrists are included under "upper limbs"
(4) The hips and the ankles are included under "Lower limbs"
(5) Calender days
(7) Community of the IX

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Explanatory notes - Tables 2

GENERAL DEFINITIONS

1. Accident

Bodily injury resulting from a sudden and abnormal external cause in the course of work.

The Mine Safety and Health Commission's statistics should only cover victims of accidents underground, including accidents which occur when men enter and leave the cages and while the cages are in motion.

2. Fatal accident

An accident causing the death of the victim witnin 56 days following the accident. Victims dying more than 56 days after the day of the accident should not be included in the fatal accidents category but in that of accidents resulting in incapacity involving an absence from work of more than 56 days.

3. Persons covered by the statistics

Pit staff and employees of contractor firms who belong to a miner's social security scheme.

The statistics count victims and not accidents; everyone who is the victim of an accident while actually underground as well as during descent and ascent should be included. Victims can therefore only be miners, supervisors, engineers or staff belonging to contractor firms.

4. Shifts and number of hours worked

Shifts and number of hours worked by the persons on the books of the mine and other staff belonging to a miners' social insurance scheme; account should be taken both of extra shifts and overtime.

The period of reference adopted is the period of actual exposure to risk; extra shifts and overtime must therefor be counted in terms of time actually worked and not of number of hours paid.

5. Accident rates

Number of accidents per million hours worked.

The frequency rates are arrived at by dividing the number of accidents of a given category by the total number of hours spent on all types of work underground.

9. Location of the injury

When an accident has resulted in multiple injuries to different parts of the body and one of the injuries is clearly more serious than the others, this accident should be classified in the group relating to the part of the body most seriously injured; for example, a fracture of the leg, together with grazing of a hand, should be classified in category VI "Lower limbs" and not in category V "Hands".

I. Head and neck

Covers in particular the skull, the scalp, brain injuries, the ears, the mouth (including the lips, teeth and tongue), the nose, the face, the neck but not the eyes which are included in category II.

II. Eyes

Also covers the eye socket and the optic nerve.

III. Trunk

Covers the back (vertebrae and adjacent muscles, the spinal marrow), the thorax (ribs, sternum, bronchi, lungs), the abdomen (including internal organs, kidneys, liver, spleen), the abdomen and the genital organs.

The shoulders and wrists are regarded as part of the upper limbs (category IV) and not of the trunk or hands (category V).

The hips and the ankles are regarded as part of the lower limbs (category VI) and not as part of the trunk or feet (category VII).

IV. Upper limbs (excluding the hands)

This includes injuries to the shoulders, including the collar bone and shoulder blades, injuries to the arms, elbows, forearms and wrists.

V. Hands

The wrists are not regarded as part of the hands but of the upper limbs (category IV).

VI. Lower limbs (excluding feet)

This includes the hips, thighs, knees, legs and ankles.

VII. Feet

The ankles are not regarded as part of the feet but of the lower limbs (category VI).

VIII. Multiple locations

This group, covering multiple locations, should only be used when the victim has suffered several injuries to different parts of his body, none of which is clearly more serious than the others.

The category may cover injuries to the head and trunk, the head and one or more limbs, the trunk and one or more limbs or an upper and a lower limb.

IX. Not specified

This group should only be used when there is no evidence of the exact location of the injury.

10. Nature of the injury

When an accident has resulted in several injuries to different parts of the body and one of them is clearly more serious than the others, the accident should be classified in the group relating to the most serious injury.

1. Amputations and enucleations

This includes traumatic avulsion of the eye.

2. Fractures with or without dislocation

This includes simple fractures; fractures with injuries to the soft parts of the body, closed or compound fractures; fractures with internal or nerve damage, fractures with luxations, contusions and crushings.

3. Luxations, twists and sprains

LUXATIONS

This covers minor luxations and dislocations, traumatic lumbago, lumbago sciatica caused by strain; it does not include luxations with fracture covered by category 2.

TWISTS AND SPRAINS

This covers ruptures, torn and lacerated muscles, tendons, ligaments and joints as well as hernia due to strain and slipped discs, except when they are associated with open wounds.

4. Concussion and internal injury

This category includes internal bruising, internal bleeding, internal lacerations and ruptures except where associated with fractures.

It does not include internal injuries accompanied by fractures which are covered by category 2.

5. Open wounds, contusions and muscular abrasions

This covers lacerations, flesh wounds, cuts, contusions, scalp wounds, loss of a nail or an ear, wounds with nerve injuries, haemarthosis, haematoma and bruises, contusions and bruises with superficial wounds. It does not include traumatic amputation, enucleations or avulsion of an eye, which are covered by category 1, compound fractures, contusions and crushings accompanying a fracture which are covered by category 2, concussion covered by 4, burns with wounds covered by 6.

6. Burns and harmful effects of electrictiy and radiation

Covers burns from fire, boiling liquid, friction, chemical substances (external burns only), burns with wounds, electrocution, electric shock and burns caused by electricity, the effect of X-rays, radioactive substances, ultra violet rays and ionizing radiation.

It does not cover burns caused by the absorption of a corrosive or caustic substance which are classified in category 7.

7. Poisoning and suffocation

This category covers the effects of the injection, ingestion, absorption or inhalation of toxic, corrosive or caustic substances.

Asphyxiation or suffocation by compression or roof fall; asphyxiation due to the suppression or reduction of oxygen in the atmosphere, the entry of a foreign bodies into the respiratory system, to carbon monoxide or other toxic gases.

8. Multiple injuries or those not specified (including complications)

This category includes those cases in which the victim has suffered several injuries of different types, none of which is clearly more serious than the others, and those which are not covered in any other category.

It also covers the various early complications of injuries and pathological reactions, which, however, should only be classified in this group when the nature of the original injury is not known.

PERIOD OF INCAPACITY

Accidents should be broken down according to two periods of incapacity :

- accidents involving an absence of more than 56 calendar days

- fatal accidents.

The day of the accident does not count. The number of days of incapacity to be taken into consideration is defined by the effective absence of the miner from work.

Regarding table 2, which gives the breakdown of accident victims according to the location and nature of the injury and the period of absence from work, it must first of all be pointed out that not all the Member States were able to provide all the necessary figures for the compilation of a properly harmonised table for the whole Community. The United Kingdom and Federal Republic of Germany give the total figure for injuries resulting in more than four days' absence according to the nature of the injury, which is not the case for France and Belgium. As regards the total, Belgium does not give the total number of injuries resulting in between four and 56 days' absence from work; as Belgium accounts for only 4.25 % of total man-hours worked, the table of injuries resulting in less than 56 days' absence from work only covers the other Member States of the Community.

No table of frequency rates was compiled in view of the lack of harmonization from country to country and the fact that these figures are of little statistical significance. The following conclusions may however be validly drawn from these figures.

No matter what the seriousness of the injuries, accidents to hands are the most frequent (29 %) followed by accidents to the lower limbs (18 %) and accidents to the body (17 %), though we must nevertheless note that accidents to the feet resulting in absence from work of more than 56 days are slightly more frequent than similar accidents to the body.

As regards the other locations of the injuries, there is no longer any harmonization of injuries according to the degree of seriousness which could be used as a basis for classifying them all under the heading "location of injury". In the case of fatalities, multiple injury locations (38), to which multiple unspecified lesions have been added (21), represent a total of 45 % of all fatalities.

Accidents to the head (36), and in particular fractures (24), account for 27 % of fatalities; accidents to the body account for 21 %.

A.

Comparative table of number of persons incapacitated
by underground accidents for eight weeks or longer
years 1958 - 1979 per '000,000 man-hours
(frequency)

COMMUNITY VI (IX since 1977)	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	4,846	4,490	4,571	4,434	4,387	4,337	4,509	4,215	4,186	4,060	4,261	4,492	4,135	4,109	4,08	4,29	4,15	3,61	3,48	2,31	2,36	2,23
2) Haulage and transport	2,602	2,347	2,310	2,371	2,521	2,520	2,346	2,416	2,173	2,037	2,139	2,118	2,016	1,953	1,93	2,11	1,91	2,28	2,14	1,82	1,83	1,65
3) Movement of personnel	2,003	1,823	2,185	2,185	2,282	2,261	2,326	2,354	2,320	2,354	2,795	3,023	3,084	3,117	3,47	3,88	3,89	3,38	3,62	3,05	3,12	2,96
4) Machinery, handling of tools and supports	1,098	1,064	1,264	1,423	1,712	1,818	1,848	1,773	1,815	1,790	1,945	1,865	2,011	1,876	1,75	2,01	1,98	2,29	2,15	1,87	1,62	1,40
5) Falling objects	1,962	2,161	2,105	2,353	2,375	2,406	2,442	2,415	2,362	2,638	2,858	3,185	3,308	3,506	3,62	3,63	3,62	3,08	3,08	1,93	2,04	1,98
6) Explosives	0,023	0,020	0,017	0,012	0,018	0,010	0,011	0,013	0,007	0,019	0,015	0,019	0,011	0,002	0,008	-	0,01	0,006	0,01	0,01	0,01	0,01
7) Explosions of firedamp or coal dust	0,017	0,030	0,010	0,001	0,071	0,006	0,001	0,011	0,016	-	0,002	0,004	0,025	0,007	-	-	0,02	-	-	-	0,01	0,00
8) Sudden outbursts of firedamp, suffocation by natural gases	0,002	-	-	-	-	-	-	0,002	0,001	0,003	-	-	-	-	-	-	-	0,003	0,003	-	0,01	-
9) Underground combustion and fires	-	-	0,002	0,001	-	-	-	0,002	-	-	0,002	-	-	-	-	0,003	0,01	0,003	-	-	-	-
10) Inrushes of water	0,002	-	..	-	0,001	0,002	0,003	-	0,001	-	0,002	-	0,009	0,002	0,003	0,009	-		0,01	-	-	-
11) Electricity	0,010	0,008	0,010	0,018	0,007	0,012	0,008	0,006	0,007	0,005	0,010	0,021	0,014	0,007	0,008	0,006	0,01	0,16	-	-	0,01	0,01
12) Other causes	0,985	1,012	0,513	0,428	0,404	0,390	0,364	0,289	0,354	0,337	0,341	0,333	0,434	0,509	0,73	0,84	0,53	0,37	0,40	0,70	0,62	0,51
TOTAL	13,551	12,954	12,986	13,227	13,781	13,781	13,861	13,506	13,242	13,246	14,370	15,160	15,047	15,088	15,60	16,77	16,12	15,05	14,92	11,49	11,62	10,76

B.

Underground accidents resulting in death within eight weeks

year 1958 - 1979

per '000.000 man-hours

(frequency)

COMMUNITY VI (IX since 1977)	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	0,253	0,242	0,235	0,217	0,234	0,217	0,175	0,177	0,208	0,192	0,160	0,176	0,135	0,133	0,092	0,13	0,11	0,10	0,07	0,05	0,08	o,o4
2) Haulage and transport	0,147	0,141	0,146	0,168	0,124	0,167	0,178	0,149	0,160	0,128	0,115	0,145	0,132	0,104	0,141	0,12	0,08	0,11	0,09	0,08	0,11	o,o8
3) Movement of personnel	0,057	0,063	0,047	0,056	0,045	0,060	0,045	0,051	0,060	0,044	0,054	0,038	0,039	0,043	0,043	0,04	0,05	0,047	0,06	0,02	0,02	o,o3
4) Machinery, handling of tools and supports	0,011	0,028	0,012	0,021	0,037	0,013	0,030	0,024	0,023	0,024	0,017	0,023	0,027	0,029	0,019	0,02	0,02	0,047	0,05	0,02	0,02	o,o1
5) Falling objects	0,045	0,077	0,024	0,041	0,062	0,046	0,037	0,037	0,030	0,036	0,040	0,031	0,025	0,041	0,038	0,02	0,04	0,038	0,04	0,01	0,01	o,o2
6) Explosives	0,009	0,010	0,002	-	0,002	0,001	0,002	0,002	0,001	0,002	0,006	-	0,002	0,005	-	-	-	-	0,006	0,01	0,00	o
7) Explosions of firedamp or coal dust	0,032	0,036	0,002	-	0,375	0,001	0,001	0,053	0,030	-	0,044	-	0,037	0,005	-	-	0,13	-	0,06	-	-	o,o3
8) Sudden outbursts of firedamp, suffocation by natural gases	0,016	0,010	0,006	0,003	0,007	0,005	0,002	0,006	0,004	0,012	0,006	0,004	-	0,027	0,022	0,012	-	-	0,006	-	-	-
9) Underground combustion and fires	-	0,003	-	0,001	-	0,003	0,005	0,005	-	-	-	-	-	-	0,003	-	-	-	-	0,01	-	-
10) Inrushes of water	0,002	0,002	0,001	0,006	0,005	0,005	-	0,001	-	0,002	-	-	0,011	-	0,003	0,003	-	-	-	-	-	-
11) Electricity	0,016	0,007	0,007	0,004	0,008	0,008	0,003	0,004	0,003	0,004	0,006	0,006	0,004	-	0,003	0,003	-	-	0,003	-	-	-
12) Other causes	0,023	0,021	0,024	0,029	0,032	0,021	0,014	0,013	0,017	0,015	0,012	0,015	0,016	0,053	0,035	0,06	0,02	0,003	0,02	0,01	-	o,o1
TOTAL	0,610	0,590	0,507	0,546	0,932	0,547	0,492	0,522	0,536	0,457	0,460	0,438	0,429	0,440	0,399	0,413	0,456	0,35	0,42	0,20	0,25	o,24

C. COMPARATIVE TABLE OF UNDERGROUND GROUP ACCIDENTS

years 1960 - 1979

CAUSES	1960			1961			1962			1963			1964			1965			1966			1967			1968			1969		
	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b
1. *Falls of ground*	2	2	10	1		7	3	3	18																			1		6
2. *Haulage and transport*													2	5	14															
3. *Movement of personnel*																												1		5
4. *Machinery, handing of tools and supports*																														
5. *Falling objects*																														
6. *Explosives*																														
7. *Explosions of firedamp or coal dust*							3	62	38							3	4	41	3	11	21				1		17			
8. *Sudden outburst of firedamp, suffocation by natural gases*																														
9. *Underground combustion and fires*																														
10. *Inrushes of water*																														
11. *Electricity*																														
12. *Other causes*																														
TOTAL	2	2	10	1		7	6	65	56				2	5	14	3	4	41	3	11	21				1		17	2		11

CAUSES	1970			1971			1972			1973			1974			1975			1976			1977			1978			1979		
	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b	N	a	b
1. *Falls of ground*				2		12				2		9	1	1	5													1	0	5
2. *Haulage and transport*																									1	3	7			
3. *Movement of personnel*																														
4. *Machinery, handing of tools and supports*																														
5. *Falling objects*																														
6. *Explosives*																														
7. *Explosions of firedamp or coal dust*	1	11	16										1	5	42				1		16							2	2	17
8. *Sudden outburst of firedamp, suffocation by natural gases*						8																								
9. *Underground combustion and fires*																						1	7	7						
10. *Inrushes of water*																														
11. *Electricity*																														
12. *Other causes*																														
TOTAL	1	11	16	3		20				2		9	2	6	47						1	1	7	7	1	3	7	3	2	22

(1) Accidents involving more than five casualties of type (a).
(N) Number of groups accidents.
(a) Casualties were unable to resume work below ground for at least eight weeks.
(b) Casualties died within eight weeks.

D. RECAPITULATION : COMMUNITY OF THE SIX

Year	Extraction (1)	Underground o.m.s. (kg./hour)	Million man-hours worked	Fatalities	Serious injuries (4) (disablement for 8 weeks or over)	Fatalities per m. tons	Serious injuries (4) per m. tons	Fatalities per m. man-hours	Serious injuries per m. man-hours
1958	252 278	200	1 260	770	17 074	3,052	67,68	0,610	13,551
1959	240 602	214	1 122	622	14 539	2,585	60,43	0,590	12,950
1960	239 967	231	1 037	526	13 459	2,192	56,09	0,507	12,986
1961	235 848	245	962	527	12 720	2,235	53,93	0,548	13,227
1962	233 233	259	901	840 (3) 541 (4)	12 418	3,602 (3) 2,320 (4)	53,24	0,932 (3) 0,600 (4)	13,781
1963	229 769	270	849	465	11 686	2,024	50,86	0,547	13,761
1964	235 007	279	841	411	11 726	1,749	49,89	0,493	13,860
1965	224 249	286	784	410	10 595	1,828	47,25	0,522	13,506
1966	210 189	301	698	374	9 247	1,779	43,99	0,536	13,242
1967	189 484	322	567	269	7 781	1,420	41,06	0,457	13,246
1968	181 016	346	522	240	7 501	1,326	41,44	0,460	14,370
1969	176 749	371	476	209	7 222	1,181	40,82	0,438	15,160
1970	170 355	388	438	188	6 591	1,104	38,69	0,429	15,047
1971	164 910	398	414	182	6 249	1,104	37,89	0,440	15,088
1972	151 899	411	369	147	5 763	1,033	26,34	0,399	15,60
1973	139 700	421	332	137	5 560	0,981	39,80	0,413	16,77
1974	133 300	426	313	143	5 054	1,073	37,91	0,456	16,12
1975	129 100	405	319	110	4 795	0,852	37,14	0,35	15,05
1976	125 600	417	301	125	4 491	0,995	35,76	0,415	14,92
1977	119.670	421	284	33	4 357	0,694	36,40	0,293	15,36
1978	116.383	431	270	95	4.443	0,816	38,18	0,352	16,44
1979	118,012	444	266	91	4.380	0,764	37,11	0,349	16,43

(1) Net extraction, slurry and dust.
(2) Incl. Luisenthal explosion.
(3) Excl. Luisenthal explosion.
(4) Casualties were unable to resume work for at least eight weeks.

UNITED KINGDOM

						o/oo			
1973	130 200	423	306	74	490	0,568	3,76	0,242	1,60
1974	109 200	407	268	37	417	0,339	3,82	0,138	1,555
1975	127 700	421	303	55	522	0,431	4,09	0,181	1,722
1976	122 100	425	287	45	2 407 (1) 444	0,369	19,73 (1) 3,64	0,157	8,387 (1 1,536
1977	120.700	411	294	33	2 280	0, 273	18, 874	0, 11	7, 75
1978	121.695	424	287	43	2.029	0,353	16,673	0,150	7,07
1979	120,596	414	291	40	1.612	0,332	13,37	0,138	5,54

Important Note : The figures for serious injuries and those given in the above table are not comparable prior to 1976 as the definition of "serious accident" for the U.K. before this date was substantially different from that used for the Community of six.

(1) For 1976 both figures for both definitions have been given.

E. ACCIDENT LEVELS SINCE 1971 (COMMUNITY OF THE SIX)

	1971	1972	1973	1974	1975	1976	1977	1978	1979
4-20 days - actual.	47 203	40 376	37 384	34 797	33 985	30 643	29 466	27 602	26 325
Frequency rate	113,96	109,31	112,77	110,97	106,67	101,77	103,90	102,15	99,86
increase/decrease on previous year. . . . . o/o	-	- 4 (s)	+ 3,17 (s)	- 1,6 (s)	- 3,9 (s)	- 4,8 (s)	+ 2,1(s)	- 1,7(s)	- 2,2(s)
21 - 56 days - actual	21 116	18 531	17 325	15 875	15 454	13 923	13 388	13 240	12 779
Frequency rate	50,98	50,17	52,26	50,62	48,5	46,24	47,21	49,00	47,95
increase/decrease on previous year. . . . . o/o	-	- 1,59	+ 4,17	- 3 (s)	- 4,2 (s)	- 4,8 (s)	+ 2,1	+ 3,7 (s)	- 2,1
more than 56 days - actual.	6 249	5 763	5560	5 054	4 795	4 791	4 357	4 443	4 380
frequency rate.	15,09	15,60	16,77	16,12	15,05	14,92	15,36	16,44	16,43
increase/decrease on previous year. . . . . o/o	-	+ 3,4 (s)	+ 7 (s)	- 4 (s)	- 6,7 (s)	- 0,8	+ 2,9	+ 6,6 (s)	- 0,06
Fatalities total - actual	182	147	137	143	110	125	83	95	91
frequency rate.	0,440	0,399	0,413	0,456	0,345	0,415	0,293	0,352	0,341
increase/decrease on previous year. . . . . o/o	-	- 10	+ 3,9	+ 10,4	- 24	+ 20	- 29,4(s)	+ 20,1	- 4,2
actual without group accident. . .	162	141	128	96	110	109	66	95	81
frequency rate.	0,391	0,382	0,385	0,307	0,345	0,362	0,233	0,352	0,304
increase/decrease on previous year. . . . . o/o	-	- 2,3	+ 1 %	- 21 (s)	+ 12	+ 4,9	- 39,4 (s)	+ 51,1 (s)	- 13,6

(s) significant variation

A. *Comparative table of number of persons incapacitated*

by underground accidents for eight weeks or longer

years 1958 - 1979 per '000,000 man-hours

(frequency)

FEDERAL REPUBLIC OF GERMANY	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1) Falls of ground	4,843	4,779	4,886	4,797	4,682	4,663	4,894	4,732	4,721	4,524	4,618
2) Haulage and transport	2,550	2,569	2,445	2.458	2,501	2,433	2,385	2,411	2,067	1,913	1,994
3) Movement of personnel	2,497	2,463	2,348	2,512	2,608	2,646	2,744	3,032	2,852	2,974	3,300
4) Machinery, handling of tools and supports	0,767	0,914	0,920	0,867	1,046	1,213	1,242	1,234	1,244	1,124	1,396
5) Falling objects	2,537	2,719	2,738	2,945	3,077	3,038	3,242	3,344	3,272	3,642	3,773
6) Explosives	0,015	0,011	0,010	0,009	0,008	0,006	0,006	0,005	0,005	0,017	0,011
7) Explosions of firedamp or coal dust	0,011	0,016	-	0,002	0,123	0,010	-	0,014	0,013	-	0,004
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-	-	-	-	-	-	0,005	-	0,003	-
9) Underground combustion and fires	-	-	0,003	0,002	-	-	-	-	-	-	0,004
10) Inrushes of water	0,004	-	-	-	-	0,004	-	-	-	-	-
11) Electricity	0,010	0,014	0,012	0,014	0,006	0,012	0,009	0,002	0,010	0,006	0,011
12) Other causes	0,487	0,522	0,457	0,503	0,488	0,473	0,477	0,354	0,414	0,396	0,429
TOTAL	13,721	14,007	13,819	14,109	14,539	14,499	14,999	15,133	14,598	14,599	15,540

FEDERAL REPUBLIC OF GERMANY	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	4,736	4,321	4,354	4,20	4,30	4,08	3,69	3,47	3,67	3,48	3,51
2) Haulage and transport	2,195	2,007	1,724	1,81	1,80	1,68	2,16	1,89	1,74	1,77	1,71
3) Movement of personnel	3,399	3,370	3,246	3,48	3,98	4,15	3,37	3,58	4,09	4,17	4,63
4) Machinery, handling of tools and supports	1,291	1,382	1,597	1,38	1,61	1,58	2,16	1,85	2,09	1,90	1,85
5) Falling objects	4,036	4,166	3,313	3,49	3,49	3,37	2,97	2,92	3,03	3,34	3,54
6) Explosives	0,007	0,008	-	-	-	0,01	-	0,01	-	-	0,01
7) Explosions of firedamp or coal dust	0,004	-	0,012	-	-	-	-	0,02	-	-	0,01
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-	-	-	-	-	-	-	-	-	-
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-	-	-
10) Inrushes of water	-	-	-	-	-	-	-	-	-	-	-
11) Electricity	0,026	0,012	0,008	0,01	0,005	-	0,009	0,01	0,01	0,01	0,07
12) Other causes	0,402	0,532	0,632	0,96	0,99	0,52	0,32	0,40	0,36	0,20	0,56
TOTAL	16,096	15,798	14,886	15,31	16,19	15,40	14,69	14,16	14,99	14,87	15,42

D.

Underground accidents resulting in death within eight weeks

year 1958 - 1979

per '000,000 man-hours

(frequency)

FEDERAL REPUBLIC OF GERMANY	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	0,268	0,290	0,263	0,216	0,280	0,260	0,200	0,184	0,197	0,206	0,148	0,192	0,113	0,147	0,10	0,08	0,12	0,12	0,06	0,07	0,13	0,08
2) Haulage and transport	0,179	0,169	0,182	0,196	0,149	0,178	0,300	0,191	0,175	0,150	0,126	0,143	0,128	0,103	0,16	0,13	0,07	0,12	0,10	0,08	0,14	0,11
3) Movement of personnel	0,094	0,097	0,070	0,086	0,059	0,089	0,071	0,070	0,094	0,076	0,079	0,056	0,058	0,032	0,06	0,06	0,06	0,06	0,07	0,05	0,05	0,07
4) Machinery, handling of tools and supports	0,010	0,027	0,012	0,027	0,037	0,019	0,028	0,025	0,030	0,020	0,014	0,034	0,031	0,032	0,03	0,02	0,02	0,05	0,03	0,04	0,04	0,03
5) Falling objects	0,065	0,041	0,039	0,065	0,072	0,072	0,054	0,058	0,048	0,063	0,051	0,049	0,035	0,047	0,06	0,02	0,04	0,05	0,05	0,02	0,03	0,05
6) Explosives	0,009	0,003	0,003	-	0,004	-	0,002	-	-	-	0,004	-	-	-	-	-	-	-	0,005	-		-
7) Explosions of firedamp or coal dust	0,011	0,012	-	-	0,660	0,002	0,002	0,019	0,056	-	0,061	-	-	0,008	-	-	-	-	0,01	-		0,04
8) Sudden outbursts of firedamp, suffocation by natural gases	0,005	0,003	0,002	0,004	0,002	-	-	0,002	0,002	0,007	-	0,004	-	0,008	0,004	0,005	-	-	0,01	-		-
9) Underground combustion and fires	-	0,003	-	0,002	-	0,006	0,009	0,005	-	-	-	-	-	-	-	-	-	-	-	0,04		-
10) Inrushes of water	-	0,003	0,002	-	-	0,004	-	-	-	-	-	-	0,012	-	-	-	-	-	-	-		-
11) Electricity	0,022	0,008	0,002	0,005	0,010	0,002	0,004	0,005	-	0,003	0,004	0,004	0,004	-	0,004	0,005	-	-	0,005	0,01		-
12) Other causes	0,025	0,025	0,036	0,049	0,049	0,025	0,017	0,023	0,027	0,017	0,022	0,022	0,027	0,083	0,04	0,09	0,03	0,005	0,03	0,02	0,01	0,01
TOTAL	0,687	0,680	0,611	0,651	1,344	0,657	0,587	0,582	0,629	0,542	0,509	0,504	0,408	0,460	0,46	0,420	0,34	0,41	0,377	0,34	0,40	0,40

SAFETY AND HEALTH COMMISSION
FOR THE MINING
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Common Statistics on victims
of accidents underground in coal mines

DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

Table 1a

COUNTRY FEDERAL REPUBLIC OF GERMANY *(absolute figures)*

COAL-FIELD

YEAR 1979

MAN-HOURS WORKED (1) 188 721 270

SITE OF THE ACCIDENT	Production faces 1					Headings excluding shafts and staple-pits 2					Shafts and staple-pits 3					Other places 4					Total of accidents underground 5					Group accidents (2) 6		
CAUSES OF ACCIDENTS / Period of incapacity	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	56 days (3)	Fatal accidents	total
I FALLS OF GROUNDS AND ROCKS	1 433	917	363	5	2 718	1 205	636	255	10	2 106	11	6	4	–	21	200	127	40	1	368	2 849	1 686	662	16	5 213	–	–	–
II TRANSPORT, TOTAL	138	122	88	5	353	61	56	37	4	158	31	38	32	3	104	195	251	165	9	620	425	467	322	21	1 235	–	–	–
a) Continuous Transport	47	50	49	3	149	15	16	12	1	44	2	1	2	–	5	14	17	20	2	53	78	84	83	6	251	–	–	–
b) Discontinuous Transport	91	72	39	2	204	46	40	25	3	114	29	37	30	3	99	181	234	145	7	567	347	383	239	15	984	–	–	–
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	1 611	1 214	292	3	3 120	1 118	793	226	2	2 139	161	129	47	5	342	1 258	906	309	3	2 476	4 148	3 042	874	13	8 077	–	–	–
a) while moving about the mine	–	–	–	–	–	–	–	–	–	–	4	2	1	–	7	–	–	–	–	–	4	2	1	–	7	–	–	–
b) in the course of other activities	1 611	1 214	292	3	3 120	1 118	793	226	2	2 139	157	127	46	5	335	1 258	906	309	3	2 476	4 144	3 040	873	13	8 070	–	–	–
IV MACHINES, TOOLS AND SUPPORTS TOTAL	640	526	171	2	1 339	494	305	113	3	915	22	22	6	–	50	276	196	59	1	532	1 432	1 049	349	6	2 836	–	–	–
a) Machines	93	100	51	–	243	73	52	46	2	173	10	8	2	–	20	65	48	23	1	137	240	208	122	3	573	–	–	–
b) Tools	283	142	33	–	458	245	122	35	–	402	7	14	3	–	24	170	105	15	–	290	705	383	86	–	1 174	–	–	–
c) Supports	265	284	87	2	638	176	131	32	1	340	5	–	1	–	6	41	43	21	–	105	487	458	141	3	1 089	–	–	–
V FALLS OF OBJECTS	1 399	848	336	3	2586	760	367	162	4	1 293	72	59	24	1	156	624	406	146	2	1 178	2 855	1 680	668	10	5 213	–	–	–
VI EXPLOSIVES	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–	–	–
VII IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	1	–	1	3	5	–	–	–	4	4	–	–	–	–	–	–	–	–	–	–	1	–	1	7	9	1	7	9
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	1	1	–	–	2	–	–	–	–	–	–	–	–	–	–	4	–	–	–	4	5	1	–	–	6	–	–	–
a) Outbursts of Gas	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
b) De-oxygenation and Poisoning by natural Gases	1	1	–	–	2	–	–	–	–	–	–	–	–	–	–	4	–	–	–	4	5	1	–	–	6	–	–	–
IX HEATINGS OR FIRES	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
X. INRUSHES	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
XI. ELECTRICITY	1	6	1	–	8	–	1	–	–	1	–	–	–	–	–	3	6	–	–	9	4	13	1	–	18	–	–	–
XII OTHER CAUSES	105	53	18	2	178	80	21	6	–	107	6	3	2	–	11	90	28	6	–	124	281	105	32	2	420	–	–	–
TOTAL	5 329	3 687	1 271	23	10310	3 718	2 179	799	27	6 723	303	257	115	9	684	2 650	1 920	725	16	5 311	12 000	8 043	2 910	75	23 028	1	7	9

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks)
(3) Calendar days

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(frequency rates)

Table 1b

COUNTRY FEDERAL REPUBLIC OF GERMANY
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 188 721 270

SITE OF THE ACCIDENT	Production faces 1					Headings excluding shafts and staple-pits 2					Shafts and staple-pits 3					Other places 4					Total of accidents underground 5					Group accidents (2) 6		
CAUSES OF ACCIDENTS / Period of incapacity	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	56 days (3)	Fatal accidents	total
I FALLS OF GROUNDS AND ROCKS	7,59	4,86	1,92	0,03	14,40	6,39	3,37	1,35	0,05	11,16	0,06	0,03	0,02	–	0,11	1,06	0,67	0,21	0,01	1,95	15,10	8,93	3,51	0,08	27,62	–	–	–
II TRANSPORT, TOTAL	0,72	0,65	0,47	0,03	1,87	0,32	0,30	0,20	0,02	0,84	0,16	0,20	0,17	0,02	0,55	1,03	1,33	0,87	0,05	3,29	2,25	2,47	1,71	0,11	6,54	–	–	–
a) Continuous Transport	0,25	0,26	0,26	0,02	0,79	0,08	0,08	0,06	0,01	0,23	0,01	0,01	0,01	–	0,03	0,07	0,09	0,11	0,01	0,28	0,41	0,45	0,44	0,03	1,33	–	–	–
b) Discontinuous Transport	0,48	0,38	0,21	0,01	1,08	0,24	0,21	0,13	0,02	0,60	0,15	0,20	0,16	0,02	0,52	0,96	1,24	0,77	0,04	3,00	1,84	2,03	1,27	0,08	5,21	–	–	–
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	8,54	6,43	1,55	0,02	16,54	5,92	4,20	1,20	0,01	11,33	0,85	0,68	0,25	0,03	1,81	6,67	4,80	1,64	0,02	13,12	21,98	16,12	4,63	0,07	42,80	–	–	–
a) while moving about the mine	–	–	–	–	–	–	–	–	–	–	0,02	0,01	0,01	–	0,04	–	–	–	–	–	0,02	0,01	0,01	–	0,04	–	–	–
b) in the course of other activities	8,54	6,43	1,55	0,02	16,54	5,92	4,20	1,20	0,01	11,33	0,83	0,67	0,24	0,03	1,78	6,67	4,80	1,64	0,02	13,12	21,96	16,11	4,63	0,07	42,76	–	–	–
IV MACHINES, TOOLS AND SUPPORTS TOTAL	3,39	2,79	0,91	0,01	7,10	2,63	1,62	0,60	0,02	4,85	0,12	0,12	0,03	–	0,26	1,46	1,04	0,31	0,01	2,82	7,59	5,56	1,85	0,03	15,03	–	–	–
a) Machines	0,49	0,53	0,27	–	1,29	0,39	0,28	0,24	0,01	0,92	0,05	0,04	0,01	–	0,11	0,34	0,25	0,12	0,01	0,73	1,27	1,10	0,65	0,02	3,04	–	–	–
b) Tools	1,50	0,75	0,17	–	2,43	1,30	0,65	0,19	–	2,13	0,04	0,07	0,02	–	0,13	0,90	0,56	0,08	–	1,54	3,74	2,03	0,46	–	6,22	–	–	–
c) Supports	1,40	1,50	0,46	0,01	3,38	0,93	0,69	0,17	0,01	1,80	0,03	–	0,01	–	0,03	0,22	0,23	0,11	–	0,56	2,58	2,43	0,75	0,02	5,77	–	–	–
V FALLS OF OBJECTS	7,41	4,49	1,78	0,02	13,70	4,03	1,94	0,86	0,02	6,85	0,38	0,31	0,13	0,01	0,83	3,31	2,15	0,77	0,01	6,24	15,13	8,90	3,54	0,05	27,62	–	–	–
VI EXPLOSIVES	–	–	0,01	–	0,01	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0,01	–	0,01	–	–	–
VII IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0,01	–	0,01	0,02	0,03	–	–	–	0,02	0,02	–	–	–	–	–	–	–	–	–	–	0,01	–	0,01	0,04	0,05	0,01	0,04	0,05
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0,01	0,01	–	–	0,01	–	–	–	–	–	–	–	–	–	–	0,02	–	–	–	0,02	0,03	0,01	–	–	0,03	–	–	–
a) Outbursts of Gas	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
b) De-oxygenation and Poisoning by natural Gases	0,01	0,01	–	–	0,01	–	–	–	–	–	–	–	–	–	–	0,02	–	–	–	0,02	0,03	0,01	–	–	0,03	–	–	–
IX HEATINGS OR FIRES	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
X INRUSHES	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
XI ELECTRICITY	0,01	0,03	0,01	–	0,04	–	0,01	–	–	0,01	–	–	–	–	–	0,02	0,03	–	–	0,05	0,02	0,07	0,01	–	0,10	–	–	–
XII OTHER CAUSES	0,56	0,28	0,10	0,01	0,94	0,42	0,11	0,03	–	0,57	0,03	0,02	0,01	–	0,06	0,48	0,15	0,03	–	0,66	1,49	0,56	0,17	0,01	2,23	–	–	–
TOTAL	28,24	19,54	6,72	0,12	54,63	19,70	11,55	4,23	0,14	35,62	1,61	1,36	0,61	0,05	3,62	14,04	10,17	3,84	0,08	28,14	63,59	42,62	15,42	0,40	122,02	0,01	0,04	0,05

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners social insurance scheme
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks).
(3) Calendar days

SAFETY AND HEALTH COMMISSION
FOR THE MINING
AND OTHER EXTRACTIVE INDUSTRIES
Common Statistics on victims
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Table 2a

DETAILED BREAKDOWN OF VICTIMS ACCORDING TO LOCATION AND NATURE OF INJURY AND PERIOD OF INCAPACITY

(absolute figures)

COUNTRY FEDERAL REPUBLIC OF GERMANY

COAL-FIELD

YEAR 1979

MAN-HOURS WORKED (1) 188 721 270

NATURE OF THE INJURY	Amputations and enucleations 1			Fractures with or without dislocation 2			Luxations, twist and sprains 3			Concussion and internal injury 4			Open wounds contusion and muscular abrasions 5			Burns and harmful effects of electricity and radiation 6			Poisoning and suffocation 7			Multiple injuries of those not specified (2) 8			TOTAL 9				
PERIOD OF INCAPACITY	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	4 to 20 days (5)	21 to 56 days (5)	> 56 days (5)	Fatal accidents	total
LOCATION OF THE INJURY																													
I Head and neck	–	–	5	48	17	240	1	1	15	16	3	132	89	1	2 181	1	–	32				–	1	6	1 802	595	155	23	2575
II Eyes	[illegible]	–	6							1	–	3	52	–	636	4	–	65				1	–	20	578	89	63	–	730
III Trunk	–	–	–	125	[illegible]	354	9	–	75	6	5	21	83	3	1 480	1	–	37				–	–	3	1 028	698	224	20	1 970
IV Upper limbs (excluding the hands) (3)	1	–	2	173	1	300	18	–	135				102	1	2 368	5	–	45				–	–	10	1 823	736	299	2	2 860
V Hands	47	–	125	602	–	2695	19	–	151				273	–	5 417	2	–	32				–	–	2	3 768	3 721	943	–	8 432
VI Lower limbs (excluding feet) (4)	1	–	3	318	2	404	103	–	391				226	–	2 474	4	–	27				1	–	3	1 546	1 096	658	2	3 302
VII Feet	10	–	12	286	–	666	83	–	725				152	–	1 499	2	–	14				–	–	–	1 353	1 030	533	–	2 916
VIII Multiple locations	–	1	1	11	11	26	–	8	10	–	5	8	24	3	178	–	–	18				–	–	2	102	78	35	28	243
IX Not specified																–	–	–	–	–	–	–	–	–	–	–	–	–	–
TOTAL	[illegible]	1	[illegible]	1563	43	4049	238	9	1302	23	13	164	1001	8	16233	19	–	270	–	–	–	2	1	46	12 000	8 043	2 910	75	23 028

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miner's social insurance scheme
(2) including complications
(3) The shoulders and the wrists are included under "upper limbs"
(4) The hips and the ankles are included under "Lower limbs"
(5) Calender days

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A.

Comparative table of number of persons incapacitated
by underground accidents for eight weeks or longer
years 1958 - 1979 per '000,000 man-hours
(frequency)

BELGIUM	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
1) Falls of ground	5,911	4,294	4,324	4,071	4,439	4,432	4,417	3,574	3,568	3,850	3,676
2) Haulage and transport	4,132	2,979	2,709	2,770	3,331	3,565	3,419	2,866	3,269	2,960	3,220
3) Movement of personnel	1,354	0,998	1,008	1,062	1,136	1,066	0,961	0,771	0,936	0,903	1,122
4) Machinery, handling of tools and supports	2,804	2,085	2,386	2,097	2,461	2,414	2,310	2,126	2,146	2,265	1,903
5) Falling objects	0,414	0,371	0,354	0,301	0,445	0,547	0,397	0,292	0,349	0,459	0,358
6) Explosives	0,027	0,007	0,032	0,018	-	0,019	0,018	-	0,013	0,056	0,049
7) Explosions of firedamp or coal dust	-	-	-	-	-	-	0,009	0,031	-	-	-
8) Sudden outbursts of firedamp, suffocation by natural gases	0,011	-	-	-	-	-	-	-	0,013	-	-
9) Underground combustion and fires	-	-	-	-	-	-	-	0,021	-	-	-
10) Inrushes of water	-	-	-	-	0,010	-	-	-	-	-	-
11) Electricity	0,011	-	0,016	0,018	0,010	0,009	-	0,010	0,015	-	0,016
12) Other causes	0,260	0,255	0,260	0,301	0,351	0,198	0,268	0,333	0,362	0,278	0,228
TOTAL	14,924	10,989	11,089	10,638	12,161	12,250	11,799	10,024	10,669	10,771	10,572

BELGIUM	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	5,075	4,673	3,989	4,6	4,02	3,99	2,79	2,77	2,55	3,43	3,25
2) Haulage and transport	3,169	3,018	3,365	2,8	3,33	2,43	2,39	2,98	2,21	2,74	2,74
3) Movement of personnel	1,186	1,144	1,496	1,3	1,41	1,70	1,29	1,06	0,93	1,13	1,30
4) Machinery, handling of tools and supports	2,353	1,801	2,469	1,7	2,58	2,18	1,66	1,81	1,55	1,94	1,98
5) Falling objects	1,244	1,242	1,870	1,5	1,44	1,84	1,46	1,63	1,16	1,98	1,98
6) Explosives	-	-	0,025	0,03	-	-	-	0,03	-	-	-
7) Explosions of firedamp or coal dust	0,019	-	-	-	-	-	-	-	-	-	-
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-	-	-	-	-	-	-	-	-	-
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-	-	-
10) Inrushes of water	-	-	0,025	-	-	-	-	-	-	0,00	-
11) Electricity	0,019	-	-	-	0,03	0,03	0,03	-	-	-	-
12) Other causes	0,175	0,195	0,324	0,2	0,36	0,41	0,06	0,17	0,07	0,16	0,25
TOTAL	13,240	12,097	13,563	12,13	13,16	12,61	9,71	10,47	8,49	11,37	11,51

B.

Underground accidents resulting in death within eight weeks

year 1958 - 1979

per '000,000 man-hours

(frequency)

BELGIUM	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Eboulements	0,223	0,213	0,299	0,266	0,246	0,264	0,222	0,239	0,324	0,264	0,179	0,214	0,268	0,100	0,08	0,21	0,06	0,03	0,07	0,03	0,04	0,04
2) Moyens de transport	0,101	0,124	0,157	0,168	0,142	0,245	0,166	0,166	0,187	0,180	0,114	0,097	0,170	0,125	0,18	0,21	0,06	0,16	0,03	0,07	0,16	0,25
3) Circulation du personnel	0,011	0,027	0,008	0,035	0,010	0,057	0,028	0,011	0,025	-	0,033	-	-	0,049	0,03	-	0,03	-	0,07	0,03	-	0,04
4) Machines, maniement d'outilé et de soutènement	0,005	0,014	0,016	0,027	0,047	-	0,018	0,052	0,025	0,028	0,065	-	-	0,025	-	0,03	-	0,09	0,03	0,03	0,04	-
5) Chutes d'objets	0,016	-	0,008	-	0,010	0,019	0,018	-	-	-	0,016	-	-	-	0,03	-	0,03	-	0,03	-		-
6) Explosifs	0,011	0,014	-	-	-	-	-	-	-	-	0,016	-	-	-	-	-	-	-	-	-		-
7) Explosions de grisou et de poussières	-	-	0,016	-	-	-	-	0,011	-	-	-	-	-	-	-	-	-	-	-	-		-
8) Dégagements instantanés, asphyxies par gaz naturels	0,016	0,014	-	-	0,047	-	-	0,041	0,013	-	-	-	-	0,025	0,18	0,06	-	-	-	-		-
9) Feux de mines et incendies	-	0,007	-	-	-	-	-	0,011	-	-	-	-	-	-	-	-	-	-	-	-		-
10) Coups d'eau	0,011	-	-	0,044	0,047	0,019	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-
11) Courant électrique	0,021	-	0,024	-	-	0,009	0,009	0,011	-	0,014	0,033	0,019	0,024	-	-	-	-	-	-	-		-
12) Autres causes	0,005	-	0,008	0,009	0,019	0,028	0,009	-	0,013	0,042	-	-	-	-	0,03	0,03	-	-	-	-	0,04	
TOTAL	0,420	0,413	0,536	0,549	0,568	0,641	0,471	0,542	0,587	0,528	0,456	0,330	0,462	0,324	0,53	0,54	0,20	0,29	0,24	0,183	0,28	0,34

SAFETY AND HEALTH COMMISSION
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Common Statistics on victims
of accidents underground in coal mines

DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

(absolute figures)

Table 1a

COUNTRY BELGIUM
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 23 717 496

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS / Period of incapacity	Production faces 1					Headings excluding shafts and staple-pits 2					Shafts and staple-pits 3					Other places 4					Total of accidents underground 5					Group accidents (2) 6		
	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	56 days (3)	Fatal accidents	total
I FALLS OF GROUNDS AND ROCKS	1574	163	48	o	1785	848	87	23	1	959	37	4	o	o	41	167	17	6	o	19o	2626	271	77	1	2975			
II TRANSPORT, TOTAL	[illegible]	[illegible]	7	1	83	195	5o	17	3	265	57	8	12	o	77	199	47	29	2	277	5o3	128	65	6	7o2			
a) Continuous Transport	[illegible]	18	[illegible]	1	64	47	17	5	1	7o	o	o	o	o	o	5o	9	4	o	63	136	44	15	2	197			
b) Discontinuous Transport	[illegible]	5	1	o	19	148	33	12	2	195	57	8	12	o	77	149	38	25	2	214	367	84	5o	4	5o5			
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	117	17	3	o	137	393	57	13	o	463	74	12	6	1	93	189	25	9	o	223	773	111	31	1	916			
a) while moving about the mine	[illegible]	1	o	o	1o	8o	17	4	o	1o1	11	o	2	o	13	25	8	o	o	33	125	26	6	o	157			
b) in the course of other activities	1o8	[illegible]	[illegible]	o	127	313	4o	9	o	362	63	12	4	1	8o	164	17	9	o	19o	648	85	25	1	759			
IV MACHINES, TOOLS AND SUPPORTS TOTAL	558	[illegible]	[illegible]	o	671	497	82	2o	o	599	49	6	o	o	55	191	21	3	o	215	1295	198	47	o	154o			
a) Machines	52	24	4	o	81	34	7	1	o	42	6	2	o	o	8	11	3	o	o	14	1o4	36	5	o	145			
b) Tools	137	11	4	o	152	157	9	2	o	168	27	2	o	o	29	1o1	7	2	o	11o	422	29	8	o	459			
c) Supports	368	54	16	o	438	3o6	66	17	o	389	16	2	o	o	18	79	11	1	o	91	769	133	34	o	936			
V FALLS OF OBJECTS	468	9o	18	o	576	57o	83	15	o	668	96	7	1	o	1o4	312	31	13	o	356	1446	211	47	o	17o4			
VI EXPLOSIVES	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o			
VII IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o			
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o			
a) Outbursts of Gas	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o			
b) De-oxygenation and Poisoning by natural Gases	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o			
IX HEATINGS OR FIRES	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o			
X INRUSHES	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o			
XI ELECTRICITY	o	o	o	o	o	4	1	o	o	5	o	1	o	o	1	5	o	o	o	5	9	2	o	o	11			
XII OTHER CAUSES	[illegible]	[illegible]	1	o	73	64	6	o	o	7o	11	o	2	o	13	73	2	3	o	78	217	11	6	o	234			
TOTAL	[illegible]	385	1o1	1	3325	2571	366	88	4	3o29	324	33	21	1	384	1136	143	63	2	1344	6869	932	273	8	8o82			

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks)
(3) Calendar days

FOR THE MINING AND OTHER EXTRACTIVE INDUSTRIES

Common Statistics on victims of accidents underground in coal mines

DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

(frequency rates)

Table 1b

COUNTRY BELGIUM

COAL-FIELD

YEAR 1979

MAN-HOURS WORKED (1) 23 717 496

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS (Period of incapacity)	Production face 1					Headings excluding shafts and staple-pits 2					Shafts and staple-pits 3				
	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total
I FALLS OF GROUNDS AND ROCKS	56,4	[illegible]	[illegible]	0,0	75,3	35,8	3,7	1,0	0,0	40,4	1,6	0,2	0,0	0,0	1,7
II TRANSPORT TOTAL	[illegible]	1,0	0,3	0,0	3,5	8,2	2,1	0,7	0,1	11,2	2,4	0,3	0,5	0,0	3,2
a) Continuous Transport	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0,7	[illegible]	0,0	3,0	0,0	0,0	0,0	0,0	0,0
b) Discontinuous Transport	0,5	[illegible]	0,0	0,0	0,8	6,2	1,4	0,5	0,1	8,2	2,4	0,3	0,5	0,0	3,2
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	[illegible]	0,7	0,1	0,0	5,8	16,6	2,4	0,5	0,0	19,5	3,1	0,5	0,3	0,0	3,9
a) while moving about the mine	0,1	0,0	0,0	0,0	[illegible]	3,4	0,7	[illegible]	0,0	4,3	0,5	0,0	0,1	0,0	0,5
b) in the course of other activities	[illegible]	0,7	0,1	0,0	5,4	[illegible]	1,7	0,4	0,0	15,3	[illegible]	0,5	[illegible]	0,0	3,4
IV MACHINES, TOOLS AND SUPPORTS TOTAL	[illegible]	[illegible]	1,0	0,0	[illegible]	21,0	3,5	0,8	0,0	25,3	2,1	0,3	0,0	0,0	2,3
a) Machines	[illegible]	1,0	[illegible]	0,0	[illegible]	1,4	0,3	0,0	0,0	1,8	[illegible]	0,1	0,0	0,0	0,3
b) Tools	[illegible]	[illegible]	[illegible]	0,0	0,4	6,0	0,4	0,1	0,0	7,1	1,1	0,1	0,0	0,0	1,2
c) Supports	[illegible]	[illegible]	[illegible]	0,0	18,5	[illegible]	2,8	0,7	0,0	16,4	0,7	0,1	0,0	0,0	0,8
V FALLS OF OBJECTS	[illegible]	[illegible]	0,3	0,0	24,3	24,0	3,5	0,6	0,0	[illegible]	4,0	0,3	0,0	0,0	4,4
VI EXPLOSIVES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
VII IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
a) Outbursts of Gas	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
b) De-oxygenation and Poisoning by natural Gases	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
IX. HEATINGS OR FIRES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
X INRUSHES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
XI ELECTRICITY	0,0	[illegible]	0,0	0,0	0,0	[illegible]	0,0	0,0	0,0	[illegible]	0,0	0,0	0,0	0,0	0,0
XII OTHER CAUSES	[illegible]	0,1	0,0	0,0	3,1	[illegible]	0,3	0,0	0,0	3,0	0,5	0,0	0,1	0,0	0,5
TOTAL	[illegible]	[illegible]	[illegible]	0,0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13,7	1,0	0,9	0,0	16,2

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS (Period of incapacity)	Other places 4					Total of accidents underground 5					Group accidents (2) 6		
	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	56 days (3)	Fatal accidents	total
I FALLS OF GROUNDS AND ROCKS	7,0	0,7	0,3	0,0	8,0	110,7	11,4	[illegible]	0,0	125,4			
II TRANSPORT TOTAL	8,4	2,0	1,2	0,1	11,7	21,2	5,4	2,7	0,3	29,6			
a) Continuous Transport	2,1	0,4	0,2	0,0	2,7	5,7	1,9	0,6	0,1	8,3			
b) Discontinuous Transport	6,3	1,6	1,1	0,1	9,0	15,5	3,5	2,1	0,2	21,3			
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	8,0	1,1	0,4	0,0	9,4	32,6	4,7	1,3	0,0	38,6			
a) while moving about the mine	1,1	0,3	0,0	0,0	1,4	5,3	1,1	0,3	0,0	6,6			
b) in the course of other activities	6,9	0,7	0,4	0,0	8,0	27,3	3,6	1,1	0,0	32,0			
IV MACHINES, TOOLS AND SUPPORTS TOTAL	8,1	0,9	0,1	0,0	9,1	54,6	8,3	[illegible]	0,0	64,9			
a) Machines	0,5	0,1	0,0	0,0	0,6	4,4	1,5	0,2	0,0	6,1			
b) Tools	4,3	0,3	0,1	0,0	4,6	17,8	1,2	0,3	0,0	19,4			
c) Supports	3,3	0,5	0,0	0,0	3,8	32,4	5,6	1,4	0,0	39,5			
V FALLS OF OBJECTS	13,2	1,3	0,5	0,0	15,0	61,0	8,9	2,0	0,0	71,8			
VI EXPLOSIVES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0			
VII IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0			
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0			
a) Outbursts of Gas	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0			
b) De-oxygenation and Poisoning by natural Gases	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0			
IX. HEATINGS OR FIRES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0			
X INRUSHES	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0.0	0,0			
XI ELECTRICITY	0,2	0,0	0,0	0,0	0,2	0,4	0,1	0,0	0,0	0,5			
XII OTHER CAUSES	3,1	0,1	0,1	0,0	3,3	9,1	0,5	0,3	0,0	9,9			
TOTAL	47,9	6,0	2,7	0,1	56,7	289,6	[illegible]	11,5	0,3	340,8			

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme.
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks)
(3) Calendar days

SAFETY AND HEALTH COMMISSION
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AND OTHER EXTRACTIVE INDUSTRIES
Common Statistics on victims
of accidents underground in coal mines

Table 2a

DETAILED BREAKDOWN OF VICTIMS ACCORDING TO LOCATION AND NATURE OF INJURY AND PERIOD OF INCAPACITY

(absolute figures)

COUNTRY BELGIUM
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 23 717 496

NATURE OF THE INJURY	Amputations and enucleations 1			Fractures with or without dislocation 2			Luxations, twist and sprains 3			Concussion and internal injury 4			Open wounds contusion and muscular abrasions 5			Burns and harmful effects of electricity and radiation 6			Poisoning and suffocation 7			Multiple injuries of those not specified (2) 8			TOTAL 9				
PERIOD OF INCAPACITY	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	4 to 20 days (5)	21 to 56 days (5)	> 56 days (5)	Fatal accidents	total
LOCATION OF THE INJURY																													
I Head and neck	0	0	0	5	1	6	0	0	0	1	0	1	7	0	7	0	0	0				0	0	0			13	1	14
II Eyes	0	0	0							0	0	0	4	0	4	0	0	0				0	0	0			4	0	4
III Trunk	0	0	0	12	1	13	2	0	2	1	1	2	9	0	9	0	0	0				0	1	1			24	3	27
IV Upper limbs (excluding the hands) (3)	0	0	0	22	0	22	0	0	0				15	0	15	0	0	0				0	0	0			37	0	37
V Hands	4	0	4	46	0	46	0	0	0				28	0	28	0	0	0				0	0	0			78	0	78
VI Lower limbs (excluding feet) (4)	0	0	0	38	0	38	3	0	3				38	0	38	0	0	0				0	0	0			79	0	79
VII Feet	2	0	2	14	0	14	0	0	0				16	0	16	0	0	0				1	0	1			33	0	33
VIII Multiple locations	1	0	1	2	1	3	0	0	0	0	0	0	2	0	2	0	0	0				0	3	3			5	4	9
IX Not specified													0	0	0	0	0	0	0	0	0	0	0	0			0	0	0
TOTAL	7	0	7	139	3	142	5	0	5	2	1	3	119	0	119	0	0	0	0	0	0	1	4	5			273	8	281

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miner's social insurance scheme
(2) Including complications
(3) The shoulders and the wrists are included under „Upper limbs"
(4) The hips and the ankles are included under „Lower limbs"
(5) Calendar days

17841

B.

Underground accidents resulting in death within eight weeks

year 1958 - 1979

per '000,000 men-hours

(frequency)

FRANCE	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	0,235	0,192	0,186	0,219	0,167	0,120	0,127	0,164	0,214	0,159	0,177	0,149	0,143	0,117	0,07	0,20	0,11	0,06	0,09	0,09	0,14	0,06
2) Haulage and transport	0,115	0,085	0,082	0,122	0,077	0,121	0,141	0,052	0,126	0,088	0,101	0,186	0,127	0,108	0,08	0,07	0,12	0,07	0,10	0,06	0,05	0,04
3) Movement of personnel	0,007	0,018	0,027	0,008	0,043	0,009	0,009	0,042	0,024	0,016	0,025	0,014	0,016	0,072	0,01	0,01	0,01	0,03	0,03	-	-	0,02
4) Machinery, handling of tools and supports	0,018	0,040	0,016	0,008	0,030	0,009	0,036	0,009	0,015	0,016	0,006	-	0,032	0,027	-	0,02	0,03	-	0,10	-	0,02	0,02
5) Falling objects	0,025	0,007	0,004	0,017	0,030	0,009	0,018	0,019	0,015	0,011	0,031	0,014	0,016	0,045	-	0,04	0,03	0,03	0,03	0,02	0,00	0,02
6) Explosives	-	0,026	-	-	-	0,005	0,005	0,009	0,005	0,005	0,006	-	0,108	0,018	-	-	-	-	0,01	-	0,02	-
7) Explosions of firedamp or coal dust	0,115	0,121	-	-	0,004	-	-	0,155	-	-	0,038	-	0,127	-	-	-	0,58	-	0,23	-	0,00	-
8) Sudden outbursts of firedamp, suffocation by natural gases	0,043	0,026	0,019	0,004	-	0,019	0,009	-	0,005	0,027	0,019	0,007	-	0,072	-	0,01	-	-	-	-	-	-
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,01	-	0,01	-	-	-	-	-
10) Inrushes of water	-	-	-	0,004	-	-	-	0,005	-	0,005	-	-	0,016	-	0,01	-	-	-	-	-	-	-
11) Electricity	-	0,011	0,012	-	0,009	0,024	-	-	0,010	-	-	0,007	-	-	-	-	-	-	-	-	-	-
12) Other causes	0,036	0,029	0,008	-	0,009	0,014	0,014	-	0,005	0,005	-	0,007	-	0,009	0,03	-	-	-	-	0,02	-	0,02
TOTAL	0,594	0,555	0,354	0,382	0,369	0,330	0,359	0,455	0,419	0,332	0,403	0,384	0,484	0,468	0,21	0,37	0,89	0,18	0,60	0,19	0,23	0,15

SAFETY AND HEALTH COMMISSION
FOR THE MINING
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Common Statistics on victims
of accidents underground in coal mines

DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

(absolute figures)

Table 1a

COUNTRY FRANCE

COAL-FIELD

YEAR 1979

MAN-HOURS WORKED (1) 54 060 839

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS — Period of incapacity	Production faces 1					Headings excluding shafts and staple-pits 2					Shafts and staple-pits 3					Other places 4					Total of accidents underground 5					Group accidents (2) 6		
	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal acci-dents	total	56 days (3)	Fatal acci-dents	total
I FALLS OF GROUNDS AND ROCKS	1054	477	174	3	1708	400	173	66	0	639	1	0	0	0	1	154	63	23	0	240	1609	713	263	3	2588	0	0	0
II TRANSPORT, TOTAL	82	63	29	0	174	51	51	22	0	124	9	9	6	0	24	214	163	88	2	467	357	285	145	2	789	0	0	0
a) Continuous Transport	41	27	18	0	86	20	19	5	0	44	0	2	0	0	2	27	17	18	2	64	88	65	41	2	196	0	0	0
b) Discontinuous Transport	41	36	11	0	88	31	32	17	0	80	9	7	6	0	22	187	146	70	0	403	269	220	104	0	593	0	0	0
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	902	478	114	1	1495	333	196	62	0	591	29	14	6	0	49	822	565	161	0	1548	2086	1253	343	1	3683	0	0	0
a) while moving about the mine	264	142	44	0	450	141	74	25	0	240	16	8	4	0	28	461	291	87	0	839	882	515	160	0	1557	0	0	0
b) in the course of other activities	638	336	70	1	1045	192	122	37	0	351	13	6	2	0	21	361	274	74	0	709	1204	738	183	1	2126	0	0	0
IV MACHINES, TOOLS AND SUPPORTS TOTAL	695	349	91	1	1136	306	132	42	0	480	9	4	1	0	14	380	168	40	0	588	1390	653	174	1	2218	0	0	0
a) Machines	45	31	19	0	95	43	22	17	0	82	1	0	0	0	1	30	17	13	0	60	119	70	49	0	238	0	0	0
b) Tools	320	127	32	0	479	143	48	15	0	206	5	3	0	0	8	229	91	14	0	334	697	269	61	0	1027	0	0	0
c) Supports	330	191	40	1	562	120	62	10	0	192	3	1	1	0	5	121	60	13	0	194	574	314	64	1	953	0	0	0
V FALLS OF OBJECTS	542	281	79	0	902	238	119	36	0	393	22	13	2	0	37	547	328	111	0	986	1349	741	228	0	2318	0	0	0
VI EXPLOSIVES	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0
VII IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	1	1	0	0	2	0	0	0
a) Outbursts of Gas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b) De-oxygenation and Poisoning by natural Gases	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	1	1	0	0	2	0	0	0
IX HEATINGS OR FIRES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X INRUSHES	8	4	1	0	13	0	0	0	0	0	0	0	0	0	0	1	2	1	0	4	9	6	2	0	17	0	0	0
XI ELECTRICITY	1	1	0	0	2	1	0	0	0	1	0	0	0	0	0	1	2	0	0	3	3	3	0	0	6	0	0	0
XII OTHER CAUSES	263	48	14	0	325	139	22	8	0	169	12	3	3	0	18	237	74	17	1	329	651	147	42	1	841	0	0	0
TOTAL	3547	1702	502	5	5756	1470	693	236	0	2399	82	43	18	0	143	2357	1366	441	3	4167	7457	3803	1197	8	12465	0	0	0

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks)
(3) Calendar days

SAFETY AND HEALTH COMMISSION
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Common Statistics on victims
of accidents underground in coal mines

DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

(frequency rates)

Table 1b

COUNTRY FRANCE
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 54 060 839

SITE OF THE ACCIDENT	Production faces 1					Headings excluding shafts and staple-pits 2					Shafts and staple-pits 3					Other places 4					Total of accidents underground 5					Group accidents (2) 6		
CAUSES OF ACCIDENTS / Period of incapacity	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	56 days (3)	Fatal accidents	total
I FALLS OF GROUNDS AND ROCKS	19,50	8,82	3,22	0,06	31,59	7,40	3,20	1,22	0,00	11,82	0,02	0,00	0,00	0,00	0,02	2,85	1,17	0,43	0,00	4,44	29,76	13,19	4,86	0,06	48,06	0,00	0,00	0,00
II TRANSPORT TOTAL	1,52	1,17	0,54	0,00	5,11	0,94	0,94	0,41	0,00	2,29	0,17	0,17	0,11	0,00	0,44	3,96	3,02	1,63	0,04	8,64	6,60	5,27	2,68	0,04	14,59	0,00	0,00	0,00
a) Continuous Transport	0,76	0,50	0,53	0,00	1,79	0,37	0,35	0,09	0,00	0,81	0,00	0,04	0,00	0,00	0,04	0,50	0,31	0,35	0,04	1,18	1,63	1,20	0,76	0,04	3,63	0,00	0,00	0,00
b) Discontinuous Transport	0,76	0,67	0,20	0,00	1,63	0,57	0,59	0,31	0,00	1,48	0,17	0,13	0,11	0,00	0,41	3,46	2,70	1,29	0,00	7,45	4,98	4,07	1,92	0,00	10,97	0,00	0,00	0,00
III FALLS AND MOVEMENT OF THE VICTIM, TOTAL	16,68	8,84	2,11	0,02	27,65	6,16	3,63	1,15	0,00	10,93	0,54	0,26	0,11	0,00	0,91	15,21	10,45	2,98	0,00	28,63	38,59	23,18	6,34	0,02	68,13	0,00	0,00	0,00
a) while moving about the mine	4,88	2,63	0,81	0,00	8,32	2,61	1,37	0,46	0,00	4,44	0,30	0,15	0,07	0,00	0,52	8,53	5,38	1,61	0,00	15,52	16,31	9,53	2,96	0,00	28,80	0,00	0,00	0,00
b) in the course of other activities	11,80	6,22	1,29	0,02	19,33	3,55	2,26	0,68	0,00	6,49	0,24	0,11	0,04	0,00	0,39	6,68	5,07	1,37	0,00	13,11	22,27	13,65	3,39	0,02	39,33	0,00	0,00	0,00
IV MACHINES, TOOLS AND SUPPORTS TOTAL	12,38	6,46	1,68	0,02	21,01	5,66	2,44	0,80	0,00	8,88	0,17	0,07	0,02	0,00	0,26	7,03	3,11	0,74	0,00	10,88	25,71	12,08	3,22	0,02	41,03	0,00	0,00	0,00
a) Machines	0,33	0,57	0,35	0,00	1,76	0,80	0,41	0,31	0,00	1,52	0,02	0,00	0,00	0,00	0,02	0,55	0,31	0,24	0,00	1,11	2,20	1,29	0,91	0,00	4,40	0,00	0,00	0,00
b) Tools	5,92	2,35	0,59	0,00	8,86	2,65	0,89	0,28	0,00	3,81	0,09	0,06	0,00	0,00	0,15	4,24	1,68	0,26	0,00	6,18	12,89	4,98	1,13	0,00	19,00	0,00	0,00	0,00
c) Supports	6,10	3,53	0,74	0,02	10,40	2,22	1,15	0,18	0,00	3,55	0,06	0,02	0,02	0,00	0,09	2,24	1,11	0,24	0,00	3,59	10,62	5,81	1,18	0,02	17,63	0,00	0,00	0,00
V FALLS OF OBJECTS	10,03	5,20	1,46	0,00	16,68	4,40	2,20	0,67	0,00	7,27	0,41	0,24	0,04	0,00	0,68	10,12	6,07	2,05	0,00	18,24	24,95	13,71	4,22	0,00	42,88	0,00	0,00	0,00
VI EXPLOSIVES	0,00	0,02	0,00	0,00	0,02	0,02	0,00	0,00	0,00	0,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,02	0,00	0,00	0,04	0,00	0,00	0,00
VII IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0,00	0,00	0,00	0,00	0,00	0,02	0,00	0,00	0,00	0,02	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,00	0,00	0,00	0,02	0,00	0,00	0,00
VIII OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S). TOTAL	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,02	0,00	0,00	0,04	0,02	0,02	0,00	0,00	0,04	0,00	0,00	0,00
a) Outbursts of Gas	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
b) De-oxygenation and Poisoning by natural Gases	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,02	0,00	0,00	0,04	0,02	0,02	0,00	0,00	0,04	0,00	0,00	0,00
IX. HEATINGS OR FIRES	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
X. INRUSHES	0,15	0,07	0,02	0,00	0,24	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,02	0,04	0,02	0,00	0,07	0,17	0,11	0,04	0,00	0,31	0,00	0,00	0,00
XI ELECTRICITY	0,02	0,02	0,00	0,00	0,04	0,02	0,00	0,00	0,00	0,02	0,00	0,00	0,00	0,00	0,00	0,02	0,04	0,00	0,00	0,06	0,06	0,06	0,00	0,00	0,11	0,00	0,00	0,00
XII. OTHER CAUSES	4,86	0,89	0,26	0,00	6,01	2,57	0,41	0,15	0,00	3,13	0,22	0,06	0,05	0,00	0,33	4,01	1,37	0,31	0,02	6,09	12,04	2,72	0,78	0,02	15,56	0,00	0,00	0,00
TOTAL	65,61	31,48	9,29	0,09	108,36	27,19	12,82	4,38	0,00	44,38	1,52	0,80	0,33	0,00	2,65	43,23	25,27	8,16	0,06	77,08	137,94	70,35	22,14	0,15	230,76	0,00	0,00	0,00

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme.
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks)
(3) Calendar days

SAFETY AND HEALTH COMMISSION
FOR THE MINING
AND OTHER EXTRACTIVE INDUSTRIES
Common Statistics on victims
of accidents underground in coal mines

Table 2a

DETAILED BREAKDOWN OF VICTIMS ACCORDING TO LOCATION AND NATURE OF INJURY AND PERIOD OF INCAPACITY

(absolute figures)

COUNTRY FRANCE
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 54 060 839

NATURE OF THE INJURY	Amputations and enucleations 1			Fractures with or without dislocation 2			Luxations, twist and sprains 3			Concussion and internal injury 4		
PERIOD OF INCAPACITY	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total
LOCATION OF THE INJURY												
I Head and neck	0,00	0,00	0,00	0,30	0,04	0,33	0,04	0,00	0,04	0,26	0,00	0,26
II Eyes	0,00	0,00	0,00							0,00	0,00	0,00
III Trunk	0,00	0,00	0,00	0,57	0,00	0,57	0,76	0,00	0,76	0,26	0,00	0,26
IV Upper limbs (excluding the hands) (3)	0,07	0,00	0,07	0,91	0,00	0,91	0,13	0,00	0,13			
V Hands	0,30	0,00	0,30	[illegible]	0,00	[illegible]	0,04	0,00	0,04			
VI Lower limbs (excluding feet) (4)	0,04	0,00	0,04	[illegible]	0,00	[illegible]	1,05	0,00	1,05			
VII Feet	0,02	0,00	0,02	1,55	0,00	1,55	0,17	0,00	0,17			
VIII Multiple locations	0,02	0,00	0,02	0,55	0,02	0,57	0,02	0,00	0,02	0,24	0,00	0,24
IX Not specified												
TOTAL	0,41	0,00	0,41	[illegible]	0,00	[illegible]	[illegible]	0,00	[illegible]	0,70	0,00	0,70

NATURE OF THE INJURY	Open wounds contusion and muscular abrasions 5			Burns and harmful effects of electricity and radiation 6			Poisoning and suffocation 7			Multiple injuries of those not specified (2) 8			TOTAL 9				
PERIOD OF INCAPACITY	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	4 to 20 days (5)	21 to 56 days (5)	> 56 days (5)	Fatal accidents	total
LOCATION OF THE INJURY																	
I Head and neck	0,55	0,00	0,55	0	0	0				4	0	4	667	222	65	[illegible]	1056
II Eyes	0,15	0,00	0,15	0	0	0				1	0	1	668	44	11	0	[illegible]
III Trunk	0,92	0,00	0,92	0	0	0				7	0	7	1022	698	143	1	1864
IV Upper limbs (excluding the hands) (3)	1,13	0,00	1,13	0	0	0				4	0	4	943	314	123	1	1381
V Hands	2,18	0,00	2,18	1	0	1				6	0	6	2044	1344	343	0	3731
VI Lower limbs (excluding feet) (4)	2,33	0,00	2,33	0	0	0				8	0	8	1150	568	305	0	2023
VII Feet	0,72	0,00	0,72	0	0	0				2	0	2	628	402	137	0	1167
VIII Multiple locations	0,54	0,02	0,55	0	0	0				7	0	7	274	179	70	1	524
IX Not specified	0,00	0,00	0,00	0	0	0	0	1	1	0	1	1	[illegible]	31	[illegible]	[illegible]	[illegible]
TOTAL	8,53	0,02	8,55	1	0	1	0	1	1	39	1	40	7458	3802	1198	8	12505

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miner's social insurance scheme.
(2) Including complications.
(3) The shoulders and the wrists are included under "upper limbs".
(4) The hips and the ankles are included under "Lower limbs".
(5) Calendar days.

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A.

Comparative table of number of persons incapacitated
by underground accidents for eight weeks or longer
years 1958 - 1979 per '000,000 man-hours
(frequency)

UNITED KINGDOM	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground																				1,05	1,02	0,82
2) Haulage and transport																				1,69	1,53	1,33
3) Movement of personnel																				2,03	1,72	1,38
4) Machinery, handling of tools and supports																				1,09	1,02	0,72
5) Falling objects																				0,92	0,82	0,55
6) Explosives																				0,01	0,01	0,01
7) Explosions of firedamp or coal dust																				-	-	0,00
8) Sudden outbursts of firedamp, suffocation by natural gases																				-	-	-
9) Underground combustion and fires																				-	-	-
10) Inrushes of water																				-	-	-
11) Electricity																				-	-	0,00
12) Other causes																				1,03	0,92	0,69
TOTAL																				7,75	7,07	5,54

Not available following the system of classification used in the Community of Six (1958–1976)

B.

Underground accidents resulting in death within eight weeks

year 1958 - 1979

per '000,000 man-hours

(frequency)

UNITED KINGDOM	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground																				0,02	0,03	0,01
2) Haulage and transport																				0,07	0,12	0,06
3) Movement of personnel																				-	-	0,00
4) Machinery, handling of tools and supports																				-	-	0,00
5) Falling objects	*Not available following the system of classification used in the Community of Six*																			-	-	0,01
6) Explosives																				-	-	–
7) Explosions of firedamp or coal dust																				-	-	0,03
8) Sudden outbursts of firedamp, suffocation by natural gases																				-	-	–
9) Underground combustion and fires																				-	-	–
10) Inrushes of water																				-	-	–
11) Electricity																				-	-	–
12) Other causes																				-	-	0,00
TOTAL																				0,11	0,15	0,13

SAFETY AND HEALTH COMMISSION
FOR THE MINING
AND OTHER EXTRACTIVE INDUSTRIES

Common Statistics on victims
of accidents underground in coal mines

DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

(absolute figures)

Table 1a

COUNTRY UNITED KINGDOM
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 290 633 581

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS (Period of incapacity)	Production faces 1: 4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	Headings excluding shafts and staple-pits 2: 4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total
I. FALLS OF GROUNDS AND ROCKS	2423	745	153	2	3323	620	200	55	2	877
II. TRANSPORT, TOTAL	872	306	104	4	1286	259	96	21	0	376
a) Continuous Transport	57	36	18	1	112	17	9	4	0	30
b) Discontinuous Transport	815	270	86	3	1174	242	87	17	0	346
III. FALLS AND MOVEMENT OF THE VICTIM, TOTAL	942	285	50	0	1277	612	190	38	0	840
a) while moving about the mine	248	74	6	0	328	153	48	8	0	209
b) in the course of other activities	694	211	44	0	949	459	142	30	0	631
IV. MACHINES, TOOLS AND SUPPORTS TOTAL	1700	457	111	1	2269	618	150	18	0	786
a) Machines	327	74	29	1	431	45	16	0	0	61
b) Tools	130	37	13	0	180	70	17	3	0	90
c) Supports	1243	346	69	0	1658	503	117	15	0	635
V. FALLS OF OBJECTS	1266	382	65	1	1714	294	122	22	0	438
VI. EXPLOSIVES	18	7	0	0	25	4	1	1	0	6
VII. IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0	0	0	0	0	0	0	0	0	0
VIII. OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0	0	0	0	0	0	0	0	0	0
a) Outbursts of Gas	0	0	0	0	0	0	0	0	0	0
b) De-oxygenation and Poisoning by natural Gases	0	0	0	0	0	0	0	0	0	0
IX. HEATINGS OR FIRES	1	0	0	0	1	0	0	0	0	0
X. INRUSHES	0	0	0	0	0	0	0	0	0	0
XI. ELECTRICITY	0	0	0	0	0	0	0	0	0	0
XII. OTHER CAUSES	803	242	42	2	1089	427	118	19	0	564
TOTAL	8025	2424	525	10	10984	2834	877	174	2	3887

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS (Period of incapacity)	Shafts and staple-pits 3: 4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	Other places 4: 4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total
I. FALLS OF GROUNDS AND ROCKS	0	0	0	0	0	579	173	33	1	786
II. TRANSPORT, TOTAL	22	9	1	0	32	2419	805	261	14	3499
a) Continuous Transport	0	0	0	0	0	150	60	25	3	238
b) Discontinuous Transport	22	9	1	0	32	2269	745	236	11	3261
III. FALLS AND MOVEMENT OF THE VICTIM, TOTAL	0	0	0	0	0	5177	1590	315	1	7083
a) while moving about the mine	0	0	0	0	0	2567	782	175	0	3524
b) in the course of other activities	0	0	0	0	0	2610	808	140	1	3559
IV. MACHINES, TOOLS AND SUPPORTS TOTAL	11	2	1	0	14	1808	510	80	0	2398
a) Machines	3	1	1	0	5	140	40	6	0	186
b) Tools	3	1	0	0	4	398	118	21	0	537
c) Supports	5	0	0	0	5	1270	352	53	0	1675
V. FALLS OF OBJECTS	7	3	0	1	11	1246	425	74	1	1746
VI. EXPLOSIVES	0	0	0	0	0	24	7	3	0	34
VII. IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0	0	0	0	0	0	0	1	10	11
VIII. OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0	0	0	0	0	0	0	0	0	0
a) Outbursts of Gas	0	0	0	0	0	0	0	0	0	0
b) De-oxygenation and Poisoning by natural Gases	0	0	0	0	0	0	0	0	0	0
IX. HEATINGS OR FIRES	0	0	0	0	0	2	2	0	0	4
X. INRUSHES	0	0	0	0	0	0	0	0	0	0
XI. ELECTRICITY	0	0	0	0	0	1	5	2	0	8
XII. OTHER CAUSES	14	11	4	0	29	2548	799	138	0	3485
TOTAL	54	25	6	1	86	13804	4316	907	27	19054

SITE OF THE ACCIDENT / CAUSES OF ACCIDENTS (Period of incapacity)	Total of accidents underground 5: 4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	Group accidents (2) 6: 56 days (3)	Fatal accidents	total
I. FALLS OF GROUNDS AND ROCKS	3622	1118	241	5	4986			
II. TRANSPORT, TOTAL	3572	1216	387	18	5193			
a) Continuous Transport	224	105	47	4	380			
b) Discontinuous Transport	3348	1111	340	14	4813			
III. FALLS AND MOVEMENT OF THE VICTIM, TOTAL	6731	2065	403	1	9200			
a) while moving about the mine	2968	904	189	0	4061			
b) in the course of other activities	3763	1161	214	1	5139			
IV. MACHINES, TOOLS AND SUPPORTS TOTAL	4137	1119	210	1	5467			
a) Machines	515	131	36	1	683			
b) Tools	601	173	37	0	811			
c) Supports	3021	815	137	0	3973			
V. FALLS OF OBJECTS	2813	932	161	3	3909			
VI. EXPLOSIVES	46	15	4	0	65			
VII. IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	0	0	1	10	11			
VIII. OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	0	0	0	0	0			
a) Outbursts of Gas	0	0	0	0	0			
b) De-oxygenation and Poisoning by natural Gases	0	0	0	0	0			
IX. HEATINGS OR FIRES	3	2	0	0	5			
X. INRUSHES	0	0	0	0	0			
XI. ELECTRICITY	1	5	2	0	8			
XII. OTHER CAUSES	3792	1170	203	2	5167			
TOTAL	24717	7642	1612	40	34011			

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme.
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks)
(3) Calendar days

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DETAILED BREAKDOWN OF ACCIDENT VICTIMS ACCORDING TO CAUSE AND SITE OF ACCIDENT AND PERIOD OF INCAPACITY

(frequency rates)

Table 1b

COUNTRY UNITED KINGDOM
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 290 633 581

SITE OF THE ACCIDENT	Production faces 1					Headings excluding shafts and staple-pits 2					Shafts and staple-pits 3					Other places 4					Total of accidents underground 5					Group accidents (2) 6		
CAUSES OF ACCIDENTS / Period of incapacity	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	4 to 20 days (3)	21 to 56 days (3)	> 56 days (3)	Fatal accidents	total	56 days (3)	Fatal accidents	total
I. FALLS OF GROUNDS AND ROCKS	8,33	2,56	0,52	0,00	11,43	2,13	0,68	0,18	0,00	3,01	–	–	–	–	–	1,99	0,59	0,11	0,00	2,70	12,45	3,84	0,82	0,01	17,15			
II. TRANSPORT, TOTAL	2,99	1,05	0,35	0,01	4,42	0,89	0,33	0,07	–	1,29	0,07	0,03	0,00	–	0,11	8,32	2,76	0,89	0,04	12,03	12,28	4,18	1,33	0,06	17,86			
a) Continuous Transport	0,19	0,12	0,06	0,00	0,38	0,05	0,03	0,01	–	0,10	–	–	–	–	–	0,51	0,20	0,08	0,01	0,81	0,77	0,36	0,16	0,01	1,30			
b) Discontinuous Transport	2,80	0,92	0,29	0,01	4,03	0,83	0,29	0,05	–	1,19	0,07	0,03	0,00	–	0,11	7,80	2,56	0,81	0,03	11,21	11,51	3,82	1,16	0,04	16,55			
III. FALLS AND MOVEMENT OF THE VICTIM, TOTAL	3,24	0,98	0,17	–	4,39	2,10	0,65	0,13	–	2,88	–	–	–	–	–	17,80	5,46	1,08	0,00	24,36	23,15	7,10	1,38	0,00	31,64			
a) while moving about the mine	0,85	0,25	0,02	–	1,12	0,52	0,16	0,02	–	0,71	–	–	–	–	–	8,83	2,69	0,60	–	12,12	10,20	3,10	0,65	–	13,96			
b) in the course of other activities	2,38	0,72	0,15	–	3,26	1,57	0,48	0,10	–	2,17	–	–	–	–	–	8,97	2,77	0,48	0,00	12,24	12,94	3,99	0,73	0,00	17,67			
IV. MACHINES, TOOLS AND SUPPORTS TOTAL	5,84	1,57	0,38	0,00	7,80	2,12	0,51	0,06	–	2,70	0,03	0,00	0,00	0,00	0,04	6,21	1,75	0,27	–	8,24	14,23	3,84	0,72	0,00	18,80			
a) Machines	1,12	0,25	0,09	0,00	1,48	0,15	0,05	–	–	0,20	0,01	0,00	0,00	–	0,01	0,48	0,13	0,02	–	0,63	1,77	0,45	0,12	0,00	2,34			
b) Tools	0,44	0,12	0,04	–	0,61	0,24	0,05	0,01	–	0,30	0,01	0,00	–	–	0,01	1,36	0,40	0,07	–	1,84	2,06	0,59	0,12	–	2,78			
c) Supports	4,27	1,19	0,23	–	5,70	1,73	0,40	0,05	–	2,18	0,01	0,00	–	–	0,01	4,36	1,21	0,18	–	5,76	10,39	2,80	0,47	–	13,66			
V. FALLS OF OBJECTS	4,35	1,31	0,22	0,00	5,89	1,01	0,41	0,07	–	1,50	0,02	0,01	–	0,00	0,03	4,28	1,46	0,25	0,00	6,00	9,67	3,20	0,55	0,01	13,44			
VI. EXPLOSIVES	0,06	0,02	–	–	0,08	0,01	0,00	0,00	–	0,02	–	–	–	–	–	0,08	0,02	0,01	–	0,11	0,15	0,05	0,01	–	0,22			
VII. IGNITIONS OR EXPLOSIONS OF FIREDAMP AND COAL DUST	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0,03	0,03	–	–	–	0,03	0,03			
VIII. OUTBURSTS OF GAS, DE-OXYGENATION, SUFFOCATION OR POISONING BY NATURAL GASES (CO_2, CH_4, CO, H_2S), TOTAL	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
a) Outbursts of Gas	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
b) De-oxygenation and Poisoning by natural Gases	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
IX. HEATINGS OR FIRES	0,00	–	–	–	0,00	–	–	–	–	–	–	–	–	–	–	0,00	0,00	0,00	–	0,01	0,01	0,00	0,00	–	0,01			
X. INRUSHES	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–			
XI. ELECTRICITY	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0,00	0,01	0,00	–	0,02	0,00	0,01	0,00	–	0,02			
XII. OTHER CAUSES	2,76	0,83	0,14	0,00	3,74	1,46	0,40	0,06	–	1,94	0,04	0,03	0,01	–	0,09	8,76	2,74	0,47	–	11,98	13,04	4,02	0,69	0,00	17,77			
TOTAL	27,60	8,33	1,80	0,03	37,78	9,74	3,01	0,59	0,00	13,37	0,18	0,08	0,02	0,00	0,29	47,48	14,84	3,12	0,09	65,54	85,02	26,28	5,54	0,13	116,99			

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miners' social insurance scheme.
(2) Accidents involving more than five casualties (i.e. who either died or were unable to resume work underground for at least eight weeks).
(3) Calendar days.

SAFETY AND HEALTH COMMISSION
FOR THE MINING
AND OTHER EXTRACTIVE INDUSTRIES
Common Statistics on victims
of accidents underground in coal mines

Table 2a

DETAILED BREAKDOWN OF VICTIMS ACCORDING TO LOCATION AND NATURE OF INJURY AND PERIOD OF INCAPACITY

(absolute figures)

COUNTRY UNITED KINGDOM
COAL-FIELD

YEAR 1979
MAN-HOURS WORKED (1) 290 633 581

NATURE OF THE INJURY	Amputations and enucleations 1			Fractures with or without dislocation 2			Luxations, twist and sprains 3			Concussion and internal injury 4			Open wounds contusion and muscular abrasions 5			Burns and harmful effects of electricity and radiation 6			Poisoning and suffocation 7			Multiple injuries of those not specified (3) 8			TOTAL 9				
PERIOD OF INCAPACITY / LOCATION OF THE INJURY	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	> 56 days (5)	Fatal accidents	total	4 to 20 days (5)	21 to 56 days (5)	> 56 days (5)	Fatal accidents	total
I. Head and neck	–	–	–	4	4	31	9	–	170	–	–	–	44	3	1595	–	–	1				–	3	10	1455	285	57	10	1807
II. Eyes	–	–	–							–	–	–	16	–	469	–	–	5				15	–	586	908	121	31	–	1060
III. Trunk	–	–	1	24	–	64	208	–	5633	–	–	–	80	1	2114	–	–	6				–	2	5	5756	1752	312	3	7823
IV. Upper limbs (excluding the hands) (3)	–	–	–	49	–	125	28	–	685				49	–	1799	1	–	18				–	–	12	1989	523	127	–	2639
V. Hands	35	–	94	40	–	454	12	–	235				269	–	7421	1	–	12				1	–	33	5684	2207	358	–	8249
VI. Lower limbs (excluding feet) (4)	3	–	4	122	2	225	154	–	3206				157	–	3940	–	–	14				–	–	12	5400	1563	436	2	7401
VII. Feet	2	–	4	40	–	167	–	–	181				82	–	1946	–	–	4				–	–	4	1615	567	124	–	2306
VIII. Multiple locations	–	–	2	28	1	55	38	–	765	–	–	–	90	3	1683	1	–	11				2	1	4	1771	585	159	5	2520
IX. Not specified																1	–	28	–	–	2	7	20	176	139	39	8	20	206
TOTAL	40	–	105	307	7	1121	449	–	10875	–	–	–		7	20967	4	–	99	–	–	2	25	26	842	24717	7642	1612	40	34011

(1) Number of hours worked by pit staff and employees of contractor firms who belong to a miner's social insurance scheme.
(2) including complications
(3) The shoulders and the wrists are included under „upper limbs"
(4) The hips and the ankles are included under „Lower limbs"
(5) Calendar days

17841

A.

Comparative table of number of persons incapacitated
by underground accidents for eight weeks or longer
years 1958 - 1979 per '000,000 man-hours
(frequency)

ITALY	1958	1959	1960	1961	1962	1963	1964	1965	1966
1) Falls of ground	1,355	1,378	1,808	-	0,792	0,366	0,893	5,572	6,360
2) Haulage and transport	1,335	0,984	1,205	0,676	1,847	1,465	1,787	-	0,707
3) Movement of personnel	0,668	0,394	1,005	1,578	1,056	0,732	1,787	-	0,707
4) Machinery, handling of tools and supports	1,169	0,984	0,603	0,902	1,584	1,465	3,127	7,164	7,067
5) Falling objects	1,169	1,698	1,808	2,029	2,375	3,296	3,574	0,796	-
6) Explosives	0,167	-	-	0,225	-	0,366	-	-	-
7) Explosions of firedamp or coal dust	-	-	-	-	-	-	-	-	-
8) Sudden outburst of firedamp, suffocation by natural gases	-	-	-	-	-	-	-	-	-
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-
10) Inrushes of water	-	-	-	-	-	-	-	-	-
11) Electricity	-	-	-	-	-	-	-	-	-
12) Other causes	0,334	0,591	0,603	0,451	-	-	-	1,592	3,360
TOTAL	6,197	6,299	7,032	5,861	7,654	7,690	11,168	15,124	18,201

ITALY	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	5,580	0,182	3,656	-	5,958	2,20	-	-	-				
2) Haulage and transport	0,797	0,812	-	-	3,404	-	-	-	-				
3) Movement of personnel	1,594	0,812	1,462	-	1,702	-	3,25	-	-				
4) Machinery, handling of tools and supports	13,552	7,304	8,043	6,896	2,553	-	-	-	4,00				
5) Falling objects	6,377	6,493	3,656	-	1,702	-	-	1,64	-		*Production*		
6) Explosives	-	-	-	-	-	-	-	-	-		*stopped*		
7) Explosions of firedamp or coal dust	-	-	-	-	-	-	-	-	-				
8) Sudden outburst of firedamp, suffocation by natural gases	-	-	-	-	-	-	-	-	-				
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-				
10) Inrushes of water	-	-	-	-	-	-	-	-	-				
11) Electricity	-	-	-	-	-	-	-	-	-				
12) Other causes	3,189	0,812	-	5,172	0,851	-	-	-	-				
TOTAL	31,089	17,043	16,817	12,068	16,170	2,20	3,25	1,64	4,00				

B.

Underground accidents resulting in death within eight weeks

year 1958 - 1979

per '000,000 man-hours

(frequency)

ITALY	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	0,167	-	0,201	0,225	-	0,366	-	-	-	-	-	-	-	-	2,20							
2) Haulage and transport	-	0,197	-	-	-	-	-	-	-	0,797	-	-	-	-	-							
3) Movement of personnel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
4) Machinery, handling of tools and supports	-	-	-	-	-	-	-	-	-	0,797	-	-	-	-	-							
5) Falling objects	-	0,197	-	-	-	-	-	-	-	-	-	-	-	-	-							
6) Explosives	0,501	-	-	-	-	-	-	-	-	-	-	-	-	-	-				Production stopped			
7) Explosions of firedamp or coal dust	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
8) Sudden outbursts of firedamp, suffocation by natural gases	0,167	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
10) Inrushes of water	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
11) Electricity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
12) Other causes	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
TOTAL	0,835	0,394	0,201	0,226	-	0,366	-	-	-	1,594	-	-	-	-	2 20							

A.

Comparative table of number of persons incapacitated
by underground accidents for eight weeks or longer
years 1958 - 1979 per '000,000 man-hours
(frequency)

NETHERLANDS	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	1,326	1,464	1,305	1,829	2,238	1,742	2,017	1,923	1,688	2,466	2,450	2,737	2,634	2,528	2,06	4,219	1,041					
2) Haulage and transport	1,511	1,562	1,898	1,924	2,590	1,826	1,952	2,808	2,621	1,866	2,407	2,562	2,634	1,820	2,19	2,443	2,603					
3) Movement of personnel	0,324	0,386	0,187	0,514	0,580	0,630	0,472	0,774	0,605	0,766	1,160	1,165	0,905	0,404	1,03	0,888	0,521					
4) Machinery, handling of tools and supports	0,617	0,402	0,780	0,915	1,015	1,050	1,094	1,282	2,066	0,833	1,031	1,689	1,894	3,033	1,81	1,554	4,686	*Production stopped*				
5) Falling objects	0,401	0,515	0,492	0,819	0,642	0,630	0,923	0,862	0,958	0,866	1,590	1,106	0,659	1,213	1,55	0,888	1,562					
6) Explosives	-	-	-	-	-	-	0,021	-	-	-	-	-	-	-	-	-	-					
7) Explosions of firedamp or coal dust	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
10) Inrushes of water	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
11) Electricity	-	-	-	-	0,021	-	0,021	-	-	-	-	-	-	-	-	-	-					
12) Other causes	0,262	0,161	0,390	0,210	0,497	0,147	0,129	0,088	0,353	0,700	0,301	0,116	0,165	0,202	0,52	0,666	-					
TOTAL	4,441	4,490	5,051	6,212	7,583	6,025	6,629	7,737	8,291	7,497	8,939	9,375	8,891	9,201	9,15	10,659	10,413					

B.

Underground accidents resulting in death within eight weeks

year 1958 - 1979

per '000,000 man-hours

(frequency)

NETHERLANDS	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
1) Falls of ground	0,262	0,064	0,034	0,114	0,062	0,084	0,043	0,044	0,050	0,100	0,172	0,058	0,082	0,101	-	-	-					
2) Haulage and transport	0,077	0,145	0,067	0,095	0,062	0,105	0,172	0,177	0,126	-	0,086	-	0,165	-	0,26	-	-					
3) Movement of personnel	-	-	-	-	-	-	-	-	-	-	-	0,058	-	-	-	-	-					
4) Machinery, handling of tools and supports	0,015	0,016	-	-	0,041	-	-	0,022	-	0,067	-	0,117	-	-	-	-	-					
5) Falling objects	-	0,016	-	-	-	-	0,043	-	-	-	0,043	-	-	-	-	-	0,521	*Production stopped*				
6) Explosives	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
7) Explosions of firedamp or coal dust	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
10) Inrushes of water	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
11) Electricity	-	-	-	0,019	-	-	-	-	-	-	-	-	-	-	-	-	-					
12) Other causes	-	-	0,017	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
TOTAL	0,355	0,241	0,119	0,229	0,166	0,189	0,258	0,243	0,176	0,167	0,301	0,233	0,247	0,101	0,26	-	0,521					

ANNEXES

ANNEX I

TERMS OF REFERENCE AND RULES OF PROCEDURE

OF THE MINES SAFETY COMMISSION

Decisions from the Council of Ministers of
9 July 1957, 11 March 1965 and 27 June 1974

COUNCIL OF MINISTERS

DECISION

of 9 July 1957

concerning the terms of reference and rules of procedure of the Mines Safety Commission

Having taken note of the Recommendations adopted by the Conference on Safety in Coalmines and of the proposals submitted by the High Authority in connection with the Conference's final Report, which afford a working basis for the improvement of safety in coalmines, and

having regard to their Decisions at the Council's 36th and 42nd sessions on September 6, 1956 and on May 9 and 10, 1957, setting up the Mines Safety Commission,

THE REPRESENTATIVES OF THE GOVERNMENTS OF THE MEMBER STATES MEETING AT THE SPECIAL COUNCIL OF MINISTERS,

- hereby lay down that the terms of reference of the aforesaid Commission shall be as follows:

1. The Commission shall follow developments regarding safety in coalmines, including those regarding the safety regulations instituted by the public authorities, and assemble the necessary information concerning progress and practical results obtained, more especially in the matter of accident prevention.

   To secure the necessary information, the Commission shall apply to the Governments concerned.

   The Commission shall evaluate the information in its possession and submit to the Governments proposals for the improvement of safety in coalmines.

2. The Commission shall help the High Authority to work out a method of compiling intercomparable accident statistics.

3. The Commission shall ensure the prompt forwarding to the quarters directly concerned (including in particular mines inspectorates and employers' and workers' associations) of relevant information assembled by it.

4. The Commission shall ascertain, by regular contact with the Governments, what action is being taken to implement the proposals of the Conference on Safety in Coalmines, and such proposals as it may itself draw up.

5. The Commission shall propose such study and research as it deems most indicated for the improvement of safety, with notes as to the way in which these can best be effected.

6. The Commission shall facilitate the exchange of information and experience among persons responsible for safety matters, and propose appropriate measures for this purpose (e.g. organization of study sessions, establishment of documentation services).

7. The Commission shall propose appropriate measures for ensuring the necessary liaison among the rescue services of the Community countries.

8. The Commission shall submit annually to the Council of Ministers and the High Authority a Report on its activities and on developments regarding safety in coalmines in the different member States. In this connection, it shall in particular examine the statistics compiled on accidents and incidents in coalmines.

- The Representatives of the Governments further lay down that the rules of procedure of the Commission shall be those set forth in the Annex to the present Decision.

- The Representatives of the Governments trust that the High Authority will arrange for the Commission to start work at the earliest possible moment.

This Decision was adopted by the Council at its forty-fourth session, on July 9, 1957.

For the Council,

J. REY

President.

RULES OF PROCEDURE

of the Mines Safety Commission

CHAIRMAN

Article 1

The Chairman of the Mines Safety Commission shall be a Member of the High Authority of the European Coal and Steel Community.

Article 2

The Chairman shall conduct the work of the Commission in accordance with these Rules of Procedure.

MEMBERS

Article 3 (1)

The Commission shall consist of 36 members appointed by the Governments; each country shall have four members, of whom two shall be representatives of that country's Governments, one of the employers and one of the workers.

Each Government shall send in writing to the Chairman a nominal roll of the members appointed by it. It shall notify the Chairman of all changes in this.

Each Government may appoint for any particular meeting of the Commission one or two advisers, whose names it shall send to the Chairman.

I.L.O. PARTICIPATION

Article 4

Representatives of the International Labour Organization shall be invited to attend the proceedings of the Commission in a consultative capacity.

ORGANIZATION

(a) Restricted Committee

Article 5

A Restricted Committee shall be set up, to consist of Governments representatives on the Commission.

Article 6

The Chairman of the Commission shall act as Chairman of the Restricted Committee.

Article 7

The function of the Restricted Committee shall be to ensure permanent liaison among the Governments of the member States and between them and the Commission, more especially for the purpose of exchanging relevant information. The Restricted Committee shall see to the preparation of the Commission's activities.

Article 8 (1)

The Restricted Committee shall be convened by the Chairman.

The Chairman shall be required to convene it when asked to do so by the representatives of five or more Governments.

(b) Working Parties

Article 9

The Commission of the Restricted Committee may set up Working Parties of experts to consider specific technical matters.

Article 10

The Working Parties shall decide their own modus operandi.

Article 11

The Restricted Committee shall be given reports by the Working Parties on the results of their proceedings, which it shall submit to the Commission with the comments of its members.

In the event of differences of opinion within the Working Parties, the views expressed shall be given, together with the names of those expressing them.

SECRETARIAT

Article 12 (1)

The High Authority shall be responsible for the secretarial arrangements in connection with the work of the Commission, the Restricted Committee and the Working Parties.

These arrangements shall be under the charge of a High Authority staff member appointed to act as Secretary.

All documents shall be in the six official languages of the Community.

WORKING PROCEDURE

Article 13

The Chairman shall fix the agenda and the dates of meetings after consultation with the members of the Restricted Committee.

Article 14 (1)

The Chairman shall allow to speak any member of the Commission or representative of the International Labour Organization asking to do so.

The Chairman may allow advisers to speak.

Article 15

The members of the High Authority shall have the right to attend meetings of the Commission and of the Restricted Committee, and to speak there.

The Chairman may bring with him advisers, whom he may allow to speak.

Article 16

Where the Commission or the Restricted Committee deems it desirable to obtain information concerning the various aspects of safety in coalmines, it shall request this from the Governments of the member States.

Article 17 (1)

24 members shall constitute a quorum. Conclusions shall be adopted by majority of the members present.

Proposals by the Commission under 1,3 of its terms of reference shall, however, require a vote in favour by two-thirds of the members present, and by not less than nineteen members in all.

Any dissenting opinions shall be brought to the attention of the Governments should the members expressing them so request.

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(1) Amended having regard to decision of the Council of the European Communities of 1 January 1973 (Official Journal of the European Communities L2 of 1 January 1973).

THE COUNCIL

DECISION *(1)*

of March 11, 1965

of the Representatives of the Governments
of the Member States assembled in the Special
Council of Ministers to modify the decision
of July 9, 1957

concerning the terms of reference and rules
of procedure of the Mines Safety Commission

THE REPRESENTATIVES OF THE GOVERNMENTS OF THE MEMBER STATES ASSEMBLED IN THE SPECIAL COUNCIL OF MINISTERS -

having regard to the decision of July 9, 1957 regarding the terms of reference and rules of procedure of the Mines Safety Commission, and

having regard to the High Authority's proposal of January 7, 1964, and

seeing that this decision in no way affects Article 118 of the Treaty setting up the European Economic Commununity,

DECIDE:

Article 1

The terms of reference of the Mines Safety Commission laid down by the decision of July 9, 1957 are replaced by the provisions in the annex.

Article 2

The provisions of Article 17 of the rules of procedure annexed to the Decision of July 9, 1957 are replaced by the following provisions:

"Should the Mines Safety Commission or the Restricted Committee consider it desirable to receive information regarding the various fields for which it is responsible, it shall apply to the Governments of the member States."

This decision was adopted by the Council at its one-hundredth session, on March 11, 1965.

For the Council

M. MAURICE-BOKANOWSKI

President

(1) *See "Journal officiel de la Communauté européenne du charbon et de l'acier" no. 46 of 22nd March 1965.*

ANNEX

TERMS OF REFERENCE FOR THE MINES SAFETY COMMISSION

1. The Commission shall follow developments regarding safety and measures to avoid at working-points conditions which represent a danger to health in coalmines, including to this end the safety regulations instituted by the public authorities and assemble the necessary information concerning progress and practical results obtained.

   To secure the necessary information, the Commission shall apply to the Governments concerned.

   The Commission shall evaluate the information in its possession and submit to the Governments proposals for the improvement of safety and health conditions in coalmines.

2. The Commission shall help the High Authority to work out a method of compiling intercomparable statistics on accidents and damage to health attributable to vocational activities in coalmines.

3. The Commission shall ensure the prompt forwarding to the quarters directly concerned (including in particular mines inspectorates and employers' and workers' associations) of relevant information assembled by it.

4. The Commission shall ascertain, by regular contact with the Governments, what action is being taken to implement the proposals of the Conference on Safety in Coalmines, and such proposals as it may itself draw up.

5. The Commission shall propose such study and research as it deems most indicated for the improvement of safety, and of healthy working conditions in coalmines, with notes as to the way in which these can be effected.

6. The Commission shall facilitate the exchange of information and experience among persons responsible for safety matters and the maintenance of healthy working conditions, and propose appropriate measures for this purpose (e.g. organization of study sessions, establishment of documentation services).

7. The Commission shall propose appropriate measures for ensuring the necessary liaison among the rescue services of the Community countries.

8. The Commission shall submit annually to the Council of Ministers and the High Autority a Report on its activities and on developments regarding safety and protection of health in coalmines in the different member States. In this connection, it shall in particular examine the statistics compiled in these fields.

COUNCIL DECISION

of 27 June 1974

on the extension of the responsibilities of the Mines Safety and Health Commission to all mineral-extracting industries

(74/326/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 145 thereof;

Having regard to the draft of the Commission;

Having regard to the Opinion of the European Parliament (1);

Having regard to the Opinion of the Economic and Social Committee;

Whereas the representatives of the Governments of the Member States meeting within the special Council of Ministers, by Decision of 9 and 10 May 1957, set up a Mines Safety and Health Commission whose terms of reference as laid down by Decision of 9 July 1957 (2) of the representatives of the Governments of the Member States meeting within the Special Council of Ministers, amended by Decision of 11 March 1965 (3) are to follow developments in safety and in the prevention of occupational risks to health in coal mines and to draw up proposals appropriate for the improvement of safety and health in coal mines;

Whereas this body has proved to be an effective and suitable instrument for safeguarding the health and safety of workers in coal mines;

Whereas problems of safety similar to those in coal mines also exist in other mineral-extracting industries;

Whereas the prevention of occupational accidents and diseases, as well as occupational hygiene, are among the objectives of the Treaty establishing the European Economic Community;

(1) OJ No C 40, 8. 4. 1974, p. 64.
(2) OJ No 28, 31. 8. 1957, p. 487/57.
(3) OJ No 46, 22. 3. 1965, p. 698/65.

Whereas the Council resolution of 21 January 1974 (4) concerning a social action programme envisages an action programme for workers which aims *inter alia* at improvement in safety and health conditions at work;

Whereas the Safety and Health Commission should be assigned the task of extending to all mineral-extracting industries the preventive action which has hitherto been confined to coal mines;

Whereas the representatives of the Governments of the Member States meeting within the Council agreed to assign this task to the Safety and Health Commission,

HAS DECIDED AS FOLLOWS:

Article 1

1. Preventive action against risks of accident and occupational risks to the safety and health of workers in all mineral-extracting industries except simple excavation, excluding the protection of the health of workers against the dangers arising from ionizing radiations which is subject to special regulations pursuant to the Treaty establishing the European Atomic Energy Community shall be the responsibility of the Mines Safety and Health Commission within the terms of reference laid down by Decision of 11 March 1965 of the representatives of the Governments of the Member States meeting within the special Council of Ministers.

2. Mineral-extracting industries shall be taken to mean the activities of prospecting and of extraction in the strict sense of the word as well as of preparation of extracted materials for sale (crushing, screening, washing), but not the processing of such extracted materials.

3. Simple excavation shall be taken to mean work whose purpose is not the extraction of materials for use.

(4) OJ No C 13, 12. 2. 1974, p. 1.

Article 2

1. This Decision shall enter into force on the fifth day following its publication in the *Official Journal of the European Communities.*

2. It shall apply:

— to the underground activities of the mineral-extracting industries: as from the day laid down in paragraph 1;

— to the other activities of the mineral-extracting industries: as from 1 January 1976.

Done at Luxembourg, 27 June 1974.

For the Council

The President

K. GSCHEIDLE

TERMS OF REFERENCE OF THE VARIOUS WORKING PARTIES

OF THE SAFETY AND HEALTH COMMISSION

FOR THE MINING AND OTHER EXTRACTIVE

INDUSTRIES

TERMS OF REFERENCE COMMON TO ALL WORKING PARTIES

The Safety and Health Commission for the Mining and Other Extractive Industries recalls that from its inception, the exchange of experience and information in Working Parties has been completed wherever necessary in the mining basins, testing institutes and at the manufacturers.

C VENTILATION, FIREDAMP AND OTHER MINE GASES

Chairman : Mr HARLEY

A) General terms of reference

The Working Party on Ventilation and Mine Gas will examine general problems of ventilation, particularly where prevention of firedamp explosions is concerned and other means or measures should be applied in order to suppress or control firedamp.

In addition to the study of firedamp explosions occurring in the Community, attention will also be devoted to usable results of research in the field of firedamp outbursts, in particular where maximum permissible levels in ventilation air of firedamp and other poisonous gases are concerned, and the advance estimation of firedamp emission before a working is started.

Attention will also be devoted to appropriate speeds for the flow of ventilation air, measures to be taken in the event of deceleration of the fow of air, measures for the stabilization of ventilation and the means and procedures for monitoring ventilation.

B) Special terms of reference

1. Examination of the special requirements for workings with auxiliary ventilation in which dust control and air conditioning equipment is used

2. Examination of controlled partial recirculation of air in drivages.

3. Presentation of proposals for the selection of combinations of suitable materials for the impellers and housings of auxiliary fans.

4. Preparation of a report on "Methane under armoured conveyors".

5. Preparation of a second report on "Ignitions of firedamp by power loaders and heading machines" including proposals to the Governments on automatic methane monitoring, ventilation of the space between the roadface and the body of the machine, horizon control and automatic extinguishing of ignitions.

6. Preparation of a report on "Heavy gas emissions".

7. Preparation of a report on "Effects of firedamp on the risk of explosion with coal dusts (in collaboration with the Working Party on "Flammable Dusts").

8. Drafting of uniform requirements and specifications for the design and use of CH_4 monitoring instruments.

9. Preparation of a report on "Use of diesel engines underground in mines".

10. Drafting conclusions concerning outbursts of coal and gases.

D

WINDING ROPES AND SHAFT GUIDES, WINDING ENGINES AND WINCHES

Chariman : Mr LINTZEN

Terms of reference

1. Follow-up of progress made in the testing of winding ropes by means of appropriate instruments in order to obtain information concerning its application in the mines of the Community and the United Kingdom.

2. Testing of couplings for circular and flattened winding ropes.

3. Arrangements for the installation and inspection of capels.

4. Testing of guides for winding cages in drafts and guide mechanisms for cable haulage in roadways.

5. Maintenance required to ensure safe operation of winding ropes and balance ropes.

6. Use of studies on the dynamic behaviour of shaft and roadway ropes.

7. Exchange of views on the properties operating conditions and strength of winding ropes of particular interest.

8. Discussion on accidents involving winding and hauling ropes and their couplings, which could provide new information.

E STRATA CONTROL AND ROCK MECHANICS

Chairman : Mr J.S. MARSHALL

The Working Party is instructed to examine, by exchanging experience and by evaluating the results of research, whether it is possible to draw up measures or practical directives for the prevention of falls of ground, taking into account the individual features of coal measures and workings.

1. In particular : In the interest of better roof control, particularly within the context of working schedules, it will study :

1.1. general measures to be taken into consideration in avoiding falls of ground, in the light of the type of measures and conditions of workings, e.g. sequence of working the seams, features of the working areas (length, speed of advance, etc.), type and characteristics of support ;

1.2. specific measures to deal with individual difficulties which may or may not foreseeably arise in the long term, such as disturbance zones, protective banks, working of a face at right-angles to the end of an old seam, etc.

1.3. specific measures to be taken when starting off a face in order to prevent abrupt subsidence of the roof.

2. It will also compare mining regulations on support and draw up minimum roof control requirements, taking into account the characteristics of the various faces (overall seam thickness, dip, dead rock ...).

3. Stability of Tips.

F

E L E C T R I C I T Y

Chairman : Mr STASSEN

Terms of reference

1. Comparing adopted safety and accident prevention provisions relating to :

   a) electric shock,

   b) fire hazard,

   c) explosion hazard.

2. Follow the evolution in Community countries with regard to safety regulations on underground electrical networks of low and medium voltage (up to 1 100 V) and feeder cables for movable equipment, with due regard to the specifications for the said cables.

3. Finish the report on steps to be taken when work has to be carried out on electrical equipment under voltage.

4. Finish the study on the construction of high-tension cables (of up to 6 000 V) used underground, and protective equipment.

5. Follow the evolution of oil-powered contactors used in gassy environments.

6. Follow the development of techniques designed to eliminate entirely the production of sparks on electrical contact lines (battery motors excluded).

7. Examination of the intrinsically safe circuits for remote control in conjunction with mechanisation automation.

8. The Mines Safety and Health Commission instructs the Working Party on Electricity :

8.1. to continue to take due note of the results of the work of the CENELEC entrusted with harmonizing the rules covering the design of electrical equipment for use in explosive atmosphere ;

8.2. to propose, if appropriate, modifications to the above documents of CENELEC to make them applicable to coal mines in countries of the European Community ;

8.3. to prepare the models of the certificates of conformity and control for Group I electrical apparatus (in collaboration with D.G. III of the EC - Commission) ;

8.4. to compare the rules covering installation and use of underground electrical equipment now current in each of the Community countries, particularly in respect of the dangers of firedamp ignition ; to ensure that the rules are uniform or to examine the equivalence of certain rules, so that such equipment can be used without modification in all the Community countries.

G HUMAN FACTORS AFFECTING SAFETY

Chairman : Mr LINTZEN

Terms of reference

1. To study and work out proposals on the aspects by which behaviour and attitudes of individuals in extractive industries can be influenced in order to improve safety and health and working conditions in these industries.

2. To gather, consider and disseminate information about behavioural, organisational and human factors relating to safety and health in extractive industries.

3. To consider arrangements for safety training.

4. To consider the initiation of campaigns designed beneficially to influence attitudes to safety at work.

5. To study the attitudes of work people and organisational arrangements in order to create greater involvement and awareness of safety and health.

6. To consider any other matters thought by the working party to be relevant to improving attitudes towards safety and health at work in extractive industries.

I

M E C H A N I Z A T I O N

Chairman : Mr MEDAETS

Taking into consideration current techniques in winning and roadway driving linings and roadway conveyors, the working party is instructed to study particular ways of preventing accidents connected with mechanization.

In particular, it is to :

a) compile a schedule for machinery manufacturers and users of the minimum work safety requirements for mechanical protection of machines and equipment;

b) study safety provisions such as : visual and acoustic signalling, operating controls and in particular the ability to stop machines from any point on the face or roadway, taking account of modern means of telecommunication and remote control, electrical protection of motors in the event of overloading or jamming of equipment, lighting, etc.

K OIL, GAS AND OTHER MATERIALS EXTRACTED BY BOREHOLE

Chairman : Mr DE KORVER

Terms of reference

1. In the light of information available on safety and health hazards and the causes of accidents during prospecting, boring and extracting to obtain petroleum, gas and other materials by the Community countries within their territory or offshore dependencies, the working party is instructed in particular :

a) to evaluate lessons to be drawn from several serious accidents which occurred during the evacuation of platforms off shore : recommandation on exercises for the rescue of men falling over board, for the evacuation of platforms, fire fighting, etc...

b) to form a study and editorial group which will study the problem of accident statistics in the specific field outlined under 1. in collaboration with the working party on Common Accident Statistics ;

c) to make proposals in the field of initial and refresher training for personnel of all ranks ;

d) to maintain contacts with the organizations and conferences working in this field, in particular with the "London Conference of Safety and Pollution Safeguards in the Development of North West European Offshore Mineral Resources" and particularly with its group III, with the "Inter-Governemental Maritime Consultative Organization", with the "International Labour Office" and the "European Diving Technology Committee".

e) to follow the evolution of techniques of exploiting by borehole, petroleum, gas and other materials; to up-date and develop proposals of the Safety and Health Commission for the mining and other extractive industries on the prevention of blowouts, and to propose usefull methods of controlling these in the event of a blowout occurring.

L COMBUSTIBLE DUSTS

Chairman : Mr. KOCH

Terms of reference

Taking into account the mechanism of dust combustion and of flame propagation and the various factors which may influence this, including the fact that methane is frequently involved in this phenomenon, the working party is instructed to carry out a study of precautions against dust explosions, in particular :

a) dust neutralization (dust control in situ, stone dusting, spraying, dust fixation by means of spreading salts and coagulating pastes etc.), this study to include the comparative analysis of the regulations and instructions applied in the Community countries, along with the methods of application of the different processes,

b) dust barriers of various types to halt dust explosions, mixed dust-methane explosions and pure methane explosions.

The working party may make any suggestions for research work considered necessary to advance the knowledge of the phenomena studied and to promote safety in these fields.

M

H E A L T H   I N   M I N E S

Chairman : Mr MARSHALL

Studying, from the standpoint of technical prevention and industrial medicine, the prevention of environmental risks to the health of workers in coal mines, and other extractive industries.

1. To update the general directives concerning airborne dust control methods in coal mines during the use of power loaders and heading machines, particularly in connection with powered supports, underground crushers and rubber tyred transport vehicles.

2. Dust measurement (methods, frequency, measuring points, conclusions to be drawn etc.) and where necessary establishing a scale of comparison of the various methods employed in coal and other mines.

3. Establishment of airborne dust thresholds. Definition of categories of permissible dustiness. Steps to be taken when faced with various categories of dustiness, especially in coal mines.

4. Among the medical problems in the control of ambient health hazards to workers in mines and other extractive industries priority must be given to the study of the following factors : climate, noise, vibration, visibility and gas, in particular radon and H_2S, and other materials which might be dangerous to health.

5. To indicate the lines of research into the use of dangerous substances and to use their results to suggest appropriate action.

N

RESCUE ARRANGEMENTS, FIRES AND UNDERGROUND COMBUSTION

Chairman : Mr COENDERS

A) <u>General terms of reference</u>

(Art. 7 of the Terms of Reference of the Mines Safety and Health Commission)

Exchange of experience between the Community countries on :

1. Rescue operations and action against spontaneous combustion, heatings and fires on the occasion of accidents or other events underground requiring the assistance of rescue teams, from which useful lessons have been learned ;

2. Organization of rescue operations underground and the presentation of reports every two years ;

3. The prevention of spontaneous combustion, heatings and fire outbreaks underground, the fighting and control of spontaneous combustion, heatings and fires, and reopening sealed-off workings.

B) <u>Special terms of reference</u>

1. Comparison of practical arrangements of rescue operations existing in the Community countries and possibly the drafting of a standard plan of procedure for the Community as a whole.

2. Exchange of experience and practical knowledge in the following fields :

   a) methods and apparatus for the early detection of combustion, heatings and pit fires,

   b) CO self-rescuers employing filters or oxygen and more

14)

generally methods to protect personnel in noxious atmospheres (gas, fumes, oxygen deficiency etc.)

c) Oxygen deficiency warning devices,

d) Fires in long plant,

e) Sealing off abandoned workings,

f) Specifications and testing conditions for fire-resistant fluids for mechanical power transmission.

3. Condensed comparative survey of new regulations and guidelines promulgated by the mining authorities of member countries on rescue arrangements, first aid and fire lighting and prevention.

C) <u>Analysis of results (partial or overall) of research projects at present in progress so as to</u> :

1. Improve borehole rescue techniques,

2. Define the standards to which flameproof clothing should conform.

D) <u>Studies to be completed on the following subjects</u> :

1. Effects of a fire in shafts,

2. Resources to be applied to combat the danger of explosion during firefighting : nitrogen and others.

O COMMON ACCIDENT STATISTICS

Chairman : Mr KOCH

Terms of reference

1. To extend the tables of accident statistics under ground, prepared for coal mines to all the extractive industries.

The working party shall determine the conditions for this extension and examine how the condensed statistics on socioeconomic items might be presented for all the extractive industries.

2. To establish statistics on certain occupational diseases notably, pneumoconiosis and deafness.

3. To study the possibility of introducing into the table for the coal mining industry which figures in the First Chapter of the Annual Report, other technical elements which may have an effect on the frequency of accidents.

4. In order to enable the Mines Safety and Health Commission to draw conclusions on accident prevention, the frequency of underground accidents in the Community coal mines should be examined, with the following objectives :

   1. To decide on suitable mathematical statistical systems;

   2. To evaluate, with their aid, chronological differences in frequency together with differences from country to country or coalfield to coalfield.

COMPOSITION OF THE SAFETY AND HEALTH COMMISSION FOR THE MINING AND OTHER EXTRACTIVE INDUSTRIES AND OF ITS WORKING PARTIES

COMPOSITION OF THE SAFETY AND HEALTH COMMISSION FOR THE MINING AND OTHER EXTRACTIVE INDUSTRIES AND OF ITS WORKING PARTIES

- SAFETY AND HEALTH COMMISSION

- RESTRICTED COMMITTEE

- Secretariat .... J. LECLERCQ

- WORKING PARTIES :

  C. Ventilation, Firedamp and Other
  Mine Gases .... Mr. T. OBST

  Committee of Experts :
  C1. Firedamp Monitoring Instruments.... Mr. T. OBST

  D. Winding Ropes and Shaft Guides,
  Winding Engines and Winches .... Mr. WETEKAM

  Committee of Experts :
  D1. Winding Ropes .... Mr. WETEKAM
  D2. Winding Engines .... Mr. WETEKAM

  E. Strata Control and Stability of Ground. Mr. WALKER

  Committee of Experts :
  E1. Stability of tips .... Mr. WALKER

  F. Electricity .... Mr. OBST

  G. Human Factors affecting Safety .... Mr. OBST

  Committee of Experts :
  G1. Community Safety Campaigns .... Mr. OBST

  I. Mechanization .... Mr. WETEKAM

  K. Oil, Gas and other Materials extracted
  by Borehole .... Mr. GILLARDIN

  Committees of Experts :
  K1. Prevention of Blowouts .... Mr. GILLARDIN
  K2. Man Overboard Emergencies .... Mr. GILLARDIN
  K3. Oil and Gas Accident Statistics ... Mr. GILLARDIN

L. Flammable Dusts .... Mr. WETEKAM

M. Health in Mines .... Mr. GILLARDIN

N. Rescue Arrangements, Mine Fires and
Underground Combustion .... Mr. WALKER

Committees of Experts :

N1. Stabilization of Ventilation .... Mr. WALKER

N2. Fire-resistant Fluids .... Mr. WALKER

N3. Conveyor Belts and Other long
Items of Plant .... Mr. WALKER

N4. Self-rescuers .... Mr. WALKER

N5. Safety Signs .... Mr. WALKER

O. Common Accident Statistics .... Mr. WALKER

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BONDSREPUBLIEK DUITSLAND - FORBUNDSREPUBLIKKEN TYSKLAND

		Groupes de travail-Working parties Arbeitsgruppen-Gruppi di lavoro Werkgroepen-Arbejdsgrupperen
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Groupes de travail-Working parties
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Groupes de travail-Working parties
Arbeitsgruppen-Gruppi di lavoro
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Groupes de travail-Working parties
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DANEMARK - DENMARK - DAENEMARK - DANIMARCA

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I should be grateful if you would (delete where inappropriate):
- ADD - CORRECT - DELETE :

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Christian name : ....
Duties : ....
Address : ....
Postcode and Town : ....
Country : ....
Telephone :(please give the regional code and then the actual number) ....
Office (extension) ....Home number ....
Name of person with whom a message may be left in case of absence (secretary or colleague) with telephone number and extension : ....
Telex : (number and code) ....
Telegraphic address ....

to/on/from the list of Members of :

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B. The RESTRICTED COMMITTEE
The following Working Parties and Committees of Experts :

C. Ventilation, Firedamp and Other Mine Gases
   C1. Firedamp Monitoring Instruments

D. Winding Ropes and Shaft Guides
   D1. Winding Ropes
   D2. Winding Engines

E. Strata Control and Stability of Ground
   E1. Stability of Tips

F. Electricity

G. Human Factors affecting Safety
   G1. Community Safety Campaigns

I. Mechanization

K. Oil and Gas
   K1. Prevention of Blowouts
   K2. Man Overboard Emergencies
   K3. Oil and Gas Accident Statistics

L. Flammable Dusts

M. Health in Mines

N. Rescue Arrangements, Mine Fires and Underground Combustion
   N1. Stabilization of Ventilation
   N2. Fire-resistant Fluids
   N3. Conveyor Belts and Other Long Items of Plant
   N4. Self-rescuers
   N5. Safety Signs

O. Common Accident Statistics

Date : ....

Signature : ....

ANNEX IV

PROPOSAL TO GOVERNMENTS

on

CONTROL OF THE FIREDAMP RISK ARISING DURING DRIVAGE
AND FOLLOWING THE ABANDONMENT OF
CUL-DE-SAC AND OTHER OLD WORKINGS

Safety and Health Commission
for the Mining and other Extractive
Industries

Working Party on Ventilation, firedamp and
other mine gases

O.P. : 159/7

Minimum requirements and Comments on the control of the firedamp risk arising during drivage and following the abandonment of cul-de-sac and other old workings.

Proposals to the Governments of Member States in accordance with Article 1 of the terms of reference of the Safety and Health Commission for the Mining and other Extractives Industries and for action in accordance with Article 4.

(adopted by the Safety and Health Commission for the Mining and other Extractive Industries on 7 May 1980).

Luxembourg, 7 May 1980

CONTENTS

LIST OF APPENDICES

1. Bibliography

2. Jet distribution at the face of headings with forcing auxiliary ventilation systems

3. Report of the National Committee (United Kingdom) to examine all aspects of the ventilation of narrow drivages (Doc. n° 4293/78 - Excerpt)

4. Examples of instructions for the controlled scouring of firedamp in workings with the requisite dilution equipment and a centralized or local remote methane monitoring system, instructions for the arrival and departure of workers, and an example of instructions on deluting firedamp (Charbonnages de France).

5. Circular from the Chief Mines Inspectorate of North-Rhine-Westfalia of 17 August 1971 concerning "Fans with combined electric-air drive (combination fans)".

1. Introduction

1.1. During the meeting held on 3 September 1976, the MSHC gave the Working Party "Ventilation and Firedamp" the following terms of reference :

1. to study all the aspects of the accidents which occurred at Lens-Liévin, Houghton Main and Luisenthal wich might be interesting and important for preventing firedamp explosions and firedamp ignition and in particular to propose measures which can be taken to control the emission of firedamp

   - coming from old workings and cul-de-sac, both those abandoned temporarily and those abandoned permanently ;

   - in cul-de-sac workings, account should be taken of the dust make, stoppages of work, and stoppage of auxiliary ventilation as well as : the length and nature of the ducting for the auxiliary ventilation ;

2. to study the utility of automatic monitoring of auxiliary ventilation (air velocity etc...) and of automatic monitoring of CH_4 (by instruments installed on coal-getting and heading machines and including electrical cut-out or alarm indication devices).

3. to compare national legislation designed to avoid the risk of sparking in auxiliary fans, with the aim of harmonising these, if possible.

1.2. Following these terms of reference the Working Party on "Ventilation, Firedamp and other Mine Gases", presents this report which contains proposals to the Governments of the Member States for the improvement of safety and health conditions in gassy working areas.

It should be observed that many of the conclusions of this report can be applied to other underground workings especially to those where other toxic or harmful gases may be present. The appropriate application of these requirements remain the task of the national authorities.

Continuing efforts are needed in those fields described in items 2.13, 6.3. and 7.2.

1.3. The documents from which this report is compiled are listed in Appendix 1 (Bibliography).

1.4. The MSHC adopted this report on its meeting held on 7 May 1980. It submits this report to the Governments of the Member States as a proposal for the improvement of safety and health in coal and other mines pursuant to Article 1 of its terms of reference and for implementation and follow-up in accordance with Article 4 of those terms of reference. The report also contains proposals pursuant to Article 5 of the terms of reference.

Pursuant to Article 3 of its terms of reference the MSHC requests prompt forwarding of this report to the quarters directly concerned.

1.5. Origin and treatment of the terms of reference.

1.5.1. On 27 December 1974 a firedamp ignition and a weak coal dust explosion occurred in a new district of shaft 3 of Lens/Liévin (Bassin du Nord Pas-de-Calais) ; 42 men were killed and 7 injured. During the meeting held on 11 July 1975 the MSHC gave the Working Party "Ventilation and Firedamp" the terms of reference :

"to study all the aspects of the accident which occurred at Lens/Liévin which might be interesting and important for preventing firedamp explosions and in particular to propose measures which can be taken to control the emission of firedamp coming from old workings and from cul-de-sacs and districts being salvaged".

1.5.2. After the explosion which occurred on 12 June 1975 at Houghton Main Colliery, South Yorkshire, which started in a temporarily abandoned cul-de-sac working and where 5 men were killed and one seriously injured, the MSHC extended the original terms of reference.

1.5.3. Following the CH_4 ignition in a development heading of the Luisenthal mine (Saar coalfield) which occurred on 21 July 1976 and where 2 men were killed and 5 injured, the MSHC extended once more the terms of references (see item 1.1.).

1.5.4. The causes and circumstances of these three accidents can be summed up as follows :

1.5.4.1. Lens/Liévin : Presumably ignition of firedamp in form of a firedamp layer at the roof in the vicinity of the intake of a descensionally ventilated longwall face where working had just started. This ignition initiated a weak coal dust explosion which propagated over the whole district (1).

1.5.4.2. Houghton Main : Ignition of firedamp which was drawn through a defective auxiliary fan situated at the entrance of a temporarily abandoned heading. The ignition was considered to be caused by frictional sparking in the fan which was faulty. The explosion extended into other workings (2).

1.5.4.3. Luisenthal : Ignition of firedamp in form of a firedamp layer at the roof in the vicinity of the face of a development coal heading driven by a heading machine. The ignition was presumably caused by frictional sparking when the machine cut into quartzitic rock in the roof.

This was an ignition without shock wave (3) (4).

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1) The figures refer to the bibliography (Appendix 1).

1.5.5. In order to deal with these extensive terms of reference the Working Party decided to compile and to compare all pertinent legislation and rules existing in the Member States, and to derive minimum requirements and guidelines for the future from this compilation.

Furthermore a number of other documents has been taken into account (See Appendix 1).

1.5.6. The present report has been divided into 5 chapters, the chapter "Minimum requirements on ventilation of cul-de-sac workings and measures in the field of auxiliary ventilation, auxiliary fans included" being the largest in sope, corresponding to the range and importance of problems to be dealt with.

In this context reference is made to the "Report of the National Committee to examine all aspects of the ventilation of narrow drivages"(5) which has been taken into account in particular for the preparation of the chapter 2.

This committee was formed in the United Kingdom following the public inquiry on the Houghton Main explosion.

2. Minimum requirements on ventilation of cul-de-sac workings and measures in the field of auxiliary ventilation, auxiliary fans included (see also chapter 6).

The evaluation of national legislation has resulted in the establishment of the minimum requirements indicated below.

In individual cases, further steps may be necessary because of the operating conditions.

2.1. General

Comments

The system should be so designed as to meet the requirements of all aspects of the environment. The choice of auxiliary ventilation system to be used will largely depend upon the parameters that it is necessary to control.

Requirements

Cul-de-sac workings must be ventilated in such a way that in particular the permissible level of CH_4 or other harmful gases in the air is not exceeded.

Ventilation by means of diffusion alone should be avoided. It may only be used in places specified according to the procedure laid down by national legislation.

2.2. Air velocities

Requirements

The air velocity should be high enough to prevent firedamp layering. A search should be carried cut to detect such layering.

If layers of firedamp are detected, counter-measures should be taken.

2.3. Planning of auxiliary ventilation

Requirements

In order to ensure compliance with the requirements specified under 2.1. and 2.2., auxiliary ventilation must be planned carefully, taking into account all stages of development of the mine working provided with auxiliary ventilation. If necessary the plan should also include the equipment required for the suppression of respirable dust and the improvement of air conditioning. Supervisors responsible for the working and, if appropriate, the other personnel should be acquainted with the plan.

2.4. Determining the distance of the end of the air duct from the roadhead.

Requirements

The distance from the end of the air duct to the roadhead is to be laid down in each particular case in such a way as to ensure that the requirements under 2.1. and 2.2. are met.

Comments

To determine the distance from the end of the air duct to the roadhead is one of the elements of the planning provided for under 2.3.

Document 2719/79 (see appendix 2) provides a basis for a calculation.

2.5. Arrangement of auxiliary fans.

Requirements

Auxiliary fans should be so arranged that over-pressure always obtains in forced auxiliary ventilation systems and under-pressure in exhaust systems. This should be checked by measurements whenever a number of fans is arranged along the ducting within the heading.

Comments

Wherever possible the use of more than one fan in series in an auxiliary ventilation system should be avoided unless these can be grouped outside the heading. Where this is not possible a ventilation survey should be carried out to determine the position at which the fans should be placed within the duct.

2.6. Installation, starting and alteration of auxiliary ventilation systems

Requirements

Auxiliary ventilation systems installed according to the plan mentioned under 2.3. should be inspected by the manager or a competent person appointed by him when they are put into operation for the first time.

Care should also be taken to ensure that the air added to the auxiliary ventilation system from the main ventilating current is always sufficient to prevent any partial recirculation. Partial recirculation is only admissible in cases where exemption has been granted.

Rules for starting, stopping or altering auxiliary ventilation systems are to be laid down by the manager.

Comments

Dust control efficiency can be improved by means of partial recirculation of the air cleaned by a dust filter.

Since the methane concentration may rise as a result, exemption is required for this procedure.

2.7. Planned stoppages of auxiliary ventilation systems

Requirements

Auxiliary ventilation may only be stopped for the duration of necessary work or to avoid dangers. Further provisions for this procedure should be laid down by the manager in special rules.

Ventilation must be resumed as rapidly as possible, taking into account the conditions set out in 2.9.

Comments

The basic principale is that auxiliary ventilation should be designed for continuous operation, i.e. on a 24-hour basis, including weekends and holidays, etc...

2.8. Involuntary stoppages or derangements of auxiliary ventilation. Stay of persons in temporarily unventilated workings and fencing of such workings.

Requirements

In the event of a stoppage or derangements of an auxiliary ventilation system, the personnel is required to inform the competent supervisory staff immediately, and to evacuate the working if necessary.

Entry to the workings must than be blocked in such a way that it is impossible to enter them inadvertently. Only persons authorized by the supervisory staff to carry out inspections or to restore the ventilation are allowed to stay in such workings.

Ventilation must be resumed as rapidly as possible, taking into account the conditions set out in 2.9.

2.9. Conditions under which auxiliary ventilation may be restored after a planned or unintended stoppage. Return of personnel.

Requirements

Auxiliary ventilation may not be restored until it has been determined by a competent person that this can be done in a controlled manner to minimise the possible hazards.

The operation of recommissioning an auxiliary ventilation system which involved dealing with major quantities of methane or other harmful gases whose concentrations exceed the permissible limit (flushing of methane or other gases) shall be supervised by a competent person.

In such cases, after resumption of auxiliary ventilation, access to the workings is prohibited until the competent person has determined that the level of CH_4 or other harmful gases in the air does not exceed the permissible limits. Provisions for these operations are to be laid down by the manager or the person appointed by him.

Comments

Where a degassing operation is undertaken a method incorporating a diluting or regulating arrangement in the system may be suitable (see appendices 3 and 4).

2.1o. Auxiliary fans

2.1o.1. Precautions to minimize the risk of incendive sparking caused by auxiliary fans.

Requirements

Fans for underground use should be designed so as to avoid the risk of incendive sparking inside the fan.

This may be achieved by

a) the selection of suitable combinations of materials for impeller and housing ;

b) protection against ingress of foreign material which may also cause sparking.

2.1o.2. Precautions for avoiding electric sparking as a result of remanent voltage in electric and combined electric/air fans.

Remanent voltage sufficient to ignite methane can be generated at the terminals of an electric motor which is driven by the fan impeller in the air current and acts as a generator. To avoid the associated hazards, appropriate measures should be laid down.

As an example the following measures are quoted which are included in a circular from the Chief Mines Inspectorate of North Rhine-Westphalia of 17 August 1971 (see Appendix 5) :

- Electricians will be given written notice of the dangers arising from fan motors being turned by the ventilation or compressed air.

- Prohibition of the use of fans with combined electric/air drive of a type whose design does not obviate this risk where an exemption to exceed the permissible CH_4 - content of 1 % has been granted.

2.11. Auxiliary ventilation ducts.

Requirements

The materials for air-duct or ventubes must comply with stipulated specifications with a view to preventing the dangers of fire and of electrostatic charging, and must have specified hygienic properties. These specifications may be determined according to the procedure laid down by national legislation.

Air ducts should be installed in a sufficient solid and careful manner in order to minimise leakage and to absorb pressure transiants occuring when fans are started.

2.12. Supervision

2.12.1. Supervision of auxiliary ventilation systems.

Requirements

Auxiliary ventilation systems must be checked at intervals specified by the manager by persons appointed for that purpose, to ensure by inspection, functional tests and monitoring of the air current that the systems are operating according to plan.

2.12.2. Supervision of workings with auxiliary ventilation

Requirements

The efficiency of auxiliary ventilation systems shall be checked by persons appointed for that purpose by taking regular readings of the amount of CH_4 and other harmful gases in the air, as well as measures of air speed and possibly other relevant parameters (e.g. leakage coefficient).

2.12.3. Taking readings

2.12.3.1. Readings from hand-held measuring instruments

Requirements

Persons appointed to take readings with hand-held instruments and supervisors should have had a thorough training including instruction in the detection of CH_4 layers near the roof and in any cavities above the supports. The checks are to be carried out during operation and before the resumption of work after each non-working day.

2.12.3.2. Readings from fixed-position or mobile measuring equipment

Comments

With modern fixed-position or mobile equipment, concentrations of methane, carbon dioxide, carbon monoxide and other harmful gases as well as the air speed in roadways and air ducts can be continuously measured, relayed, recorded and evaluated in process control computers in a reliable manner.

Such measuring equipment is capable of sounding an alert and/or switching off electrical equipment when set limit values are exceeded.

It may be considered sufficient for the system to indicate whether the firedamp level has risen to a set limit or the air quantitiy has fallen below a set level. The use of this measuring equipment in conjunction with power loaders and heading machines is dealt with in chapter 5.

Requirements

Where ventilation is monitored by fixed-position measuring devices, the type of equipment to be used and the circumstances of its use are to be laid down in special rules which should also cover maintenance, checking and commissioning procedures. Most of the automatic measuring devices currently in use have to be switched off when certain levels are reached because of the risk of ignition that may occur in certain conditions. On the other hand, however, it is in the interests of safety that automatic monitoring should be maintained without interruption. The development and application of suitable automatic measuring equipment which is intrinsically safe should therefore be promoted.

2.12.4. Isolation of power - resumption of power.

Electrical apparatus other than that permitted by national legislation for operation in all firedamp levels must be isolated when the maximum levels laid down by national regulations are exceeded. For auxiliary ventilated workings which may be endangered by firedamp, appropriate mesures are to be taken.If automatic monitoring of the auxiliary ventilation system exists, isolation of power supply for the above specified electrical apparatus for these workings may be carried out automatically when a predetermined firedamp level is exceeded or the air quantity has fallen below a predetermined level. Isolation of power may also be carried out manually after alarm is given by the automatic monitoring system.

Degassing of auxiliary ventilated workings in accordance with 2.9. should be carried out only when the electrical apparatus in this working and, if necessary, in its return airway, also is isolated.

Electrical apparatus must not be switched on again until a test of the mine air has indicated that this can be done without risk.

2.13. Dust control and air conditioning equipment in workings with auxiliary ventilation.

Requirements

In workings with auxiliary ventilation in which dust control and air conditioning equipment is used, the auxiliary ventilation systems must meet special requirements.

Comments

These special requirements, which should be established by special studies will be examined subsequently by the Working Party on Ventilation, Firedamp and other Mine Gases.

3. Minimum requirements on measures when cul-de-sac workings are temporarily or permanently abandoned.

3.1. Measures to be taken when cul-de-sac workings are temporarily abandoned.

3.1.1. Definition

Temporarily abandoned workings are those in which no work is carried out for a fairly long period. It is, however, anticipated that work will be resumed at a later date.

3.1.2. Requirements

3.1.2.1. Temporarily abandoned workings must be ventilated or stopped off with a suitable stopping in accordance with pertinent regulations.

3.1.2.2. Ventilation must be maintained up to the accessible face of the stopping.

3.2. Measures to be taken when cul-de-sac workings are permanently abandoned.

3.2.1. Definition

Permanently abandoned workings are those in which work has been discontinued and no resumption is envisaged.

3.2.2. Requirements

3.2.2.1. Permanently abandoned workings must be stopped off at the entrance by means of a solid stopping.

3.2.2.2. Ventilation must be maintained up to the accessible face of the stopping.

3.3. Reopening of stoppings.

Requirements

3.3.1. Where workings have been stopped off, the stopping may be opened only on instructions from the Manager and in accordance with a method which offers a maximum of safety.

3.3.2. The subsequent restoration of auxiliary ventilation and return of men to the workings are governed by the requirements listed under 2.9. above.

4. Minimum requirements on measures to be taken to control the emission of firedamp from old workings and temporarily or per-

manently abandoned cul-de-sac workings.

4.1. Requirements

Where harmful gases may be emitted from old workings and from stopped-off workings especially in the event of a sudden sharp drop in barometric pressure, and which may not be adequately diluted by the main ventilating current, special mesures must be taken.

4.2. Comments

Methods used so far include applying an underpressure to the workings in question and draining off the gas. To this end, the workings must in general be sealed off with stoppings. These methods must only be used after a thorough study has been carried out since they involve the risk of introducing air into old workings through uncontrolled leakage circuits which may lead to spontaneous combustion of coal.

The following are examples of these methods :

4.2.1. "Simple" methods, which involve passing a pipe through the stopping and making use of the pressure gradient between the open end of the pipe and the back of the stopping to drain off the gas, which is then released and diluted at a suitable point into the return air.

4.2.2. Methods involving draining the gas through a stopping and then feeding it into the mine's firedamp drainage system in which case the monitoring equipment prescribed by national legislation for firedamp drainage is to be provided (e.g. automatic monitoring of the CH_4 concentration in the drained gas, automatic closure of the drainage range leading from the sealed-off workings if the CH_4 concentration drops below a limit value).

4.2.3. Methods involving drainage of the gas behind a chamber which consists of two stoppings, with facilities for regulating the pressure within the chamber. The gas is fed into the firedamp drainage system. (See Doc. 3965/75 - Pressure chamber method).

This method offers the following advantages, which are of particular importance at times of marked variations in barometric pressure.

4.2.3.1. Minimizing of leakage of gas through the stoppings or the surrounding ground.

4.2.3.2. Minimizing of in-breathing of air into the workings to be drained. (This prevents a reduction of the CH_4 concentration in the exhausted gas and reduces the danger of spontaneous combustion).

4.2.4. Methods involving draining the gas through a stopping, diluting it to a safe concentration level and then releasing it at a suitable point into the return air (See Doc. 4258/1/76 - Low concentration gas drainage).

So far, this method has only been applied in cases where drainage using the method according to 4.2.2. is not possible.

This method may be used in retreating systems where the make of firedamp in the dead end of the return gate inbye the face is so great that dilution to the permissible CH_4 concentration cannot be carried out reliably. This method may only be applied if there is no tendency to spontaneous combustion in the seam.

5. Utility of automatic CH_4 monitoring by instruments installed on coal-getting or heading machines together with cut-out or alarm indication devices (see also 2.12.3.2.).

Comments

Such instruments alone do not resolve the problem of firedamp monitoring, especially in mechanised headings, but nevertheless make a substantial contribution to such monitoring.

The question of the cut-out limits to be set should be decided by the authorities in the light of local conditions.

The good results obtained in French mines with such instruments fitted on heading machines are encouraging.

There is agreement in principale on the desirability of develloping automatic CH_4 monitoring instruments for installation on longwall coal-getting machines. Priority should be given to measuring instruments for shearers, trepanners and cutters as the risk of firedamp accumulation and ignition occuring with this equipment is greater than for coal ploughs [1].

6. Comparison of national legislation designed to avoid the risk of sparking in auxiliary fans, with the aim of harmonising these, if possible.

6.1. With respect to the selection of the most suitable combinations of materials for impellers and housings of auxiliary fans work was completed some time ago in Belgium, in the Federal Republic of Germany as well as in France. This question has been raised again by the Houghton Main explosion and further research work is currently being carried out in the United Kingdom.

A research and development project on "Light alloys underground" has been started in the German coal mining industrie.

6.2. The Working Party on Ventilation, Firedamp and other Mine Gases will present proposals for the selection of suitable combinations of materials when the above mentioned work is completed and evaluated.

7. Conclusions

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1) See "First report on ignitions of firedamp by power loaders and heading machines" (14th Report of the MSHC, Annex 16).

7.1. The MSHC proposes to Governments of the Member States that the requirements contained in the different chapters of this report are adopted and asks them to take account of the guidelines for the future listed therein.

7.2. Furthermore the MSHC proposes to promote research, studies and developments as well as the use of appropriate equipment in the following fields :

7.2.1. The effects of the use of auxiliary fans in series should be the subject of further research.

7.2.2. Search for new combinations of materials for impellers and housings of auxiliary fans which further reduce the risk of incendive frictional sparking between these components.

7.2.3. Further development and use of automatic airflow monitoring instruments.

7.2.4. Further development and use of automatic CH_4 monitoring instruments (including the supply system) applicable at any CH_4 concentration level.

7.2.5. Further development of other automatic monitoring instruments installed on longwall coal-getting machines, priority being given to the cutting types of these machines.

7.3. With regard to the question of combinations of materials for impellers and housings of auxiliary fans and the effect of dust control devices on auxiliary ventilation proposals will be submitted in due course to the Governments of the Member States.

BIBLIOGRAPHY

Appendix 1

1) Doc. n° 3946/75 (Conclusions from the inquiry of the explosion which occurred on 27 December 1974 at Lens-Liévin Colliery).

2) Doc. n° 439 /76 (Report on the explosion which occurred on 12 June 1975 at Houghton Main Colliery).

3) Doc. n° 4260/76 (Report on a CH_4 ignition which occurred on 21 July 1976 at Luisenthal Colliery).

4) First report on ignitions of firedamp by power loaders and heading machines (14th Report of the MSHC, Annex 10).

5) Doc. n° 4293/73 (Report of the National Committee to examine all aspects of the ventilation of narrow drivages).

6) Doc. n° 2719/79 (Jet distribution at the face of headings with forcing auxiliary ventilation systems - K. RENNER).

7) Doc. n° 3111/79 (Pre-calculation and removal of accumulations of methane in road headings due to stoppages of the auxiliary ventilation - B. BRUYET).

8) Doc. n° 3580/79 (Circular of the Chief Mines Inspectorate North Rhine-Westphalia on fans with combined electric-air drive from 17 August 1971).

9) Doc. n° 4600/77 (Safe auxiliary ventilation of headings - E. SCHUBERT and K. GRAUMANN).

10) Doc. n° 2917/77 (Requirements for auxiliary ventilation when using heading machines together with dedusting equipment. Circular of the Chief Mines Inspectorate for North Rhine-Westphalia from 13 April 1977).

11) Doc. n° 3718/78 (Use of heading machines in conjunction with dedusting equipment - Regulation I 3904/7/77 of the Chief Mines Inspectorate for the Saar and the Rhenish Palatinate).

12) Doc. n° 3719/78 (Report on studies and experience of the ventilation aspects of the use of heading machines with dedusting equipment. Report by the Mines Ventilation Department of the Saarbergwerke AG).

13) Doc. n° 1245/77 (Reply to Doc. n° 757/77 concerning measures to be taken to control the emission of firedamp from temporarily and permanently abandonned cul-de-sac workings) (from the UK-Delegation).

14) Doc. n° 3720/78 (Control of the emission of firedamp from old workings in the United Kingdom).

15) Doc. n° 3965/75 (The control of methane emitting from sealed-off areas using pressure chamber techniques. A concise summary of the practice in British coal mines).

16) Doc. n° 4258/1/78 (Report on the low concentration gas drainage process and the application thereof in coal mines in Germany).

APPENDIX 2

Jet distribution at the face of headings with forcing auxiliary ventilation systems

Luxembourg, 12 June 1963

Jet distribution at the face of headings with forcing auxiliary ventilation systems

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Contents

1. INTRODUCTION

Dangerous gases at the head ends of drivages must be dispersed and removed as quickly as possible. A number of relevant observations on the effect of jet discharge in headings with forcing auxiliary ventilation systems and during pneumatic stowing have been described by Spencer and Carver. The aim of the present paper is to investigate the appropriate distance between the delivery end of the duct and the heading face and the positioning of the duct within the heading. In order to provide a better basis for understanding the phenomena involved a few preliminary remarks are required on the laws governing the behaviour of a round free jet discharged into an unconfined space (see also e.g. Prandtl (Abriss der Strömungslehre), Tollmien, Ruden, Förthmann, Schlichting and Reichhardt).

A round jet of air emerges from the duct (diamter d) at a virtually uniform velocity w_o (Fig. 1). Particles of the surrounding air are entrained at the jet periphery so that the volume of air moved increases as the jet progresses. Initially, the velocity in the vicinity of the jet axis remains constant (w_o) from the discharge orifice to the extreme limit of the "central cone" x_o. In the peripheral regions the jet widdens by turbulent exchange, spreading linearly with the distance x from the discharge orifice while the axial velocity of the jet decreases with increasing distance from the central cone. The lenght of the central cone x_o varies directly with the diameter of the discharge orifice d and inversely with the exchange coefficient m (a mesure of the degree of turbulence in the discharge jet). At a medium level of turbulence, the exchange coefficient m is between o.12 and o.16, i.e. the length of the central cone will be about 6 to 8 times the duct diameter d.

At greater distances from the discharge orifice ($x > x_o$) the velocity distribution in the jet is such that the profiles are similar. From the end of the central cone, the velocity at the center of the jet w_m decreases linearly with increasing distance from the point of discharge.

The velocity profiles take the form of a normal curve.

The jet diameter D_x increases as a function of the exchange coefficient m and the distance x from the point of discharge. The volume of air Q_x displaced by the jet at a point x also increases by the same ratio in relation to the volume Q_o discharged from the duct.

It is thus a characteristic of a free jet that for a given discharge volume Q_o and exchange coefficient m its form is not affected by the duct diameter d.

The processes involved in the spreading of a jet in an unconfined space may be observed e.g. on windless days above cooling towers and chimneys. The central cone spreads linearly although the laws applying are somewhat different because of changes in the temperature of the gases in the jet.

2. JET SPREAD IN A HEADING

2.1. Depth of jet penetration where the duct is diposed in the centre of a heading

When air is discharged from a duct into a roadhead, the spread of the jet is restricted by the dimensions of the available space.

The depth of jet penetration in a heading is limited by the availability of sufficient momentum to produce reversal of the air current and generate a return flow. If the space available is greater than the depth of jet penetration, a buffer zone in which no turbulent mixing occurs must necessarily be formed between the end of the jet and the heading face. In auxiliary ventilation systems the distance between the delivery end of the duct and the heading face must therefore be such as to guarantee that the jet reaches the face.

As far as is known, no measurements have as yet been made of the depth of jet penetration. Certain conclusions may, however, be drawn on the basis of the laws governing the spreading of jets in an unconfined space.

The simplest model relates to the flow in a tube of diameter D, in which a jet emerging from a duct of diameter d spreads countercurrently to and coaxially with the return flow in the tube. Fig. 2 is a schematic representation of the flow patterns and the air velocity distribution in the jet and in the return flow. The jet attains a penetration depth L ; at this point the direction of air movement is reversed to produce a return flow, which also entrains air in the zone up to the point of reversal.

The jet penetration depth may be determined by calculation of energy values on the basis of the laws governing the behaviour of free jets. It transpires that the penetration depth of the jet L varies directly with the diameter D of the tube and inversely with the exchange coefficient m of the jet. Within certain limits, the jet penetration depth L is virtually independant of the ratio of the duct and roadway cross-sections $\left(\frac{d}{D}\right)^2$. Given an exchange coefficient of average value (m = o.15), the penetration depth of a coxial jet is about 2,5 to 3 times the tube diamter D, if there is a sufficient distance between the delivery end of the duct and the heading face.

These conclusions are consistent with empirical observations. The mixing zone becomes shorter if the turbulence of the discharged jet is increased e.g. in extreme cases by imparting a spiral movement to the jet by appliances fitted in the outlet.

If the delivery end of the duct is brought sufficiently close to the heading face for the intervening distance to be equal to the jet penetration depth, turbulent exchange of the airflows in the head end occurs and the intake air and undesirable firedamp are thoroughly mixed. The intermixing of the discharged jet and the return air is very intensive.

For a duct/heading diameter ratio $d/_D$ of o,2, the volume of air displaced at the end of the jet is about three time as great as the air quantity discharged. The air velocity in the centre of the jet at the end of the mixing zone, which may be taken as a measure of scouring velocity of the jet, is then about half the velocity of discharge from the duct.

This finding is consistent with the frequent observation that the jet discharged from a duct at the head end is felt to be unpleasant wherever workmen are standing near the jet axis.

If the distance between the delivery end of the jet and the heading face is less than the penetration depth, a backing effect is observed.The phenomena are described by Spence and Carver in the article "Effect of pneumatic stowing on ventilation". By using smoke to render the air currents visible, the authors observed eddy zones at the end of the duct when the distance between the duct end and the heading face was less than the jet penetration depth. The authors gave no details of the penetration depth of the jet.

2.2. Jet spread where the duct is located near the side or roof of the heading

In drivages the duct is generally placed under the roof or at floor level at the side of the heading. The jet discharged is not coaxial with the heading with the result that the mixing flow patterns are altered. In his article on air movement in air-conditioned premises, Regenscheidt mentioned the depth of penetration of a "half-size plaine jet" entering a confined space.

If ventilation is effected e.g. by forced air delivered through a slit immediately below the roof, the jet penetration depth is considerably increased (see Fig. 3).

The jet behaves like a full-size plaine jet entering a non-confined space through a slit of twice the width. The flow patterns and velocity distribution are represented in Fig. 3. In the case of a plaine jet, no air can be entrained on the roof side and mixing is confined to the underside of the jet.

This applies only in part to a duct in a heading. That part of the jet which is directed towards the heading roof or wall must entrain air from the adjacent part of the heading. The resulting movement of the mixing flow has the form of part of a spiral (Fig. 4).

The maximum possible penetration depth of an eccentric jet can only be estimated. It will not be quite twice the depth attained in the case of the plane jet, but it will be greater than in a coxial arrangement. The zone within which the flow direction is reversed at the heading face is also larger. Depending on the degree of eccentricity of the duct within the heading cross-section, the jet will under normal conditions attain a penetration depth L which is 4 to 5.5. times as great as the equivalent diameter d corresponding to the heading cross-section F.

As in the coaxial arrangement, the scouring velocity at the heading face is to be regarded as the velocity at the centre of the jet. It is thus 1/3 to 1/2 of the velocity of discharge from the duct.

The scouring velocity at the heading face will be about 7 to 12 times as great as the average velocity in the heading.

This should be satisfactory for the dispersion of methane layers at the head end provided that care is taken to ensure that the jet penetration depth is equal to the distance between the delivery end of the duct and the heading face. A further margin of safety is provided by the fact that the transverse movement of the mixing flow further assists gas dispersal.

3. MODEL TESTS

It is difficult to make detailed measurements of the mixing flows in the vicinity of the jet at the end of a ventilation duct. These flows can, however, be readily observed in a model.

The flow patterns in a model and in full-scale tests are similar develops between the point at which the jet flow is reversed and the heading face.

4.2. Observation of zones of secondary movement (eddy zones)

The technique of rendering flow patterns in the roadhead visible by means of smoke was used in order to study the eddy zone in the vicinity of the duct end, which had also been observed by Spence and Carver.

In the following figures the flow patterns in these eddy zones and their extension are shown roughly to scale. The air movement may be described as follows :

If the distance between the duct end and the heading face is less than the maximum penetration depth of the jet, and eddy zone forms at the roof if the end of the duct is placed at one side of the heading, the air immediately under the roof travelling inbye against the return flow. The flow velocity in this eddy zone is greather than the average air velocity in the preceding section of the heading. It is sufficient to ensure rapid dispersion of smoke accumulations behind the lagging. In the immediate vicinity of the duct outlet a smaller but very rapidly rotating eddy also develops.

If the distance between the duct end and heading face is equal to the penetration depth, this small eddy persists (see Fig. 8). If the duct-to-face distance is greater than the maximum jet penetration depth, a buffer zone develops between the point at which the jet flow is reversed and the heading face. Smoke injected into this zone moves very slowly. It rises to the roof, largely under the influence of thermal effects, and there creeps slowly to the point of jet reversal where it is entrained at high velocity towards the floor by the air current produced by the jet.

Large eddy zones, such as were observed when the distance between the duct end and the heading face was small, are most undesirable in the event of firedamp layering at the roof and should be avoided as far as possible. It was therefore natural to consider the possibility of preventing the development of such zones by altering the position of the duct outlet in the heading.

A folding duct was therefore used to reposition the duct outlet immediately beneath the roof at a distance a of 7 m from the heading face (Fig. 9). The large eddy was now formed at floor level near the delivery end of the duct as shown in Fig. 9. At the roof, the velocity of the jet between the duct end and the heading face was very high. Smoke clouds were very rapidly dispersed, even behind the lagging. For purposes of comparison the duct outlet was moved to a position at floor level at the side of the roadway at a distance a of 5 m from the heading face, the other test conditions remaining unchanged. The large eddy zones was then formed in the vicinity of the duct end at roof level as shown in Fig. lo.

The following conclusions may be derived from the studies of jet spread in forcing auxiliary ventilation systems.

1. The maximum penetration depth L of the air discharged from the duct in a heading of cross-sectional area F (m^2) is about 4.5 to 5 times the equivalent diameter

   $$L = 4.5 \text{ to } 5 \times D_h \approx 4.5 \text{ to } 5 \times \sqrt{F}\ (m)$$

   if the duct outlet is disposed in the usual manner at the roadway periphery, so that the jet and heading axes are parallel (the outlet being positioned as close as possible to the roadway side or roof) and if no rotational movement has been imparted to the air leaving the duct.

The local air velocities in the zone between the duct outlet and the point at which the jet flow is reversed are much greater than the average air velocity in the heading. It was observed that smoke accumulations in this zone were very quickly dispersed as a result of increased turbulence, even behind the lagging.

2. If the distance a between the end of the duct and the heading face is greater than the jet penetration depth L ($a > L$), a buffer zone is formed between the zone in which the jet flow is reversed and the heading face irrespective of the location of the duct outlet within the roadway cross-section. In this buffer zone there is virtually no air movement.

3. If the distance a between the end of the duct and the heading face is less than the possible jet penetration depth L ($a < L$), eddy zones of varying dimensions develop in the vicinity of the duct end and outbye. These eddy zones causes flows ("back flows") countercurrent to the return air flow in specific areas near the duct end at the heading sides, floor or roof.

   The position of these eddy zones within the heading cross-section depends on the position of the duct outlet in the heading.

4. It is useful that the duct outlet be placed at the roof for the following reasons : 1. this absolutely prevents any blackflow of air at roof level in the vicinity of the duct end ; 2. the highest local jet velocities between the delivery end of the duct and the heading face will be encountered at roof level.

The field tests were made possible by the kind assistance of the Bergwerkgesellschaft Hibernia AG. The authors would like to express his thanks to the management of the Hibernia AG for the material assistance provided and to Dipl.-Ing. Escher and Dr Böhm for their help and advice in the conduct of the tests.

ABSTRACT

The air-flow conditions created in a roadhead by a jet discharged from an air duct are deduced from the laws governing the behaviour of a free jet entering an unconfined space.

The jet penetration depth can be estimated where the duct is laid coaxially with the roadway ; it is greater where the duct is laid eccentrically. Experiments with a water model and in the field have shown that the jet penetration depth largely depends on the equivalent roadway diameter D and the exchange coefficient m (an indicator of the degree of turbulence of the air discharged from the duct). Given an auxiliary ventilation system of normal dimensions and configuration, the penetration-to-diameter ratio $L/D \approx 4$ to 5.
(L = maximum penetration depth, see page 9)

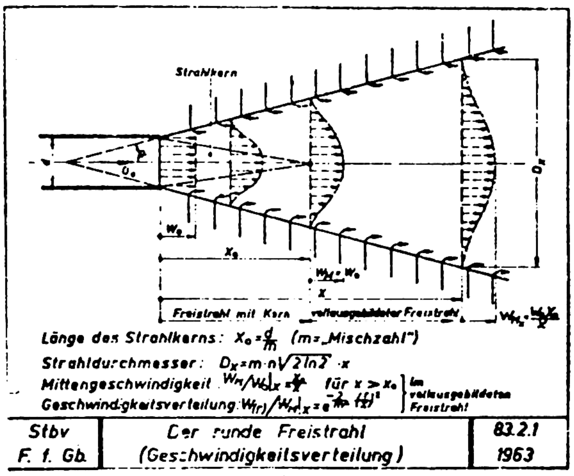
Where the distance between the duct outlet and heading face is greather than the penetration depth, a buffer zone is formed between the point at which the direction of the jet flow is reversed and the heading face, in which fresh air and dangerous gases are basically mixed by diffusion only. If the duct-to-face distance is reduced to <u>less</u> than the penetration depth, extensive eddy zones will form in the vicinity of the duct outlet. Depending on the positioning of the outlet in the heading cross-section, these eddies will produce back flows (countercurrent to the return air flow in the heading) at the sides or roof.

It is therefore recommended that the duct outlet be positioned
1. at a distance from the heading face approximately corresponding to the jet penetration depth and 2. as close to the roof as possible. This will definitely prevent the formation of eddy zones under the roof and will ensure the availability at roof level of the local air velocities required to disperse methane layers.

REFERENCES

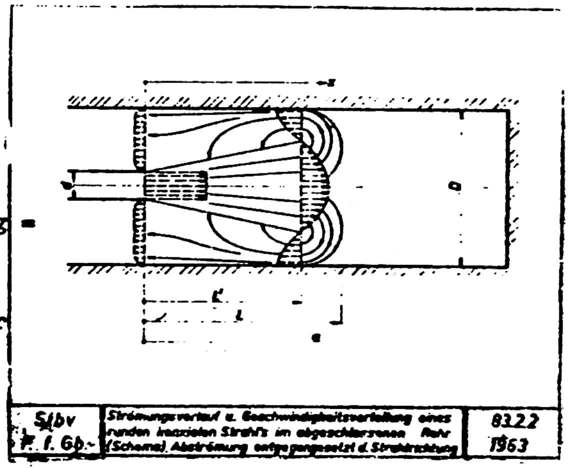
1. L. Prandtl : Führer durch die Strömungslehre
   F. Vieweg u. Sohn, Braunschweig 1944
2. W. Tollmien : Berechnung turbulenter Ausbreitvorgänge
   ZAMM 1926, s. 468/478
3. P. Ruden : Turbulente Ausbreitvorgänge im Freistrahl
   Die Naturwissenschaften 1933, s. 374/378
4. E. Forthmann : Ueber turbulente Strahlausbreitung
   Ing. Archiv 5 (1934) S. 43/53
5. H. Schlichting : Grenzschichttheorie
   E. Braun, Karlsruhe 1958
6. H. Reichardt : Gesetzmässigkeiten der freien Turbulenz VDI-Forschungsheft 414, 1951
7. W. Linke : Strömungsvorgänge in künstlich belüfteten Räumen
   Forschungsberichte des Wirtschafts- und Verkehrsministeriums Nordrhein-Westfalen Nr. 259
8. W. Linke : Strömungsvorgänge in zwangsbelüfteten Räumen
   VDI-Berichte 21 (1957) S. 29/39
9. B. Regenscheidt : Luftbewegung in klimatisierten Räumen
   Kältetechnik 11 (1969) S. 3/11
10. J. Simecek : Untersuchung des Wirkungsgrades der Sonderbewetterung von Strecken
    "Rudy 1957" Nr. 12, S. 414/423 Uebersetzung U 339 des Stbv
11. J.V. Spence u. J. Carver : Effect of Pneumatic Stowing on Ventilation (Auswirkung des Blasversatzes auf die Grubenbewetterung)
    Colliery Guardian 200 (1960) Uebersetzung BV 5 127 des Stbv
12. G. Flügel : Berechnung von Strahlapparaten
    VDI-Forschungsheft 395 2. Auflage 1951
13. R. Jung : Die Berechnung und Anwendung von Strahlgebläsen
    VDI-Forschungsheft 479/1960

FIGURE 1



Strahlkern = central cone of the jet
Freistrahl mit Kern = free jet with central cone
vollausgebildeter Freistrahl = free jet fully developed
Länge des Strahlkerns = length of central cone
Mischzahl = exchange coefficient m
Strahldurchmesser = jet diameter
Mittengeschwindigkeit = velocity in the centre of the jet
Geschwindigkeitsverteilung = velocity distribution
Im vollausgebildeten Freistrahl = in the fully developed free jet
Der runde Freistrahl (Geschwindigkeitsverteilung) = Round free jet (velocity distribution)

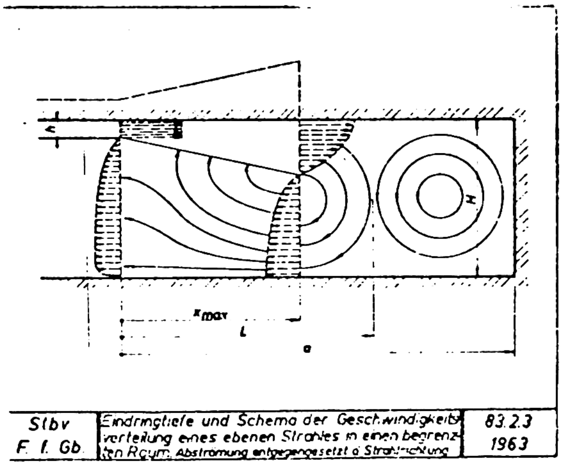
FIGURE 2



Strömungsverlauf und Geschwindigkeitsverteilung eines runden koaxialen Strahls im abgeschlossenen Rohr (Schema). Abströmung entgegengesetzt der Strahlrichtung =

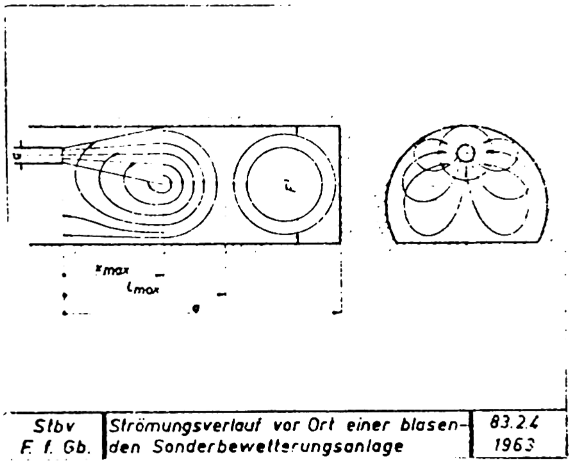
Flow pattern and velocity distribution of a round coaxial jet within a closed tube (schematic representation). Back flow counter to direction of jet.

FIGURE 3



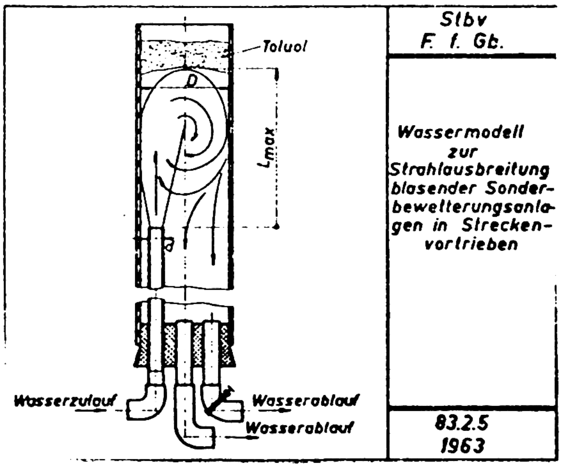
Eindringtiefe und Schema der Geschwindigkeitsverteilung eines ebenen Strahles in einen begrenzten Raum. Abströmung entgegengesetzt der Strahlenrichtung =
Penetration depth and velocity distribution pattern for a plane jet entering a confined space. Back flow counter to direction of jet.

FIGURE 4



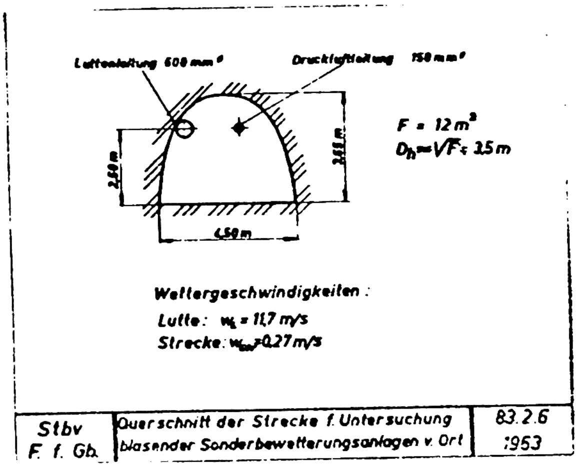
Strömungsverlauf vor Ort einer blasenden Sonderbewetterungsanlage =
Flow patterns produced at the head end by a forcing auxiliary ventilation system.

FIGURE 5



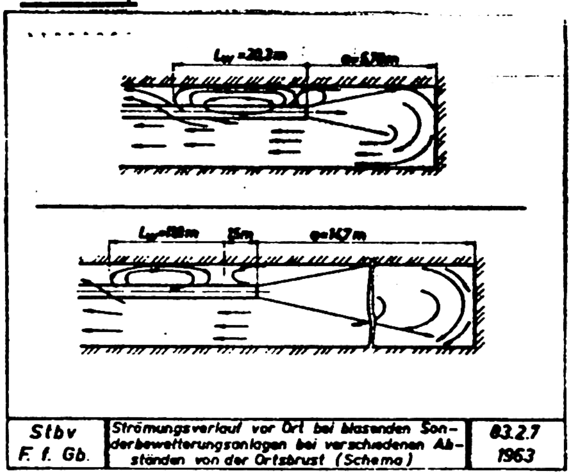
Toluol = toluol
Wasserzulauf = water inlet
Wasserablauf = water outlet
Wassermodell zur Strahlenausbreitung blasender Sonderbewetterungsanlagen in Streckenvortrieben = Water model for the investigation of jet spread in forcing auxiliary ventilation systems in headings.

FIGURE 6



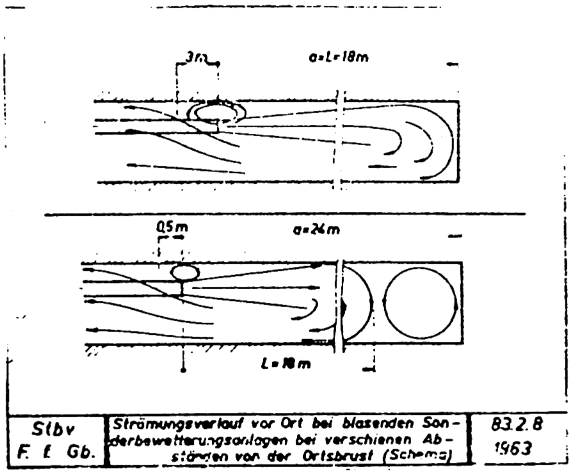
Luttenleitung = duct
Druckluftleitung = compressed air range
Wettergeschwindigkeiten = air velocities
Lutte = duct
Strecke = heading
Querschnitt der Strecke für Untersuchung blasender Sonderbewetterungsanlagen vor Ort = Cross-section of heading used for investigation of forcing auxiliary ventilation systems.

FIGURE 7



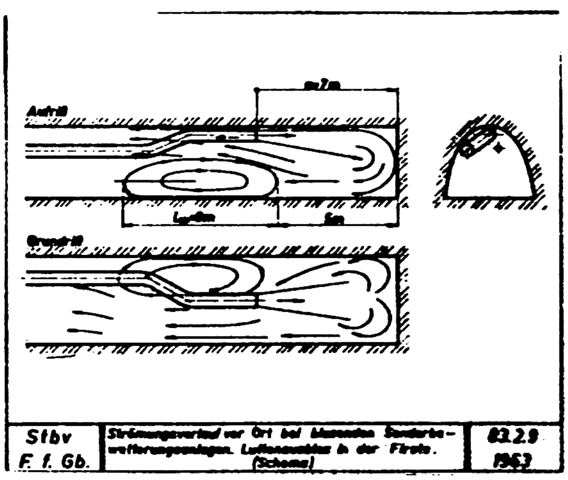
Strömungsverlauf vor Ort bei blasenden Sonderbewetterungsanlagen bei verschiedene Abständen von der Ortsbrust (Schema) =
Flow patterns at the head end produced by forcing auxiliary ventilation systems with varying distances between the duct end and the heading face (schematic representation).

FIGURE 8



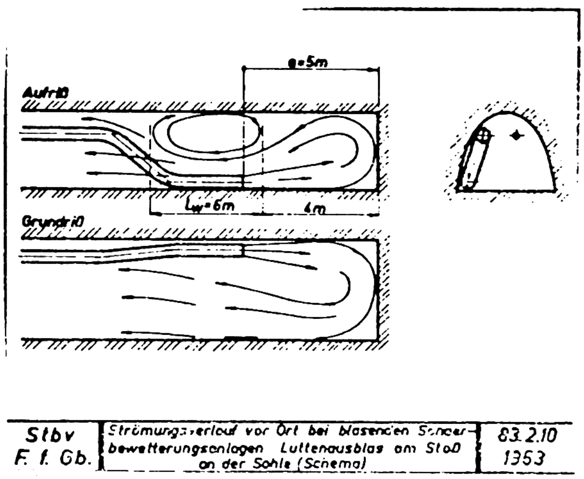
Strömungsverlauf vor Ort bei blasenden Sonderbewetterungsanlagen bei verschiedenen Abständen von der Ortsbrust (Schema) = Flow patterns at the head end produced by forcing auxiliary ventilation systems with varying distances between the duct end and the heading face (schematic representation).

FIGURE 9



Aufriss = vertical section
Grundriss = plan
Strömungsverlauf vor Ort bei blasenden Sonderbewetterungsanlagen. Luttenausblas in der Firste (Schema) = Flow patterns at the head end produced by forcing auxiliary ventilation systems, Duct outlet at the roof (schematic representation).

FIGURE 10



Aufriss = vertical section
Grundriss = plan
Strömungsverlauf vor Ort bei blasenden Sonderbewetterungsanlagen. Luttenausblas am Stoss an der Sohle (Schema) = Flow patterns at the head end produced by forcing auxiliary ventilation systems. Duct outlet at floor level at the heading side (schematic representation).

APPENDIX 3

Report of the National Committee (United Kingdom) to examine all aspects of the ventilation of narrow drivages (Doc. No. 4293/78 - Excerpt)

8. DE-GASSING OF HEADINGS

If proper provision is made for the continuous ventilation of auxiliary ventilated places then the need to de-gas a heading should be the exception rather than the rule. There will always be cases where there is a heading to be de-gassed and the correct procedure to be adopted should take into consideration the following points.

The need to de-gas a heading will usually arise from the failure of a component in the auxiliary ventilation system. The first steps to be taken should be to determine the nature and the extent of the problem. This will be dictated by the gas make in the heading, the lenght of drivage, the gradient and the lenght of time that the ventilation has been interrupted. The person in charge of the de-gassing operation should ascertain the extent of the problem by entering the heading and making determinations of the firedamp and/or blackdamp content. Before any de-gassing operation a paramount consideration is that in all workings likely to be affected the electrical equipment other than that specified in categories of approved apparatus referred to in Regulation 6 of the Coal & Other Mines (Electricity) Regulations, 1956, should be isolated and all men withdrawn.

The importance of maintaining complete control over any de-gassing operation cannot be over-emphasized.

If proper control is not exercised during a de-gassing operation using an exhausting system there may be a possibility of drawing explosive mixtures of gas over rotating fan blades. This could be avoided by changing an exhausting system to a forcing system for a de-gassing operation but the effect of this change on other districts in the ventilation circuit should be fully assessed.

It is possible using a system of ducting and diverting shutters to provide a means of readily changing an exhausting system into a forcing system. The operation of such a layout would not be in compliance with Regulation 24 (3) of the Coal & Other

Mines (Ventilation) Regulations 1956. At this stage it is difficult to envisage the widespread application of the system.

Two basic methods of de-gassing a heading are available. These are independent of whether the heading is ventilated by an exhausting system or a forcing system.

The first method relies on a heading being progressively recovered by extending the duct line into the heading as tests for gas indicate that it is being gradually dispersed. Although this method has been widely used effective control is difficult and it is possible that with an exhausting system high concentrations of gas may be drawn through the fan. In both exhausting and forcing systems, it is almost inevitable that the persons advancing the duct will at times be subject to high concentrations of gas.

The second method incorporates a by-pass attached to the main duct line which permits the regulation of the quantity of fresh air introduced into the system.

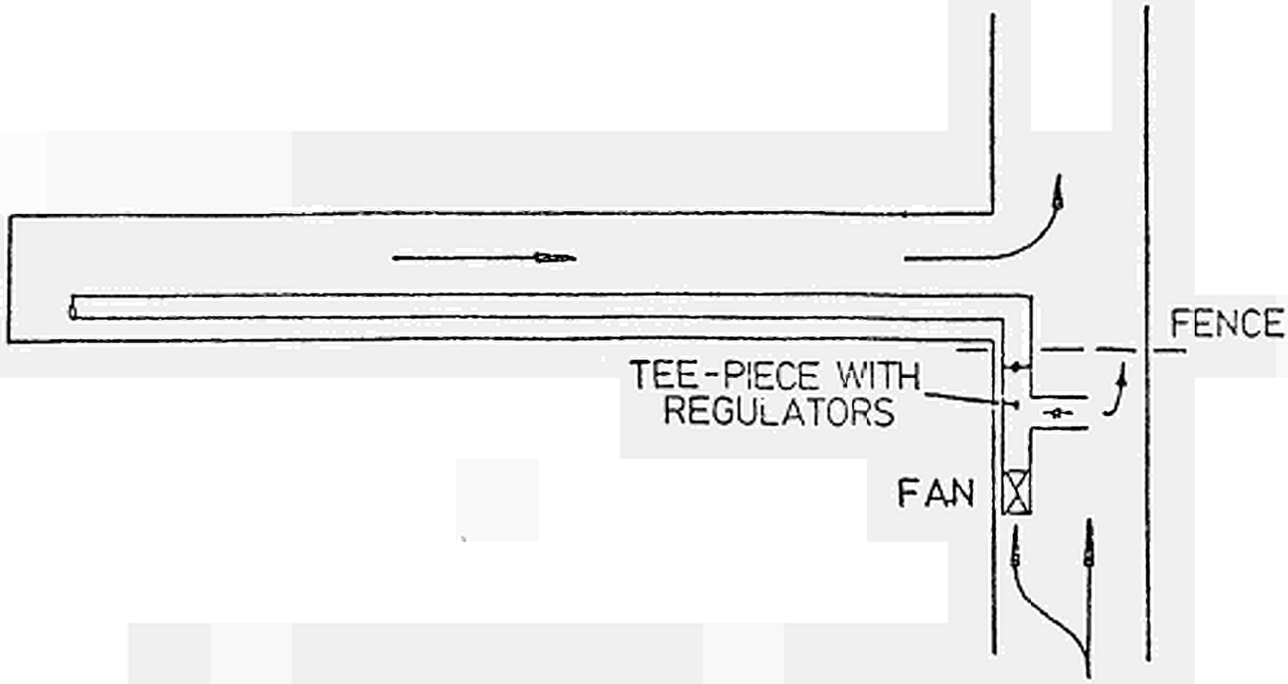
This is the method which should be adopted whenever possible.

The by-pass system is illustrated in Fig. 12 and the arrangement is basically the same whether the auxiliary system is exhausting or forcing. This method of de-gassing relies upon the by-pass being fully open at the commencement of the operation and the regulator on the main line fully closed. As de-gassing proceeds the by-pass will be gradually closed and the regulator gradually opened. Firedamp readings taken in the appropriate places will indicate what adjustments are necessary.

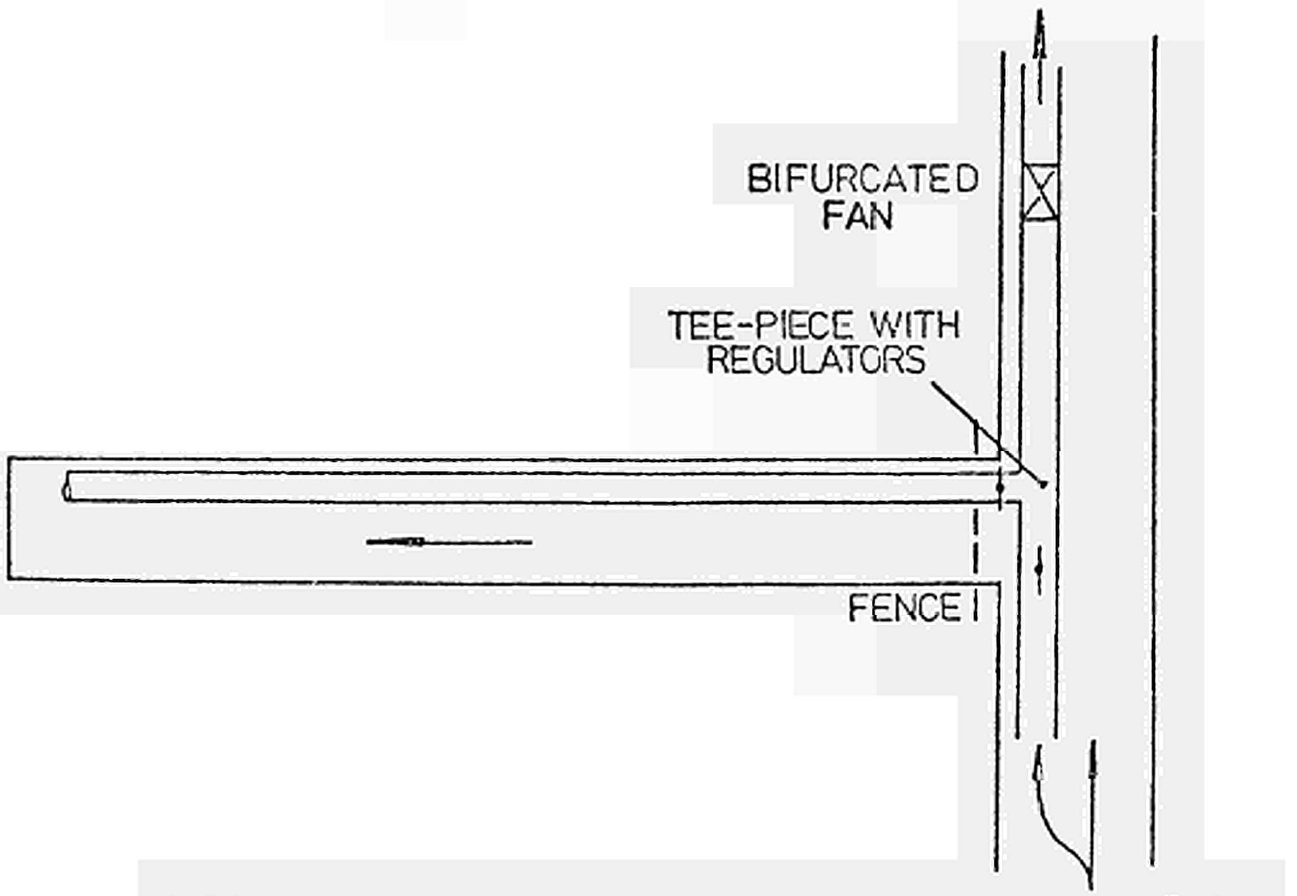
The firedamp readings should be taken to ensure that no air containing more than 1 1/4 % passes over powered fan blades or electrical apparatus. The adjustment of the regulator in the by-pass will be done manually to ensure complete safety in the de-gassing operation.

The by-pass method is relatively simple in operating using one fan or a series of fans situated outbye of the heading. The method becomes more complex where the auxiliary system employs fans in series within the duct line in the heading. In this case it may not be possible to completely de-gas the heading using only the outbye fan so that additional staged fans may have to be installed at the outbye position.

If the normal system is forcing then a de-gassing operation may necessitate passing high concentrations of firedamp through the windmilling impeller of the inbye fan. Where the system is exhausting the de-gassing operation will inevitably involve passing high concentrations of firedamp through the windmilling impeller of the inbye fan or fans. Work currently being carried out at S.M.R.E. may indicate that some metallic materials reduce the frictional sparking hazard when compared with steel. In any change over to fans made with such a material priority should be given to replacing those fans in systems employing fans in series along the duct.



DEGASSING OPERATION -FORCING SYSTEM



DEGASSING OPERATION -EXHAUSTING SYSTEM

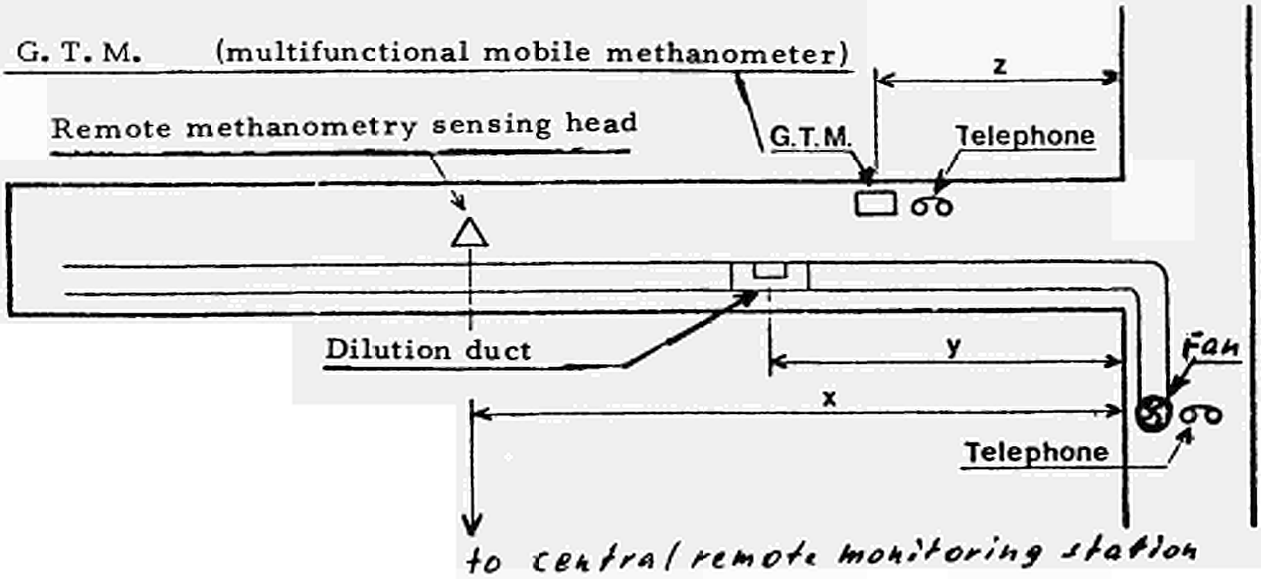
FIG. 12

APPENDIX 4

Examples of instructions for the controlled scouring of firedamp in workings with the requisite dilution equipment and a centralized or local remote methane monitoring system, instructions for the arrival and departure of workers, and an example of instructions on deluting firedamp (Charbonnages de France)

APPENDIX 4 a

Example of instructions for the controlled scouring of firedamp in workings with the requisite dilution equipment and a centralized remote methane monitoring system.



The requisite equipment for the controlled scouring of firedamp or dilution consists of the following :

- in the main ventilation system :

• at the fan, 2 air supply points with hoses to allow the fan to be switched to compressed air supply ;

• a genephone or telephone connected to the central remote methanometry station ;

- in the development roadway :

x metres from the entry, a remote methanometry sensing head to warn the personnel charged with the dilution operation of the approach of a cloud with a high concentration of methane ;

y metres from the entry :

. a diluter (delution duct) to proportion the airflow from the air duct.

z metres from the entry :

. a multifunctional mobile methanometer (G.T.M.) providing readings, at one-minute intervals, set to switch off the power supply automatically at the fan switch when concentrations of over 1.5 % occur. This G.T.M. is to be placed at the centre of gravity of the roadway section ;

an intrinsically safe genephone or telephone connected to the central remote methanometry station.

When a firedamp level of over 2 % is detected during a firedamp inspection or by the remote methanometry sensing head located in the working area, a dilution operation must be performed after evacuating the personnel if necessary, the power switched off (by electrical or manual means) the compressed air supply to the working area cut off, explosives removed and the monorail winch disconnected.

This dilution operation may only be performed under the direct surveillance of a supervisor or ventilation specialist designated by the mine engineer.

Personnel required :

A supervisor or ventilation specialist and a man equipped with methanometers and flame safety lamps.

Procedure :
The supervisor or ventilation specialist responsible for the

dilution operation informs the central remote methanometry station.

The station official takes readings from the sensing head positioned x metres from the entry once a minute (manual interrogation) throughout the dilution operation and informs the supervisor or ventilation specialist of the concentration levels.

The supervisor or ventilation specialist takes up a position at the controls of the diluter ; he and his assistant, who is next to the fan, are in communication with each other by genephone ; as soon as the central remote methanometry station informs the supervisor or ventilation specialist that the firedamp level at the sensing head positioned x metres from the entry is over 1.5%, the supervisor or ventilation specialist opens the diluter with caution.

a) If the diluter's opening is set correctly, the cloud's firedamp level will fall below 1.5 % on the G.T.M. controlling the operation of the fan ; the latter's operation will remain normal and the dilution operation will not be interrupted until the remote methanometry head positioned x metres from it detects a methane concentration of under 1.5 %. The supervisor or ventilation specialist may then visit the working area accompanied by his assistant ; the electric current must not be switched on again until the gate-end boxes have been ventilated.

b) If the diluter's opening is not wide enough, the cloud's firedamp level will rise above 1.5 % on the G.T.M., causing the fan to be switched off. The assistant then switches on the compressed air supply to the fan and the supervisor or ventilation specialist widens the diluter's opening. The supervisor or ventilation specialist takes concentration readings from the G.T.M. and adjusts the diluter's opening until the readings fall below 1.5 % ; he then instructs his assistant to switch on the electric power supply again ; the dilution operation can then be continued as described in a).

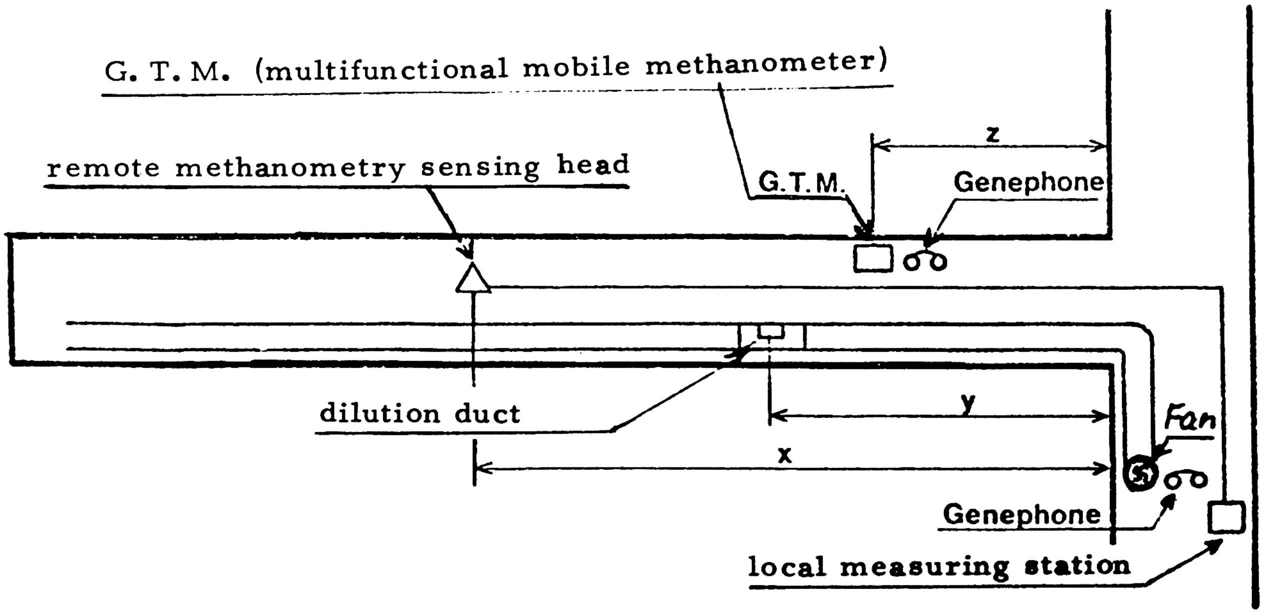
Special cases where the diluter is not accessible (firedamp level over 2 % between the entry of the development roadway (heading) and the diluter controls).

In such cases, scouring of firedamp may be performed only in accordance with the second indent of Article 13 of the instructions relating to Article 174 of the French General Regulations (personnel to be evacuated from the independent ventilation district).

Note : Distances x, y and z are specified in the instructions of the engineer responsible for the ventilation of the mine on the basis of air speed and layout of the workings.

APPENDIX 4 b

Example of instructions for controlled scouring of firedamp in workings with the requisite dilution equipment and local remote methane monitoring system



The requisite equipment for controlled scouring of firedamp or dilution consists of the following :

- in the main ventilation system :

  - at the fan, 2 air supply points with hoses to allow the fan to be switched to compressed air supply ;

  - a local measuring station ;

  - a genephone connected to a second genephone located near the dilution duct ;

- in the development roadway :

  - x metres from the entry, the remote methanometry head to warn the personnel charged with the dilution operation of the approach of a cloud with a high concentration of methane. This head is connected to the local measuring station.

- y metres from the entry :

  a diluter to proportion the airflow from the air duct ;

- z metres from the entry :

  . a multifunctional mobile methanometer (G.T.M.) providing readings at one-minute intervals, set to switch off the power supply automatically at the fan switch when concentrations of over 1.5 % occur.

    This G.T.M. is to be placed at the centre of gravity of the roadway section ;

  . an intrinsically safe genephone allowing communication between the man at the G.T.M. and the dilution duct with the man at the local measuring station.

When a firedamp level of over 2 % is detected during a firedamp inspection, a dilution operation must be performed after evacuating the personnel, if necessary the power switched off (by electrical or manual means), the compressed air supply to the working area cut off, explosives removed and the monorail winch disconnected.

This dilution operation may only be performed under the direct surveillance of a supervisor or ventilation specialist designated by the mine engineer.

Personnel required : a supervisor or ventilation engineer and a man equiped with methanometers and flame safety lamps.

Procedure:
The supervisor or ventilation specialist responsible for the

dilution operation posts a man at the local-measuring station. The latter takes a reading from the sensing head positioned x metres from the entry once a minute (manual interrogation) throughout the dilution operation and informs the supervisor or ventilation specialist of the concentration levels.

The supervisor or ventilation specialist takes up a position at the controls of the diluter ; he and his assistant, who is next to the fan, are in communication with each other by genephone ; as soon as the man at the local measuring station informs the supervisor or ventilation specialist that the firedamp level at the head positioned x metres from the entry is over 1.5 % the supervisor or ventilation specialist opens the diluter with caution.

a) If the diluter's opening is set correctly, the cloud's firedamp level will fall below 1.5 % on the G.T.M. controlling the operation of the fan ; the latter's operation will remain normal and the dilution operation will not be interrupted until the remote methanometry sensing head positioned x metres from it detects a methane concentration of under 1.5 %. The supervisor or ventilation specialist may then visit the working area accompanied by his assistant ; the electric current must not be switched on again until the gate-end boxes have been ventilated.

b) If the diluter's opening is not wide enough, the cloud's firedamp level will rise above 1.5 % on the G.T.M., causing the fan to be switched off. The assistant then switches on the compressed air supply to the fan and the supervisor or ventilation specialist widens the diluter's opening. The supervisor or ventilation specialist takes concentration readings from the G.T.M. and adjusts the diluter's opening until the readings fall below 1.5 % ; he then instructs his assistant to switch on the electric power supply again ; the dilution operation can then be continued as described in a).

Special cases where the diluter is not accessible (firedamp level of over 2 % between the entry of the development roadway and the diluter controls).

In such cases, scouring of firedamp may be performed only in accordance with the second indent of Article 13 of the instructions relating to Article 174 of the French General Regulations (personnel to be evacuated from the independant ventilation district).

Note : Distances x, y and z are specified in the instructions of the engineer responsible for the ventilation of the mine on the basis of air speed and layout of the workings.

U. P. LENS

Mine 19 Lens

APPENDIX 6 c

Geographical sector 3/4 Lens

INSTRUCTIONS FOR DRIVAGE

OF ....

WORKING AREA EQUIPMENT

The working area equipment consists of the following :

- at the fan, two air supply points and 25 mm dia. hoses to allow the fan to be switched to compressed air supply. A genephone connected to the diluter controls.

- .... m from roadway junction .... : a diluter to proportion the air supply from the air duct ;

  a multifunctional mobile methanometer (G.T.M.) providing readings at one-minute intervals, set to switch off the power supply automatically at the fan switch when concentrations of over 1.5 % occur. This G.T.M. is to be placed at the centre of gravity of the roadway section.

- at the diluter controls located .... :

. an intrinsically safe genephone - telephone (I) connected to the central remote methanometry station ;

. a genephone connected to the fan location.

- .... m from the roadway junction ...., a remote methanometry sensing head, No ...., to warn the personnel charged with the dilution operation of the approach of a cloud with a high concentration of methane.

- at the scraper ramp, a methanometry sensing head, No .... An instrinsically safe genephone-telephone (I) connected to the central remote methanometry station.

- above the electric pump, a G.T.M., to disconnect the power in the development roadway when the firedamp level is above 1.5 % (I).

- ....

- ....

- ....

(I) Delete where inapplicable

INSTRUCTIONS FOR THE SHIFT-FOREMAN - SHOTFIRER

INSTRUCTIONS FOR THE ARRIVAL AND DEPARTURE OF WORKERS

- A. Electrical risks

(1) When there are no men in the working area, the cul-de-sac power supply is disconnected in the TT section by the shift foreman when he leaves the working.

When the workforce arrives, the shift foreman calls the central remote methanometry station by genephone from the entry to the working in order to determine the concentration levels at the methanometer sensing heads. If these levels are below 1.5 % and have not exceeded 2 % for more than 8 hours whilst the power was cut off, the power supply to the TT section may be switched on again. If the firedamp levels are higher, the supervisor must be informed (I).

Alternatively

(2) The G.T.M. at the face of the heading which controls the electric pump disconnects the TT section if the firedamp level is above 1.5 %.

When the workforce arrives, if the TT section is disconnected, the power supply should not be switched on again and the supervisor must be informed (I).

The supervisor inspects the working with a flame safety lamp and methanometer, and switches on the TT section again if the firedamp level is below 1.5 % throughout the working. If the level has exceeded 2 % for more than 8 hours, the gate-end boxes must be ventilated beforehand.

- B. Compressed air and monorail risks (I)

When there are no men in the working, the compressed air is switched off at the entry and the monorail prevented from operation (I) by the shift foreman when he leaves the working.

When the workforce arrives, after obtaining the readings from the central remote methanometry station by genephone, the shift foreman

- switches on the compressed air and authorizes operation of the monorail (I) if the firedamp level is below 2 % at all the sensing heads located in the cul-de-sac ; the workforce may then enter the working ;

- fences the working off and informs the supervisor if the firedamp levels are abnormal (2 % or more at one sensing head at least).

INSTRUCTIONS FOR SHOTFIRING

Immediately prior to shotfiring the shotfirer shall contact the central remote methanometry station.

All monorail operation shall be discontinued before shotfiring and may not be resumed until the firedamp levels has been checked following shotfiring (I).

The following precautions shall be taken if two readings of over 2 % are obtained after shotfiring during three successive shotfiring rounds.

These instructions shall only be rescinded if no readings above 2 % are obtained after 6 successives rounds :

(I) - Delete where inapplicable.

1) The firing station shall be taken back to the main ventilation circuit.

....

....

2) Prior the shotfiring, the power shall be switched off at the TT section supplying the electrical equipment. After shotfiring the power may not be switched on again until the firedamp level has been checked and found to be less than 1.5 %. If it has exceeded 2 % for more than 8 hours, the gate-end boxes shall be ventilated beforehand.

All monorail operations shall be prevented until the firedamp check has been carried out after shotfiring (I).

3) Prior to shotfiring, the compressed air supply shall be switched off in the cul-de-sac working and shall not be re-established until the firedamp level has been checked.

4) If the readings taken at the face of the heading (head No.....) indicate that a cloud of over 1.5 % methane may arrive at the diluter, which may cause the fan to be switched off by the G.T.M., the concentrations at head No .... shall be checked at 1 - minute intervals by the central remote methanometry station. The supervisor, the man placed in charge (I) (2) shall take up position at the controls of the diluter, an assistant at the fan, and the procedure for controlled dilution of the methane cloud is performed according to the dilution instructions given below :

....

....

....

....

....

....

....

(2) The ventilation technicians and qualified firedamp inspectors designated by the ventilation engineer shall be placed in the same category as supervisors.

(I) Delete where inapplicable.

INSTRUCTION FOR THE DEPUTY

DILUTION INSTRUCTIONS

When a firedamp level of over 2 % has been detected during a firedamp inspection or by one of the remote methanometry sensing heads in the working, a dilution operation must be performed after evacuation the workforce if necessary, the compressed air supply switched off and explosives removed from the heading.

- The power supply shall be disconnected from the TT section (I).

- The power supply will have been automatically disconnected by the G.T.M. at the face of the heading (I).

This dilution operation may only be performed under the direct surveillance of a supervisor (2). Requisite personnel : a supervisor and an assistant equipped with a methanometer and a flame safety lamp.

Procedure :

The supervisor (2) in charge of the dilution operation informs the central remote methanometry station.

The central station operator shall take a reading from the head located ..... m from the entry once a minute (manual interrogation) throughout the dilution operation and shall inform the supervisor of the levels.

The supervisor (2) and his assistant shall take up positions at the diluter controls and next to the fan respectively. They shall be in communication by genephone.

As soon as the central remote methanometry station informs the supervisor that the firedamp level is higher than 1.5 % at the sensing head located ..... m from the entry, the supervisor shall open the diluter.

a) If the diluter's opening is set correctly, the firedamp level of the cloud will fall below 1.5 % on the G.T.M. controlling the fan's operation ; the latter will continue to operate normally and the dilution operation shall be resumed until the sensing head located 5o m away detects firedamp levels below 1.5 %. The supervisor may then inspect the working accompanied by his assistant. The power may not be switched on again until after the gate-end boxes have been ventilated if they have been subjected to a firedamp atmosphere for over 8 hours.

b) If the diluter's opening is not wide enough, the firedamp level of the cloud will rise above 1.5 % on the G.T.M., causing the fan to be switched off. The assistant shall then switch the latter over to compressed air supply and the supervisor shall widen the diluter's opening. The supervisor shall check the firedamp level on the G.T.M. and adjust the diluter's opening to lower the level to below 1.5 % on the G.T.M.

He shall then instruct his assistant to switch on the electric power supply again and the dilution operation may then proceed as in a).

Special cases where the diluter cannot be adjusted (firedamp levels of over 2 % between the entry to the development roadway and the diluter's controls).

In such cases, scouring may only be performed in compliance with the first indent of Article 15 of the instructions relating to Article 174 of the French General Regulations (personnel to be evacuated from the independent ventilation district).

---

(2) The ventilation technicians and qualified firedamp inspectors designated by the ventilation engineer shall be placed in the same category as supervisors.

(I) Delete where inapplicable.

SPECIAL INSTRUCTIONS

....

....

....

....

....

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....

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....

The engineer responsible for drivage,

The engineer, Head of Safety, Management and Staff Training,

Diagrams :

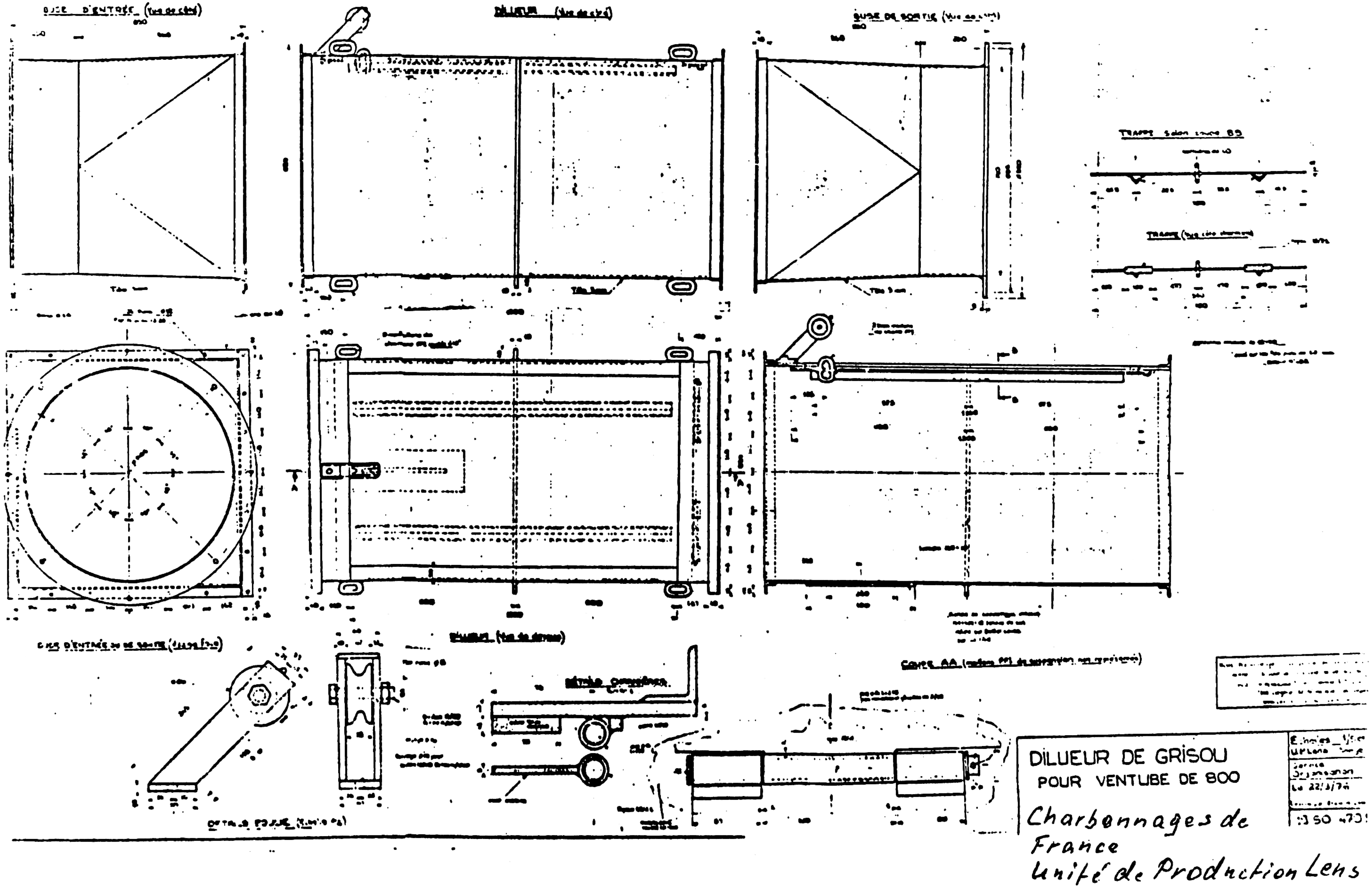
DILUEUR DE GRISOU POUR VENTUBE DE 800 : Firedamp diluter for 800 ventube

Commande à distance : remote control

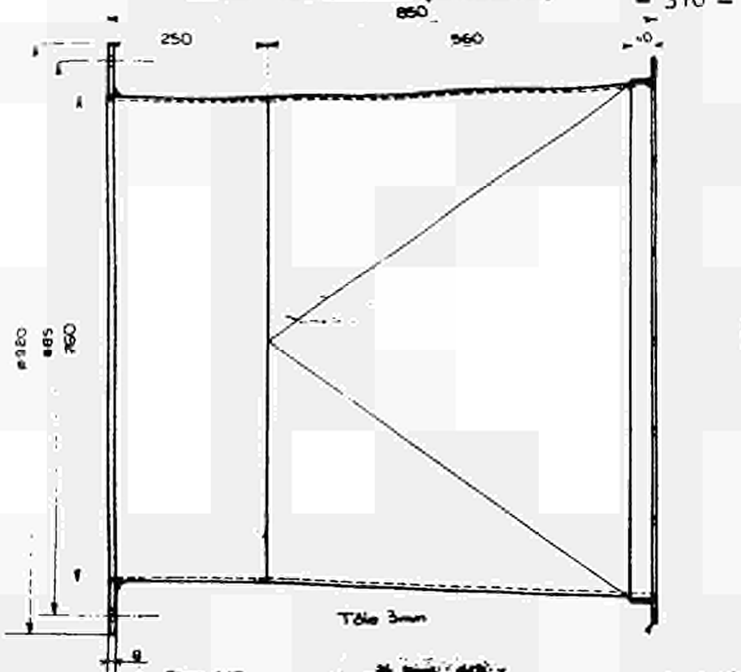
Volant de Vanne : valve wheel 300 mm dia.

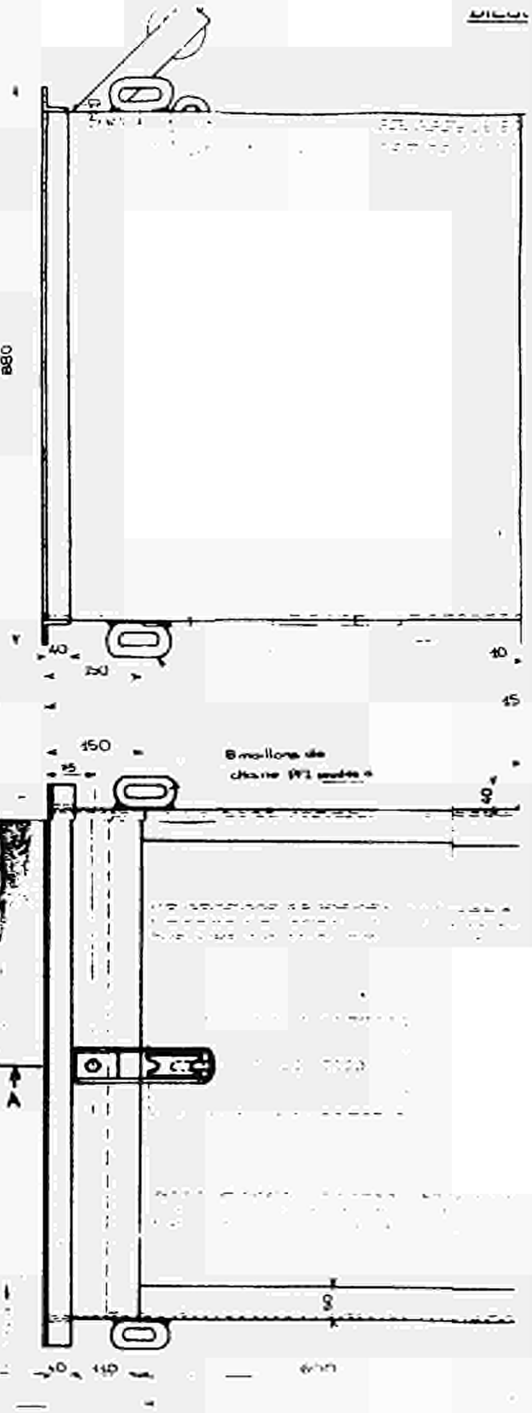
Unité de production : production unit

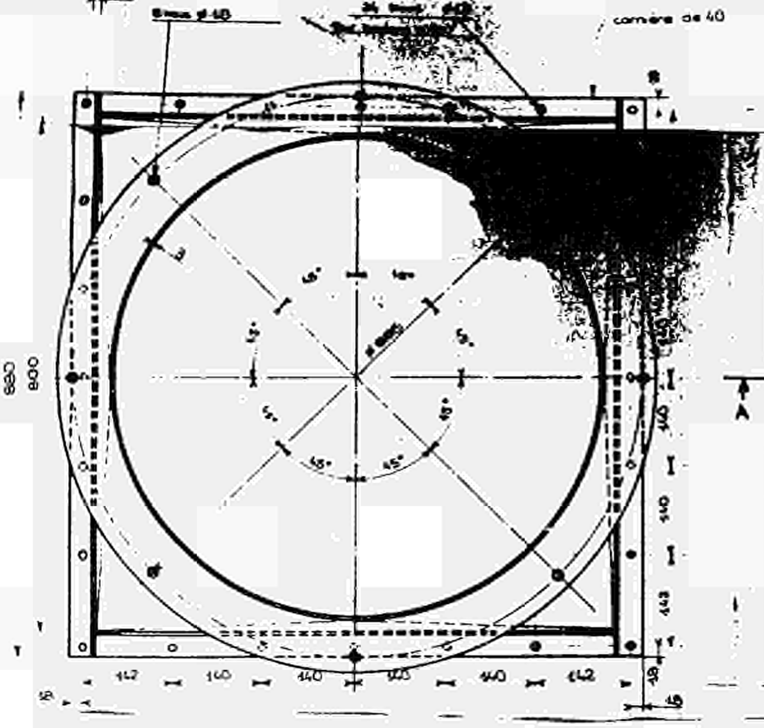
Siège : mine


DILUEUR DE GRISOU
POUR VENTUBE DE 800
Charbonnages de
France
Unité de Production Lens

BUSE D ENTREE (Vue de cote)

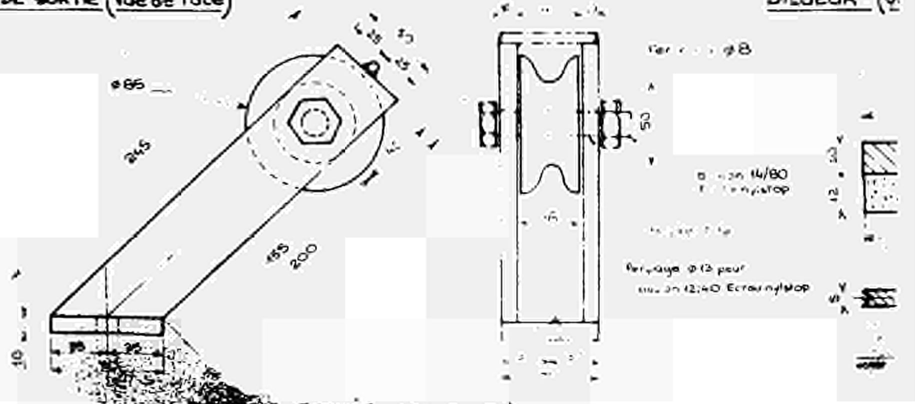




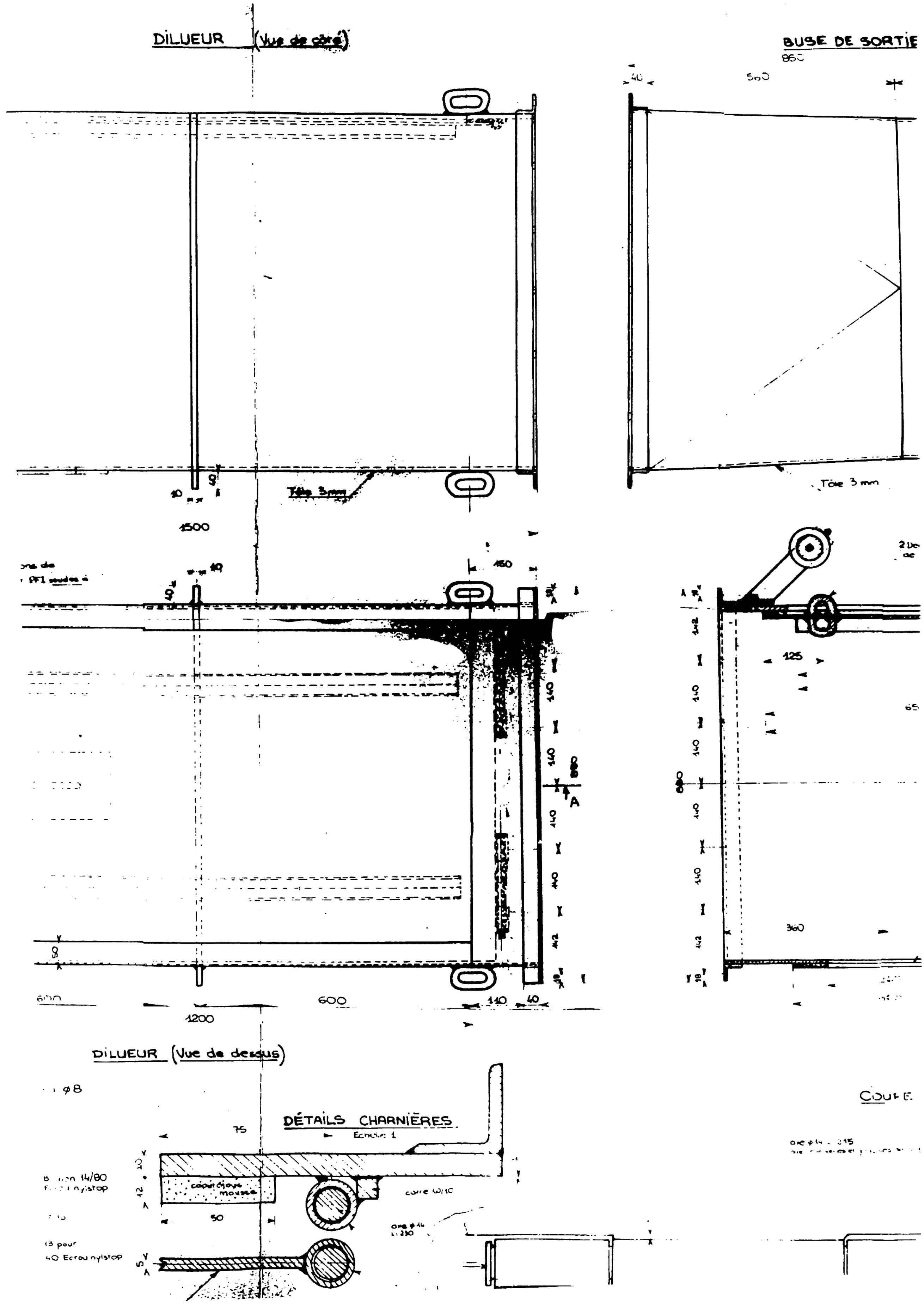


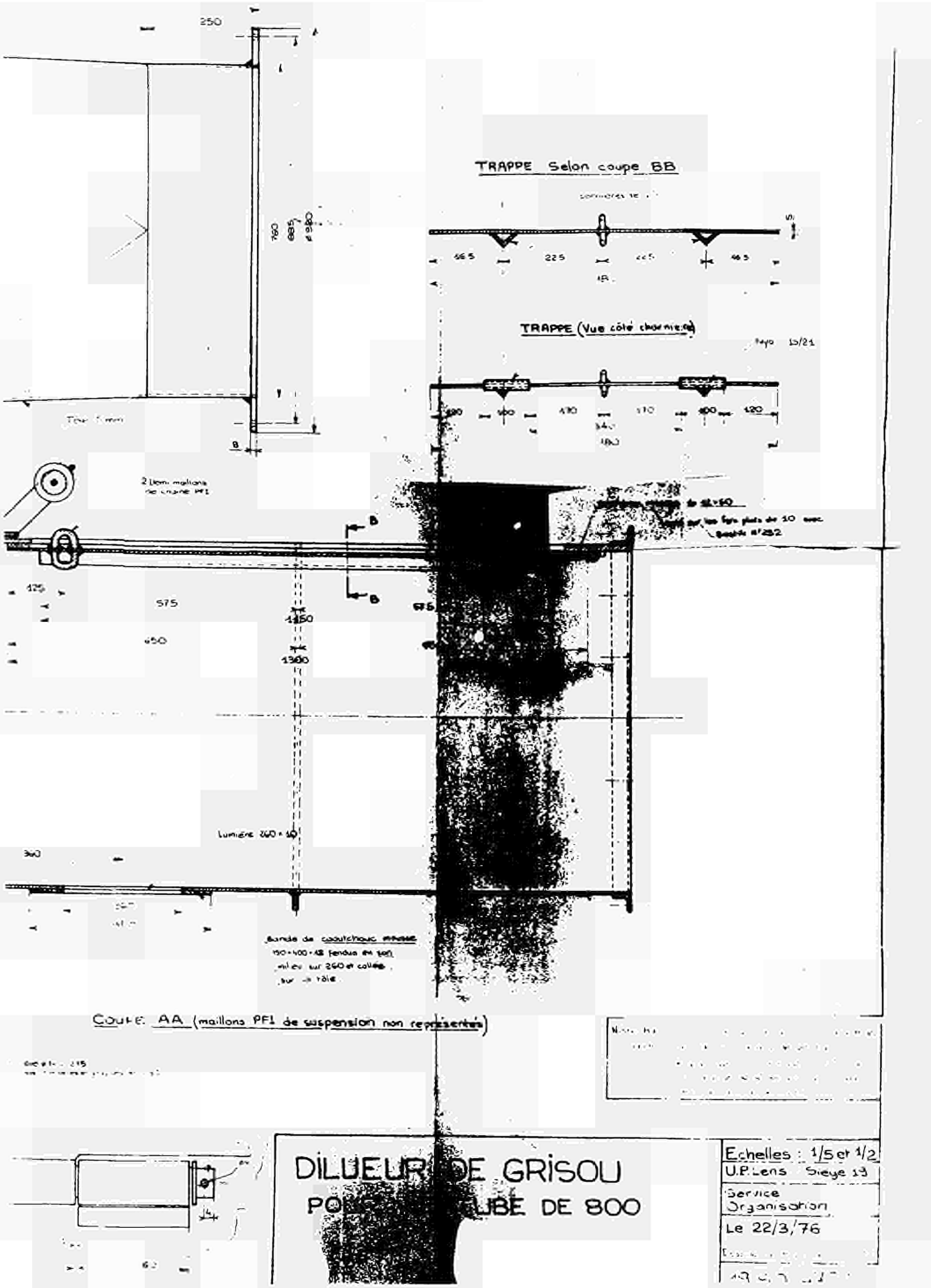
BUSE D'ENTRÉE OU DE SORTIE (Vue de face)

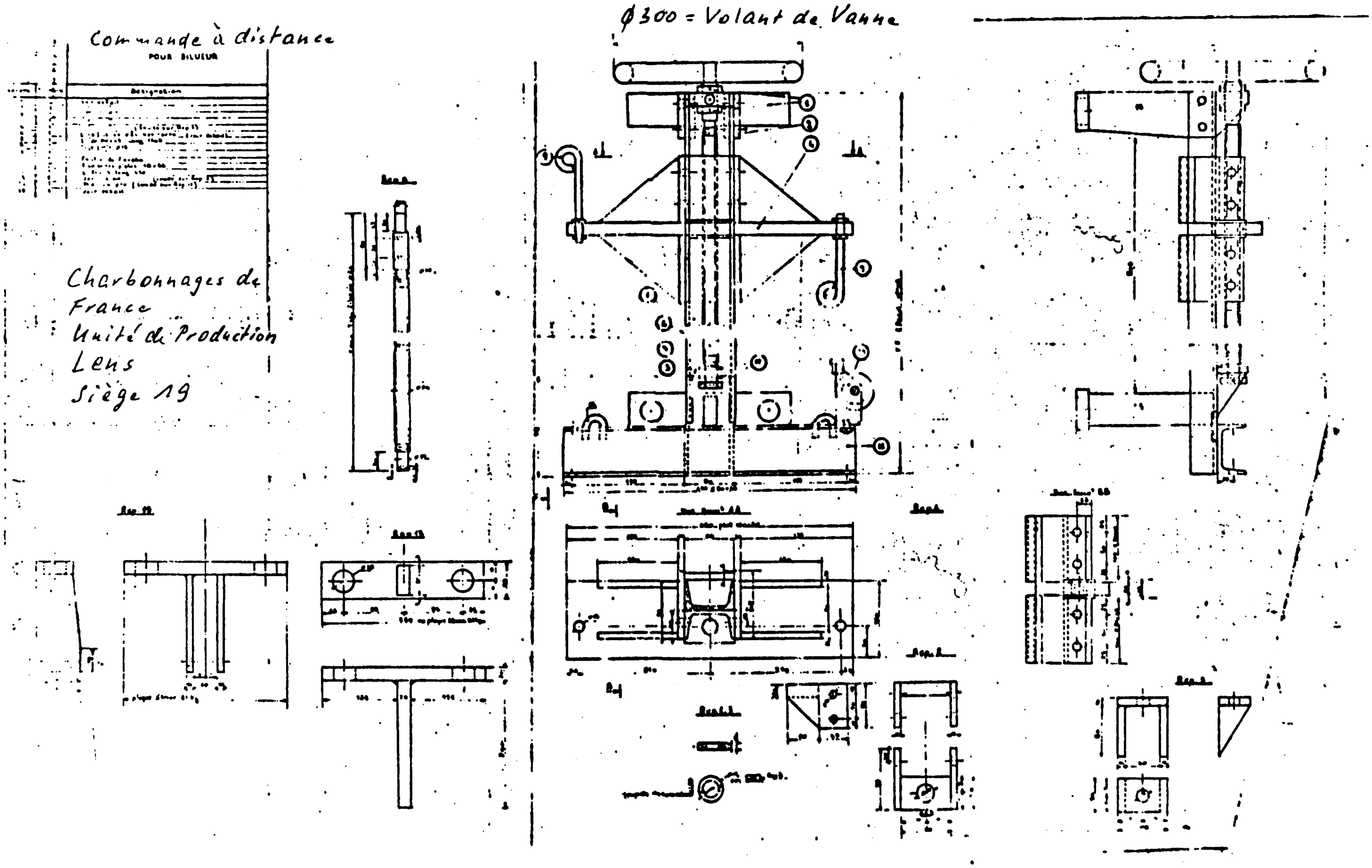
DILUEUR (V...



DÉTAIL POULIE (Echelle 1/2)


DILUEUR (Vue de côté)
BUSE DE SORTIE
Tôle 3mm
Tôle 3 mm
1500
DILUEUR (Vue de dessus)
1200
600
DÉTAILS CHARNIÈRES
Echelle 1
caoutchouc mousse
Ecrou nylstop


TRAPPE Selon coupe BB
TRAPPE (Vue côté charnières)
2 Demi maillons de chaîne PF1
Lumière 260 × 10
Bande de caoutchouc mousse 150 × 400 × 18 fendue en son milieu sur 260 et collée sur la tôle
COUPE AA (maillons PF1 de suspension non représentés)
DILUEUR DE GRISOU
POUR TUBE DE 800
Echelles : 1/5 et 1/2
U.P. Lens Siège 19
Service Organisation
Le 22/3/76


Commande à distance
POUR DILUEUR
Designation
Ø300 = Volant de Vanne
Charbonnages de France
Unité de Production Lens
Siège 19

BDPC U.P Lens

Siège 19.7

S.O 7 Lievin

Div. 252

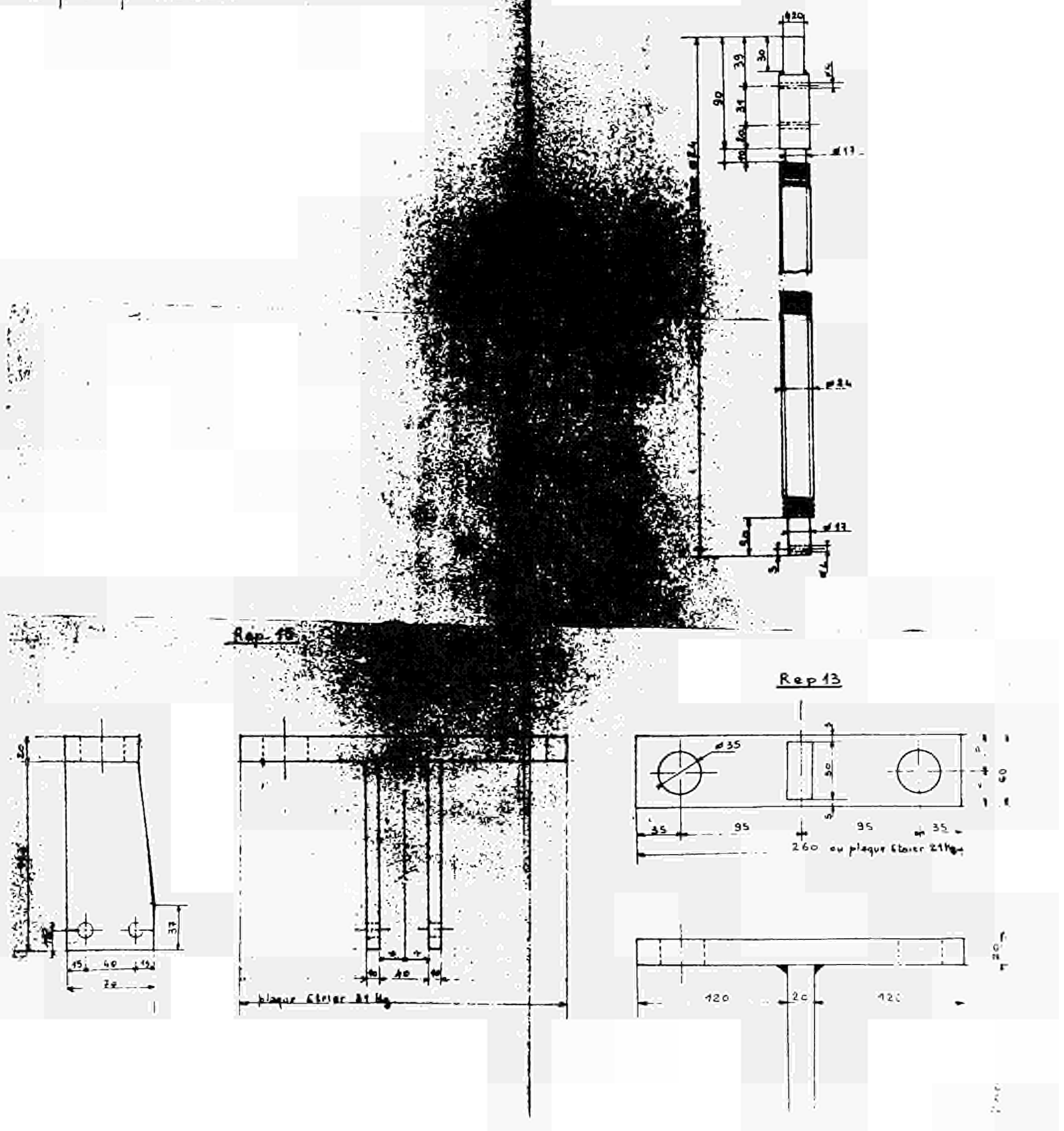
ch. 1/2 le 23.2.71

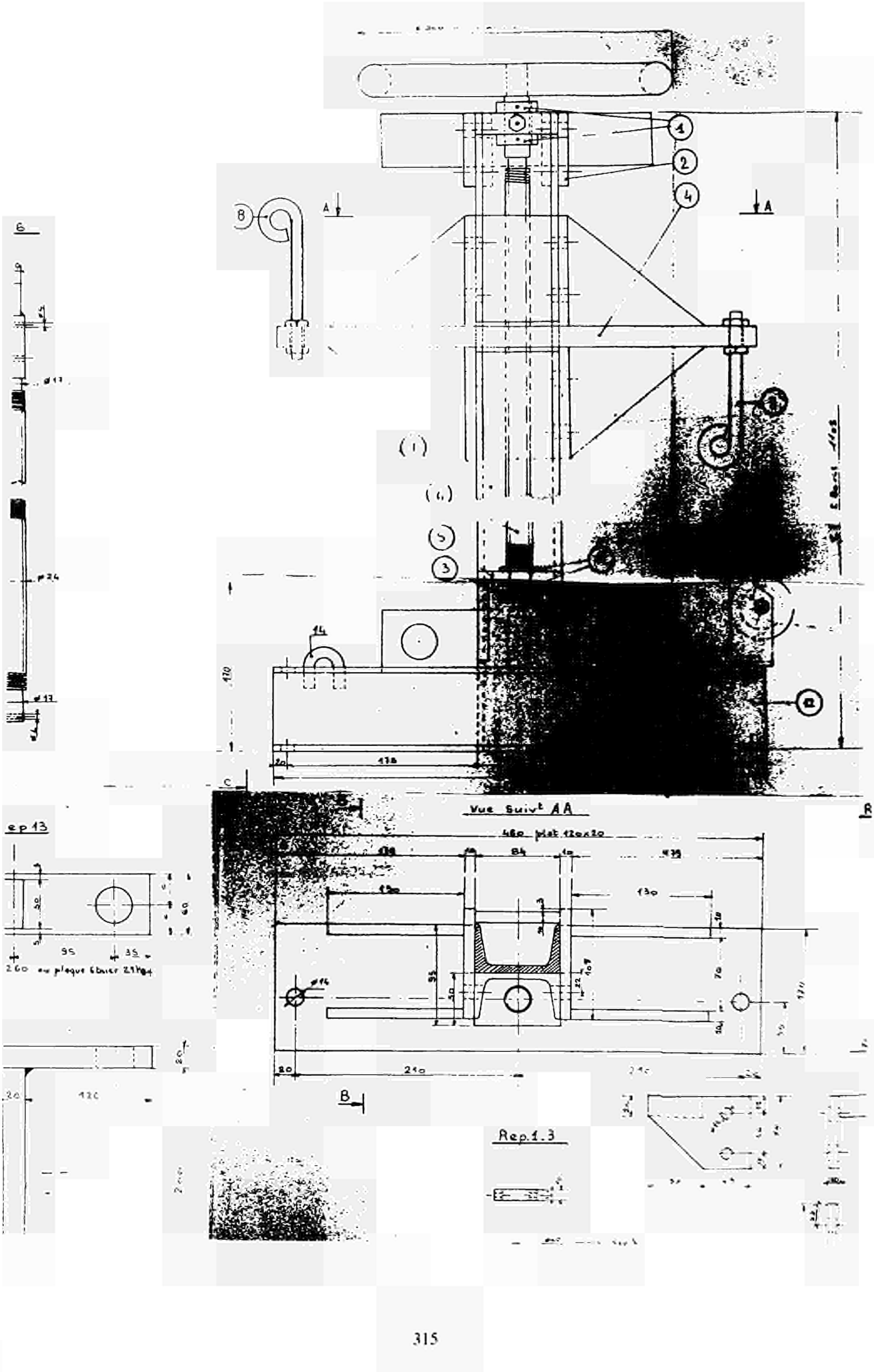
COMMANDE

POUR [redacted]

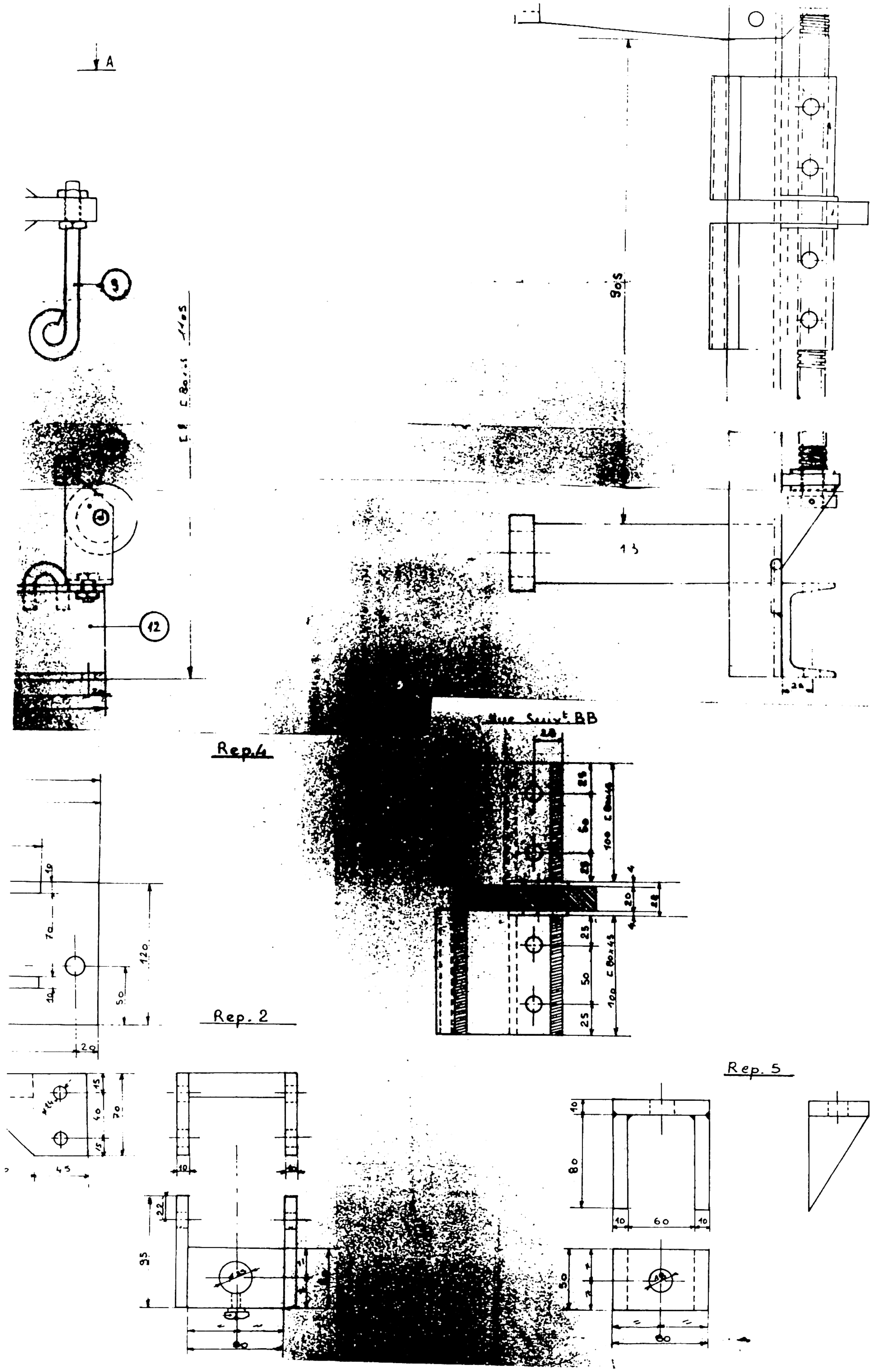
Repère	Nombre	Désignation
1	2	Voir détail
2	1	" "
3	1	" "
4	1	" "
5	1	" " (soudé sur Rep 7)
6	1	tige filetée ø24 pas carré (Voir détail)
7	1	C de 80x45 Long 1105
8	1	tige fileté ø12
9	1	" " "
10	1	Poulie de Lavabo
11	2	Rondelles plates 18 x 56
12	1	C 80x45 long. 470
13	1	Voir détail (soudé sur Rep. 7)
14	2	Maillon ø10 (soudé sur Rep 12)
15	1	Voir détail

Rep 6





1)


A
Rep.4
Rep. 2
Rep. 5

APPENDIX 5

Circular from the Chief Mines Inspectorate of North-Rhine-Westphalia of 17 August 1971 concerning 'Fans with combined electric/air drive (Combination fans)'

ELECTRICAL APPARATUS

To the Inspectorates of North Rhine-Westphalia

Subject : Fans with combined electric/air drive ("Combination fans")

The Berggewerkschaftliche Versuchsstrecke has recently carried out tests on this type of fan to determine whether in compressed air operation the electric drive, deactivated but acting as a generator on account of the remanence in the iron of its rotor (which continues to be driven), is capable of generating energy sufficient to ignite firedamp.

These studies have shown that firedamp can be ignited at around one third nominal revolutions (3 000 rpm) of the fan by a short-circuit across the terminals. Current peaks of over 1 A were noted.

The results of similar studies on motors running down, and on face conveyor drives which are deactivated but continue to rotate, have been known for some time. These results led to the requirement in service instructions for electricians that work may not be carried out on motors, their cables and associated switchgear after shutdown until the rotors have come to a standstill.

I consider the following action advisable :

1. In accordance with the provisions of § 124 BVOE(Mining regulations for electrical apparatus) electricians are to be informed of the dangers arising from the generative operation of motors and the service instruction to be supplemented if appropriate [1].

2. The provisions of § 1o9 subpara. 1 BVOE [1] also apply to this generative operation. All components of an installation in which a remanent potential occurs are to be considered as live.

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1) see pages 2/3

3. Combination fans, the design of which may give rise to the same hazards, should not be used in workings for which an exemption from § 15o subpara. 1 BVOSt (Mining regulations for hard coal mines) [1] has been granted or is being sought.

Dortmund, 17.8.1971

Landesoberbergamt NW

Coenders

1) see pages 2/3

1. Excerpt from the Mining regulations for electrical apparatus issued by the Chief Mines Inspectorate North-Rhine-Westfalia

Art. 1o9

Work on live parts of electrical installations in underground workings exposed to firedamp hazards, and in areas exposed to explosion hazards.

(1) In underground workings exposed to firedamp hazards, and in areas exposed to explosion hazards, work on live parts and the internal cleaning of equipment through which current is passing are forbidden.

(2) Para. 1 does not apply to intrinsically safe installations or circuits ; exceptions to this are parts of power networks and power sources which are not intrinsically safe, belonging to such installations or circuits.

(3) If both dead and live parts are accommodated within the same housing, work may be done on the dead parts only if the design is such as to exclude all risk of accidental contact with the live parts.

(4) Para. 1 does not apply to the changing of batteries for local battery-telephone systems.

(5) Notwithstanding the provisions of para. 1, firedamp-proof or explosionproof testing appliances may be applied to live parts (Articles 98 & 99).

Art. 124

Instructions to electricians on measures for maintaining the protection against firedamp and explosion

(1) In mines where the workings are exposed to firedamp hazards, the Owner or the qualified electrical engineer appointed by him must instruct the electricians at intervals of not more than two years on the measures which have to be taken to maintain the protection of the equipment against firedamp hazards. A set of appropriate instructions must be issued to them.

(2) In mines with electrical installations in areas exposed to explosion hazards, the Owner or the qualified electrical engineer appointed by him must instruct the electricians at intervals of not more than two years on the measures which have to be taken to maintain the protection of the equipment against explosion hazards. A set of appropriate instructions must be issued to them.

2. Excerpt from the Mining regulations for hard coal mines issued by the Chief Mines Inspectorate North-Rhine-Westfalia

Art. 150
Air volume

(1) The volume of air supplied to the workings should be such that the air in the clear cross-section of the workings as a whole should contain less than 1 % mine gas (CH_4). The Mines Inspectorate can grant exceptions under para 1, up to a level of 1.5 % CH_4.

PROPOSAL TO GOVERNMENTS

for

PRODUCTION WELL COMPLETION OFFSHORE

COMMISSION OF THE EUROPEAN COMMUNITIES

SAFETY AND HEALTH COMMISSION FOR THE MINING AND EXTRACTIVE INDUSTRIES

Working Party

on

Oil, Gas and other materials extracted by borehole

Committee of Experts

on Well Control

PROPOSAL TO GOVERNMENTS
for
PRODUCTION WELL COMPLETION OFFSHORE

This proposal is the third stage of the work of the Committee of Experts, referred to in paragraph 2 (2.3.) of paper 3318/6/77 and forms the continuation of that document.

Adopted by the SAFETY AND HEALTH COMMISSION
FOR THE MINING AND EXTRACTIVE INDUSTRIES
on 7 september *1979*
in accordance with articles 1 and 4 of the terms of reference,
and article 1 of the Council decision of 27 june 1974
on the extension of the responsabilities of the Safety and Health Commission

LUXEMBOURG, 1979

A. Naturally flowing production wells

1. In section A, the wells referred to are those which can produce oil and/or gas under naturally flowing conditions to the surface.

2. Christmas trees of such wells above the sea-surface require two master valves, the highest one remotely controllable, one valve in the flow-wing and one swab valve with a manometer connection and valve.

3. Wellheads of such wells which are above the sea-surface must be equipped with two outlets for each annular space between casings.
The components of the wellhead above the surface-casing housing must also have a valve removal capability.
Each outlet must be closed off with a valve if the annular space has open connection to the formations. If there is no open connection to the formations only one of the outlets must be closed off with a valve.
The annular space between casing and tubing must have two outlets each with two valves. The outlets, valves and annular space between casing and tubing must be large enough to permit the well to be killed.
The wellhead with flanges and spools must be sufficiently strong for the expected pressures. Provision must be made for the monitoring of all critical annuli.

Remark : On christmas trees and wellheads the installation of a second valve is recommended when regular valve operation is foreseen.

4. Christmas trees of such wells below the sea-surface require at least one remotely controllable master valve and a similar valve in the flow-wing.

5. Wellheads of such wells below the sea-surface must be equipped with at least one remotely controllable valve of a size which is sufficient to permit the killing of the well. Provision must be made for the monitoring of all critical annuli.

6. The pressure rating of the christmas tree and the flowline must be adequats for the maximum expected pressure to which each is subjected.

7. The tubing hanger must be provided with a facility to accomodate a plug or safety valve.

8. The tubing must be equipped with a surface controlled subsurface safety valve below the mudline.
The proper working of this valve must be tested at least twice yearly.
Details and dates of the tests must be recorded.

Remark : The installation depth of the valve should be adapted both to the type of formations just below the sea-bed and to the depth of water.

9. The production tubing should preferably be equipped with a circulating device down-hole.

10. Such wells must be equipped with a production packer in the casing as close as possible above the producing interval, to seal off the annular space between the casing and the tubing.

11. The production packer or tailpipe below the packer must be provided with a facility to accomodate a retrievable plug or safety valve.

12. A safety device must be installed to activate the closing of the well in the event of abnormal flowline pressures.

B. <u>Artificially producing wells</u>

1. In section B of this document the wells refered to are those which can not produce oil and gas under naturally flowing conditions to the surface.

Remark : Where the quantity and/or pressure of oil and gas flowing naturally from a well would not create dangerous conditions, such a well may be included in this section.

2. The energy supply to an artificially producing well must be shut off automatically in case of damage to the christmas tree or flowline, whether the energy supply is electric, high pressure gas, air or hydraulic oil.

3. All provisions under A are applicable to artificially producing wells, except provisions 1, 8, 10 and 11.

C. <u>Général</u>

A full specification of the completed well must be available in every case.

Remark : The specification should include all test results.

ANNEX VI

PROPOSAL TO GOVERNMENTS

for

WORKOVER PROGRAMME OFFSHORE

COMMISSION OF THE EUROPEAN COMMUNITIES

SAFETY AND HEALTH COMMISSION FOR THE MINING AND EXTRACTIVE INDUSTRIES

Working Party

on

Oil, Gas and other materials extracted by borehole

Committee of Experts

on Well Control

PROPOSAL TO GOVERNMENTS
for
WORKOVER PROGRAMME OFFSHORE

This proposal is the fourth stage of the work of the Committee of Experts, referred to in paragraph 2 (2.4.) of paper 3318/6/77 and forms the continuation of that document.

Adopted by the SAFETY AND HEALTH COMMISSION
FOR THE MINING AND EXTRACTIVE INDUSTRIES
on September 7, 1979
in accordance with articles 1 and 4 of the terms of reference, and article 1 of the Council decision of 27 June 1974 on the extension of the responsibilities of the Safety and Health Commission.

Luxembourg, 1979

WORKOVER PROGRAMME OFFSHORE

1. A workover is an operation involving the removal of the christmas tree to permit downhole operations and which requires the killing or securing of the well. A programme must be issued before work is begun.

2. The programme must include details on the following :

2.1. The justification of the workover, including a brief production history.

2.2. All crucial data of the well : e.g.

1. field-name, number and location (co-ordinates) of well,
2. date of the original completion or last workover,
3. a plot of the well deviation, if applicable,
4. a description of the well production casing, its specifications, setting depth and the depth to the top of the annular cement,
5. completed interval and perforations,
6. a description and specification of the surface or sub-sea completion, including the wellhead installation,
7. a full specification of the down-hole completion,
8. maximum expected closed-in tubing and annular pressures,
9. bottom hole formation pressures and reference depth,
10. bottom hole and surface well temperature,
11. contents of tubing and annular spaces,
12. production mechanism,
13. open flow potential.

2.3. The workover unit to be employed.

2.4. The wellhead safety installations to be installed.

2.5. The sequence of the workover operations, indicating any foreseeable alternative step - and in particular commenting on critical operations.

2.6. The method of safe-guarding adjacent wells, if applicable.

2.7. The estimated duration of the work.

2.8. The job title of the responsible persons, designated by the operator to take charge of operations on the side and on the land base.

GENERAL REMARK

Important changes of programme must, when safety conditions permit, be notified in advance

ANNEX VII

PROPOSAL TO GOVERNMENTS

for

THE MONITORING OF DUST NEUTRALIZATION
BY CALCAREOUS DUST IN THE UNDERGROUND WORKINGS OF COAL MINES

COMMISSION OF THE EUROPEAN COMMUNITIES

SAFETY AND HEALTH COMMISSION FOR THE MINING
AND OTHER EXTRACTIVE INDUSTRIES

Working Party
"Flammable Dusts"

PROPOSAL TO GOVERNMENTS

for

THE MONITORING OF DUST NEUTRALIZATION BY CALCAREOUS DUST IN THE UNDERGROUND WORKINGS OF COAL MINES

Adopted by the
Safety and Health Commission for the Mining
and Other Extractive Industries
on 25 march 1980
and sent to Governments
as a proposal
in accordance with Art. 1 and 4 of its terms of reference

RECOMMENDATION CONCERNING THE MONITORING OF DUST NEUTRALIZATION BY CALCAREOUS DUST IN THE UNDERGROUND WORKINGS OF COAL MINES

1. INTRODUCTION

1.1 The terms of reference of the Working Party on Flammable Dusts laid down by the Mines Safety and Health Commission are as follows:

'To carry out a study of precautions against the combustion and explosion of dust, in particular:

- dust neutralization..., this study to include the comparative analysis of the regulations in the Community countries, along with the methods of application of the different procedures...'

1.2 In 1974, The Working Party commenced such a comparative study of the procedures employed in the various countries, and by 1976 this study had already led to a recommendation on the application of dust binding by hygroscopic salts (adopted by the Mines Safety and Health Commission on 3 September 1976).

1.3 In addition, on 11 July 1975 the MSHC stated that it 'attaches great importance to any conclusions that it (the Working Party) may draw (from the examination of the Lens - Lievin accident of 27.12.1974), especially if harmonized measures for the most effective control of dust explosions in coal mines can be proposed.'

1.4 With this harmonization in mind, the Working Party has carried out a comparative detailed analysis of the procedures for monitoring stonedusting in the Member States, both from the point of view of the regulations currently in force in these States and of their practical application.

1.5 This document concerns all mine workings where the method used to neutralize dust is stonedusting with calcareous dust, and is not concerned with workings where other neutralization methods are employed.

2. EXPLANATORY MEMORANDUM

2.1 The purpose of stonedusting is to prevent the initiation and propagation of dust explosions by rendering the dust which can be raised into the air non-explosible. This dust must therefore contain, everywhere and at all times, a minimum percentage of inerts as specified in national regulations.

2.2 In the 'Recommendation on the application of dust binding by hygroscopic salts etc...', the MSHC states that it 'considers stonedusting as acceptable provided that it is carried out with appropriate regularity'. As its effectiveness decreases with the passage of time, stonedusting must therefore be monitored at suitable intervals.

2.3 Monitoring of stonedusting generally comprises the measurement of the neutralization ratio of samples made up of increments taken at specific points or from specific areas. But experience has shown that the formation of dust deposits in roadways is not regular, and this constitutes a difficulty when approaching the problem of sampling.

2.4 In fact, numerous factors influence the deposition of dust: of these, the following are the most important:-

- the quantity and particle size of the dust generated;
- the location of the deposits relative to their sources;
- the velocity of the air current and the obstacles encountered;
- the variations in direction and cross-section of roadways;
- transport and other types of movement;
- the nature of the roadway surfaces.

2.5 In principle, one ought to take into account all these factors when choosing a system of sampling.

In this way the Working Party has brought forward a recommendation that a very general distinction should be made between two types of workings:*

- Type A: Workings or part of workings situated near a source of emission of dusts and in which the depositions of dust are large and irregular.
- Type B: Workings or part of workings situated a greater distance from such sources, and in which the dust depositions are smaller and more uniform.

The present document makes in addition recommendations concerning:

- on the one hand, certain aspects of monitoring in general (Chapter 3), and of sampling in particular (Chapter 4):
- on the other hand, the preparation of samples for analysis, and their actual analysis (Chapter 5).

Concerning other aspects of sampling, each of the interested countries has its own principles and its own system, hallowed by long years of use. These principles and systems are described in Annexes I to IV.

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* It is up to the competent national authorities to divide underground workings into these two types.

3. MONITORING REQUIREMENTS

3.1 The object of stonedusting is to obtain, everywhere and at all times, in the surface layer* of deposited dust, not less than a minimum percentage of inert matter (fixed by the national regulations, as stated in para. 2.1).

3.2 The responsibility for the relevant measures rests with the mine manager, i.e. he must arrange for stonedusting operations to be carried out at intervals which depend on the dust concentration in each roadway or length of roadway.

3.3 The mine manager must also be satisfied that these measures achieve their purpose, i.e. that the neutralization ratio is adequate everywhere and at all times.

3.4 In consequence, it would be desirable, on the one hand, to provide for stonedusting operations as a function of the characteristics of each roadway on the basis of experience and/or the systematic measurement of the amount of coal dust deposited, and, on the other hand, to keep a record of controls carried out.

3.5 Great importance attaches to the training of the personnel responsible for the monitoring. This training should cover both theoretical aspects (causes and development of explosions, mechanism of the various preventive methods, etc.) and practical aspects (proper application of these methods and proper verification of their effectiveness).

3.6 Frequency. As a consequence of what has been said above, and because the manager is always responsible for the efficacy of the methods used, he must be allowed a certain latitude concerning the frequency of monitoring in a particular working or part of a working.

A maximum interval between two consecutive monitoring operations should certainly be recommended. This maximum is 1 month for Type A and 3 months for Type B workings. For workings where the manager is able to show that the quantity of coal dust deposited is small or that the variation of the degree of neutralization is negligible over the period mentioned above, these maxima may be extended by law**

4. SAMPLING UNDERGROUND

4.1 General principles

The general distinction between two types of underground workings (mentioned in para. 2.5) has already led us to a recommendation for the frequency of monitoring based on the type. This same principle is recommended in respect of the number of samples and the distance between them: it seems logical that the density of sampling - like the frequency - should be greater in workings of Type A than in those of Type B.

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*The work 'surface' is used here in the sense that will be explained in paragraph 4.3.

**The principles stated in this paragraph may be changed if new and reliable methods of continuously measuring deposited dusts are developed and applied.

4.2 Sampling of the different surfaces of the roadway

The general rule on this subject can be put as follows:

In Type A workings, one makes up at least two samples: the first by means of increments taken from the floor and the second, distinct from the first, by means of increments taken from the other surfaces.

In Type B, a single sample is formed from increments from the floor and the other surfaces.

Possibly, one could have 3 samples: floor, roof and sides.

The particular case where the floor is treated with hygroscopic salts, and the roof and sides by stonedusting, is left to the consideration of the national authorities in those countries where this is practised.

4.3 Depth of sampling

When an explosion occurs, the thickness of the layer of dust which is raised into the air depends on the intensity of the explosion. Stonedusting - like the other procedures for preventing dust explosions - must prevent the propagation of any explosion, even of the least violent ones that raise only a thin surface layer of dust. The effectiveness of neutralization must therefore be guaranteed, even for a surface layer of limited thickness. From a practical viewpoint, however, it would be difficult to stipulate sampling to a small precise number of millimetres.

A compromise between these two viewpoints leads one to recommend a sampling depth, or thickness, of:

- not more than 1 cm for the floor;
- not more than 5 or 6 mm for the other surfaces.

Sampling should be carried out with a paintbrush or flexible sweeping brush. For the floor, use may also be made of a scoop.

4.4 Sampling in lengths of wet roadways*

The question whether, in a length of wet roadway, stonedusting or some other method should or should not be applied, is not the concern of this document which only deals with the monitoring of stonedusting.

The problem of sampling in a damp length of road where stonedusting is nevertheless carried out may arise. In this case, the sampling should be carried out according to the general rule.

We shall discuss in para. 53 the moisture content of the samples that are collected and of the samples prepared for analysis.

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* One may note here the interest shown in water-resistant limestone for stonedusting when the moisture in the air is such that normal limestone has a tendency to agglomerate and so become ineffective.

N.B. the German delegation requests that this note be deleted.

5. PREPARATION AND ANALYSIS OF THE SAMPLE

From the total sample collected as described in Section 4 (and in the Annexes I to IV), a sample for analysis is obtained by means of a series of operations. This series of operations is referred to as the preparation. The sample so obtained is subjected to one or more operations in order to determine the neutralization ratio. This is called the analysis.

5.1 Preparation of the sample to be analysed

5.1.1 The final sample for analysis is obtained from the total sample collected by:

- mixing and successive divisions into quarters;
- sieving with a sieve of 250 μm mesh, the waste in this sieve being thrown away;
- drying at a temperature of 105 $\pm$ 2°C;
- determination of the moisture content if knowledge of this variable is desired.

A detailed description of these processes does not seem necessary in a document such as this.

5.1.2 Depending on established practice and the size of the total samples taken, a more or less substantial part of the preparation can take place underground.

5.2 Analysis of the sample

5.2.1 Several methods are in use in the different countries of the Community: one of them is used, in different ways, everywhere and has been harmonized, and is recommended as a common method. This is combustion at a temperature of 490 $\pm$ 10°C.*

5.2.2 The other methods, which have been proved for some time, need not be excluded. As a matter of information, these are listed in annex V.

5.2.3 Analysis of a sample by combustion at 490 $\pm$ 10°C.

A quantity of approx. 1 g, (weighed to the nearest 0.1 mg), is taken from the sample prepared as in 5.1 and spread out on a dish or boat made of silica, porcelain or platinum.

This quantity is placed in a cold muffle furnace and heated to a temperature of 490 $\pm$ 10°C until its mass is constant (loss of mass $<$ 1 mg).

The quantity is weighed to the nearest 0.1 mg after it has cooled in a dryer. The neutralization ratio N of the sample analyzed is expressed as a percentage by the formula:

$$N = \frac{m_2}{m_1} \cdot 100$$

where m_1 is the mass of the dried sample, and m_2 is the mass of the residue. The result is recorded to one decimal place.

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*In recommending this method, it is not the intention to exclude any new methods, accurate and quicker, which may be brought forward in the future.

5.3 Moisture content

It was stated in paragraph 5.1.1 that the moisture content of the sample could be determined if desired.

But the question of whether or not to count the moisture content as part of the inert material in the sample is not within the competence of the present document.

(5.

Annex I

Principles and practice of sampling in Belgium: present conditions and the future

The 'Code des Mines' states a very general rule on measures to prevent the initiation and spread of a dust explosion: 'In the roadways of any classified mine... coal dust which could be dispersed into the air shall be bound or neutralized by means of substances which do not contain free silica'.

The general rule is applied in practice through directives set out in circulars from the Chief Inspector of Mines. Thus the current method of sampling is based on the circular of 24 July 1963, of which Article 5 stipulates:

'The effectiveness of stonedusting... shall be monitored once a month by taking and analysing representative samples from each stonedusted zone... In a neutralized zone exceeding 50 m in length, at least four samples are necessary, of which two (one from the walls and one from the floor) shall be taken per zone of 20 m or of 20 compartments of supports.

The distance between these two zones shall not exceed 100 m.

Each sample shall comprise a mixture of 20 increments obtained in the following way:

A. (walls) the 20 increments ... shall be judiciously distributed over a spiral ...

B. (floor) the 20 increments shall be taken at points vertically below where the corresponding increments for the first sample were taken.'

The 'philosophy' of such monitoring is simple: it is monitoring by sampling, every neutralized zone being 'represented' by two sampling zones. Of course, the monitoring in successive months relates to sampling zones which change from one month to the next.

Belgium considers that these principles are still valid. The only lacuna observed is the absence of a definition for 'neutralized zone': this expression is generally interpreted as denoting an entire roadway, whatever its length.

After studying the procedures followed in the other countries, the Belgian authorities are contemplating the following amendments to the regulations (which will be explained in detail below by way of example):

- 20 m-long sampling zones;
- 2 x 20 increments from each of these zones (walls and floor);
- the distance between the sampling zones would vary according to the characteristics of the roadways and the dust concentration. The maximum distance could for example be fixed:

- at 200 m in the conveyor roadways used for transporting coal (type A workings);
- at 300 or 400 m in the other stonedusted workings (type B workings).
- There should always be one sampling zone in the 100 m length of roadway downwind of each dust source.
- The position of these sampling zones would vary from one monitoring operation to the next, so as to cover the whole length of the working in a certain period of time.
- The results of the analysis of the samples would be recorded in a register laid out to give an overall view of each stonedusted working with its characteristics and its dust sources.
- The monitoring operations as a whole would be the responsibility of a person appointed for that purpose by the mine management.

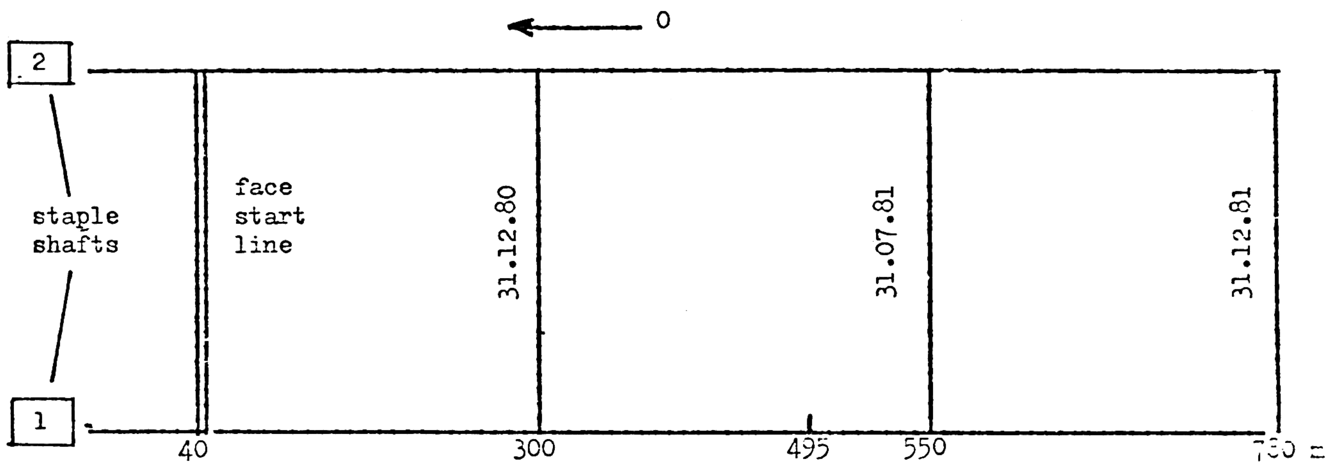
The application of such a method is intended to achieve the following results:

- excellent monitoring by sampling;
- the material aspects of monitoring are not too cumbersome;
- nevertheless, special attention is given to the points at which large dust deposits are to be expected.

<u>Example of the application of the above principles</u>

This example relates to the main gate and intake airway of an advancing face in operation.

<u>Diagram of the face</u>



The conveyor belt discharges the coal into the spiral chute of staple shaft 1.

A number of hypotheses had to be made, regarding this face, before it was possible to complete the attached table.

- The rate of advance of the face is 40 m a month.
- At the end of 1980 the gate is 300 m long.
- At the end of July 1981 it reaches 550 m, and it is necessary to install a second belt conveyor; the coal falls from this conveyor onto the first conveyor at point 495.

ROADWAY   Designation   Bottom Road 0 123

Type A   Conveyor roadway (coal)

YEAR: 1981

floor
walls

Dust Sources	Length of roadway from..to..	Date of sampling - Results of analyses 1979 01	02	03	04	05	06	07	08	09	10	11	1979 12
Gravity conveying in staple shaft	0- 20	X					X					X	
	20- 40		X					X					X
	40- 60			X					X				
	60- 80				X					X			
	80-100					X					X		
	100-120						X						
	120-140												X
	140-160							X					
	160-180											X	
	180-200								X				
	200-220	X											
	220-240		X										
	240-260			X						X			
	260-280				X								
	280-300					X					X		
	300-320						X						
	320-340												X
	340-360							X					
	360-380											X	
	380-400							X					
	400-420												
	420-440										X		
	440-460									X			
	460-480												
495 m: transfer point between two conveyor belts	480-500												
	500-520												X
	520-540								X				
	540-560									X			
	560-580											X	
	580-600										X		
	600-620												
	620-640												
	640-660												
	660-680												
	680-700												X
	700-720												
	720-740												
	740-760												

Certain points concerning the registering of the results:

- In the first column the fixed sources of dust are noted.
- The second column comprises the division of the roadway into 20 m-long sampling zones.
- The other columns are used for entering the results of the monitoring carried out during each month of a given year.
- The shaded portion of the table represents the part of the roadway not yet driven at the time successive monthly samples are taken.
- The crosses entered in the table represent the instructions given to his staff by the person responsible for monitoring. Their distribution takes account of the requirements formulated above.

Annex II

Principles and practice of sampling in West Germany

In German collieries, stonedusting is practised mainly outside the winning area. In gate roads, as well as in other workings where the deposition of dust is considerable. coal dust is bound using hygroscopic salts. Stonedusting is therefore practised in mine workings where the dust concentration is generally lower than in the winning area.

With regard to sampling, practice is based on the fact that the quantity of dust deposited becomes progressively less the further one goes from the dust source in the direction of the air flow. That is why samples need only be taken at a small number of points.

The samples are therefore taken at such points, for example downwind of loading or transfer points, at air doors, etc. The choice of these sampling points, whether fixed or variable, is the responsibility of the 'Explosionsschutzsteiger'* ('explosion control deputy'). It is he who must take the necessary decisions in the light of his training and experience.

For sampling, it is the walls which must be considered first and foremost. A sample from the floor is not necessary if only very small quantities of dust that can be raised into the air are deposited there, and also because the dust on the floor is very often kept indispersible, either through dust binding or through natural dampness. Sampling from the roof is usually not done, for experience has shown that coal dust deposits are greater on the walls than on the roof, and because the roof can usually be reached only by using special equipment.

Consequently, samples are in practice taken in the following way. At each of the chosen points, at least 50 cm^3 is taken from the dust deposited on the walls or on the roadway installations. The increments are taken on both sides of the roadway, at knee-height, chest-height, and raised-arm height. When deposits of dust are small it may be advisable to take samples in a zone of about 10 metres' length. When samples are taken from the floor, they must be kept apart and analyzed separately.

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*The 'Explosionsschutzsteiger' is a person whose essential task comprises supervision and monitoring of all measures to protect against explosions, neutralization and binding of dust, barriers, etc.

With regard to the stonedusting process, this means that it is the 'Explosionsschutzsteiger' himself who must take the samples.

Annex III

Principles and practice of sampling in France

Principles

The sample should be representative of the average concentration in the monitored zone of dust that is liable to be raised into the air and ignited during a dust explosion.

Samples should be taken at regular intervals in lengths of the roadways that are homogeneous from the point of view of dust concentration.

The length of a homogeneous section decreases and samples should be taken at closer intervals with increasing proximity to the dust source. In the vicinity of these sources it becomes necessary to make up two separate samples - one from the floor and one from the rest of the surface of roadway. At distances of more than 300 m from the dust source this is not compulsory.

Practice as provided for by new draft regulations

Each roadway is divided into sections which are homogeneous from the point of view of dust concentration. The maximum length of a section is 1000 m when outside a district and 200 m in district roadways. In the vicinity of dust sources, this maximum is reduced to 50 m.

Two separate samples are made up, - one from the floor, and one from the roof and the walls, up to a distance of 300 m from the working face, after which a single sample is permissible.

Sampling increments are taken as follows (L = length of section):

- every $\frac{L}{50}$ up to 300 m from the working face;

after which :

- every $\frac{L}{50}$ with a lower limit of 4 m if the roadway contains belt conveyors;
- every $\frac{L}{25}$ if there are not belt conveyors.

Annex IV

Principles and practice of sampling in the United Kingdom

The philosophy and practice derive from a regulation which, broadly speaking, requires that any dust on the floor, roof or sides that can be raised into the air shall contain not less than a minimum amount of incombustible matter, the amount depending on the volatile content of the coal. Sampling is required to check that this regulation is being complied with.

In practice, the average composition of the dust on the floor, roof or sides over 80 m lengths or roadway is determined. Roadways are, in effect, divided into lengths of 80 m, these being known as 'sub-zones', and alternate sub-zones are sampled at monthly intervals. This means that the whole length of a roadway is sampled at intervals of no more than two months; the frequency of sampling, however, may be reduced when experience has shown that the deposition of coal dust is low.

The method has the advantage that the personnel carrying out the sampling have a relatively routine and well-defined task and are not faced with the question of choosing a length of roadway over which to sample in order to obtain average conditions, or worse than average conditions, as the case may be. It also means that the accuracy of sampling, that is the degree to which samples reflect conditions along the whole length of the roadway, is likely to remain constant over a period of time and be consistent from one roadway to another.

The amount of sampling done is great, but it is felt that the effort is justified because it has been shown that conditions can be maintained within acceptable limits by this means.

Annex V

Methods, other than combustion at around $500^{\circ}C$, which are currently in use in one or more countries of the Community for the analysis of samples

Preliminary note:

This list does not exclude any new accurate and quicker method which may be developed in the future.

1. Combustion at $815 \pm 10^{\circ}C$

This method corresponds to the standard ISO 1171 for determining ash content. As it leads to decomposition of the carbonates contained in the stonedust, the level of carbon dioxide must be determined separately.

2. Combustion at temperatures above $950^{\circ}C$

The above remarks also apply this method which would appear to give rise to more complex chemical phenomena.

3. Volumetric method

Two volumes are compared: the one is that of a weighed amount of the mixture of coal-dust and calcareous dust that constitutes the sample and the other is that of the same weight of a standard mixture. This method must be frequently calibrated.

4. Colorimetric method

Comparison of the colour of the sample for analysis with that of a sample containing 80% or more incombustible matter.

Methods 3 and 4 must be verified periodically by comparing the results with those of analysis by combustion.

ANNEX VIII

PROPOSAL TO GOVERNMENTS

for

THE CONSTRUCTION AND TESTING OF CHEMICAL OXYGEN SELF-RESCUERS FOR USE IN COAL MINES

COMMISSION OF THE EUROPEAN COMMUNITIES
SAFETY AND HEALTH COMMISSION FOR THE MINING AND EXTRACTIVE INDUSTRIES
Working Party
on
Rescue Arrangements,
Mine Fires and Underground Combustion
Committee of Experts
on
Self-rescuers

PROPOSAL TO GOVERNMENTS

for

THE CONSTRUCTION AND TESTING

OF CHEMICAL OXYGEN SELF-RESCUERS

FOR USE IN COAL MINES

Adopted by the
Safety and Health Commission for the Mining
and other Extractive Industries
on 7. May 1980
and sent to Governments
as a proposal
in accordance with Art. 1 and 4 of its terms of reference

Doc. 4936/8/78 E   LUXEMBOURG - July 1980   Printed separately 1980

Preface

The filter self-rescuer, with which the majority of miners in the European Coal Mining Industry is equipped, represents a compromise between the ideal requirements and the technical feasibility of an effective escape apparatus, since such rescuers will permit the escape of personnel through fire gases or post-explosion fumes only in the presence of sufficient oxygen and the absence of too high concentrations of carbon monoxide. The ineffectiveness of filter self-rescuers in oxygen deficient atmospheres had already caused the High Authority in 1957 to promote by financial means the development of self-rescuers to give full protection against toxic gases and the lack of oxygen. Prizes were awarded in 1962 for two types of such "full protection self-rescuers." The maximum protective life of these devices was about 45 minutes.

The Working Party on Mines Rescue and Mine Fires, after publication of Parts I to III of the Report on Filter Self-Rescuers", under a remit from the Mines Safety and Health Commission, has closely followed the further development of the "full-protection" self-rescuers for the mining industry. Latest apparatus of this type uses the principle of oxygen storage in chemical form, a method that, after some initial doubts, is no longer regarded as unacceptable in the coal mining industry. The increasing use of diesel-engined trackless vehicles in mines and its associated increase in fire hazard also were among reasons for the remit to the Experts' Committee on Self-Rescuers to prepare the Guidelines for the Construction and Testing of Oxygen Self-Rescuers *) giving a protection for 90 mins. even in difficult escape conditions. These Guidelines are presented herewith, as a guide for rescuers for use in coal mines.

The requirements on which these Guidelines are based approximate in their severity to the regulations in force in the U.S.A. At the moment there are no commercially available oxygen self-rescuers which fulfill the requirement for a 90 min. life under these conditions. Until apparatus to comply with these European Guidelines is built (to be known as "standard apparatus") testing of lighter apparatus of similar type should be carried out according to the procedures listed herein.

*) In France such apparatus is called APEVA.

In the meantime apparatus with a test life of 60 min. at a minute volume of 30 litres on the artificial lung will be accepted. Such apparatus will be called "light-type oxygen self-rescuer". As soon as "standard apparatus" become available on the market (except in special cases) only apparatus of the standard type should be acquired.

The Working Party on Mines Rescue and Mine Fires takes it that the present Guidelines will be published as a recommendation of the Organe Permanent. After publication of the recommendation the Working Party and its Experts' Committee on Self Rescuers will still have to continue with the preparation of proposals for the check-testing and training in the field

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1) Commission of the European Communities, Safety and Health Commission for the Mining and Extractive Industries.

The Use of Filter Self-Rescuers in Coal Mines in Member States of the European Community.

Document No. 3919/79E

Luxembourg, 1979

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Guidelines for the construction and testing of chemical oxygen self-rescuers

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Guidelines for the construction and testing of chemical oxygen self-rescuers

1. Procedure for testing and approval

1.1 Procedure used in the German Federal Republic.

The manufacturer of a chemical oxygen self-rescuer applies to the director of the German Mines Rescue Committee in quadruplicate to have the device tested for its suitability as an escape apparatus for use in deep mines. The application must state clearly the designation of the apparatus and the name of the manufacturer. Drawings and description of the apparatus should be appended in quadruplicate. The application should be accompanied by 8 sets of apparatus together with parts needed for testing by the testing establishments of the Committee.

The director of the Committee passes one copy of the application together with the drawings and descriptive material on to the testing establishments. The testing laboratories, independently of one another, carry out the tests specified in the Guidelines and report their results to the director.

When an apparatus is judged suitable by the Committee the director issues the applicant with a certificate (suitability certificate).

This suitability certificate forms the basis for the approval of the chemical oxygen self-rescuer by the Mining Authority in the Länder of the Federal German Republic. Only approved breathing apparatus (approved by the appropriate authority) may be used underground.

1.2. Procedure used in Belgium

The application for approval must be made by the manufacturer to the Chief Director of the Belgian Mining Authority.

One copy of this application, four prototypes to be tested, nine copies of descriptions and drawings must be sent to the Chief Engineer, Director of the INIEX test gallery, Paturages Division.

The apparatus is tested by the test gallery in accordance with the current regulations. When a positive result is obtained the test report on the apparatus is passed on to the Chief Director for approval.

Only breathing apparatus of a type and construction approved by the Chief Director of the Mining Authority may be used underground.

1.3. Procedure in France

In France there are no official approval conditions. The Apparatus is brought into use after tests at Cerchar and the rescue stations. The choice of the type of apparatus is entirely a matter for the owner of the mine.

1.4. Procedure in the United Kingdom.

The manufacturers apply for approval to the H.M. Mines Inspectorate, Health and Safety Executive. After a preliminary discussion (at which the fees are agreed) 2 sets of the apparatus are supplied for testing for compliance with BS. 4667, Part 4 at HSE Laboratories in Sheffield (SMRE).

If the apparatus passes this test practical men-wearing trials are made at the NCB Doncaster Mines Rescue Station. After successful completion of these trials the Health and Safety Executive issues a certificate to that effect. Having obtained this certificate the manufacturer applies to H.M. Mines Inspectorate for approval of the apparatus for use in mines. H.M. Chief Inspector of Mines then decides whether the apparatus is suitable for underground use and issues the appropriate certificate of approval.

2. General

2.1 Application and Storage

Oxygen self-rescuers must protect the underground personnel against toxic gases and lack of oxygen by providing an O_2 supply independent of the surrounding atmosphere. The guidelines are aimed at an oxygen self-rescuer that would protect endangered miners for 90 min. even in difficult conditions during escape in oxygen deficient atmospheres.

In coal mines, they should preferably only be stored in protected caches or carried on machines in protected places in order to prevent the risk of fire as a result of violent mechanical damage. In addition, they could serve as auxiliary apparatus for mines rescue services.

2.2. Definitions

The term oxygen self-rescuer 'as carried' describes the complete apparatus including the outer container. As a rule, it consists of the outer container and the actual oxygen self-rescuer.

The oxygen self-rescuer provides its wearer with oxygen generated by a chemical. Carbon dioxide and moisture in the exhaled air react with the chemical and produce the oxygen required for respiration.

2.3. Life

The life of an oxygen self-rescuer must be a least 90 minutes for a minute volume of 35 l/min, and at least 240 minutes for a minute volume of 10 l/min in a test conducted according to paragraph 4.2.2.1.

3. Guidelines for the construction of chemical oxygen self-rescuers

3.1 Physiological requirements

3.1.1 Oxygen content of inspired air

The oxygen content of inspired air may not be less than 21% O_2 by volume at any time.

3.1.2 Carbon dioxide content of inspired air

The carbon dioxide content of inspired air must not exceed 1.5% v/v

3.1.3 Temperature and humidity of inspired air

The temperature of inspired air may not exceed 50°C in a test conducted according to paragraph 4.2.2.1.

During wearer trials the inspired air must not lead to any intolerable drying out of the respiratory passages.

3.1.4 Purity of inspired air

The materials in contact with the respired air and the oxygen must not produce any harmful, evil-smelling or evil-tasting vapours or gases. Over and above this, the wearer's breathing and the functioning of the apparatus must not be impaired by dust.

3.1.5 Volume demand

Oxygen self-rescuers must at all times, especially immediately after donning, provide the necessary volume flow without causing any marked difficulty in breathing, it shall also perform satisfactorily at a high flow rate of 70 litres per minute for a period of five minutes (as per 4.2.2.1.1).

3.1.6 Respiration resistance

The total pressure change in the apparatus may not exceed 11.5 mbar when tested in accordance with paragraph 4.2.2.1. The pressure change during inhalation or exhalation must not exceed 6.5 mbar. The pressure change during exhalation may briefly reach 12.0 mbar shortly after the self-rescuer is put on.

3.1.7 Operating pressure of the relief valve.

The pressure relief valve must open in any position at an excess pressure of 2.5 ± 1.0 mbar.

3.2 Constructional requirements

3.2.1 Materials

Materials must be stable and retain their physical properties when stored over several years. The container must be adequately protected against corrosion.

The materials used must be of sufficient strength to withstand the mechanical stresses to which self-rescuers may be subjected when carried on mining machinery underground.

Light alloys must not be used for the outer case or for the exposed parts of the oxygen self-rescuer.

In order to avoid the accumulation of dangerous electrostatic charges, the surface resistivity of the materials used for the container must not exceed 10^9 ohms.

The apparatus must be so constructed that it cannot ignite H_2/air mixtures when used in the prescribed manner.

The starting device, if present, must be incapable of accidental activation.

3.2.2 Weight

No limit is prescribed for the weight of the oxygen self-rescuer and its container. The weight of the ready-for-use oxygen self-rescuer removed from its case and including the breathing connections must not exc eed 5.0 kg.

3.2.3 Dimensions

No specification

3.2.4 Supporting harness

The oxygen self-rescuer must have a harness giving safe and comfortable support when the device is worn. The harness must be adjustable within adequate limits.

The outer container must also be provided with carrying straps.

3.2.5 Handleability

The oxygen self-rescuer must be capable of being opened, donned and put into operation quickly, simply and without undue exertion in difficult conditions.

3.2.6 Breathing connection and goggles

3.2.6.1 Breathing connection

The breathing connection should consist of a mouthpiece with a nose clip. The mouthpiece shall have two 'teeth lugs' arranged so that they are gripped by the canine teeth or outer incisors. The part of the mouthpiece between the lips and the gums must be of a shape to ensure a good seal. The mouthpiece must not cause any irritation of the mucous membranes when worn for the whole of the protective life of the rescuer. It must be so constructed that the air passage cannot be accidentally restricted while the rescuer is worn.

The mouthpiece must be provided with an adjustable elastic support strap if it is likely to exert an undue pull on the wearer's mouth. The nose clip must provide an air-tight seal of the nose. It is flexibly attached to the mouthpiece and must have large pressure pads. The material in skin contact must be elastic, soft and non-slip and have no harmful effect on the nose.

3.2.6.2. Goggles

The oxygen self-rescuer must have anti-gas goggles with non-shatter lenses protected against misting. The head-bands must be flexible and easily adjustable.

3.2.7 Breathing tubes and breathing bag

3.2.7.1 Breathing tubes

If the apparatus has one or more breathing tubes, they must be flexible and allow an adequate range of head movement

3.2.7.2 Breathing bag

The breathing bag must either be made of a reinforced material or be specially protected. It must be highly impermeable to gas and resistant to ageing.

The useful volume of the bag must be at least 6 l.

3.2.8 Valves

3.2.8.1. Breathing valves

If the apparatus is fitted with breathing valves they must reliably govern the circulation of the breathing air.

3.2.8.2. Pressure relief valves

The apparatus must be fitted with one or more pressure relief valves incorporating non-return valves. The pressure relief valves must be automatic in operation. They must be sufficiently air-tight to prevent a change of pressure of more than 1 mbar in a volume of 1l. within one minute of a pressure of 10 mbar being exerted on the valves from outside. Other designs are permitted, provided they afford the same protection.

3.2.9 Air-tightness

3.2.9.1 Air-tightness of oxygen self-rescuers

When ready-for-use oxygen self-rescuers are subjected to a partial vacuum or pressure of 7.5 mbar using dry air with the pressure relief valve sealed, the pressure change shall not exceed 0.3 mbar within one minute.

3.2.9.2. Air-tightness of the container

The container must be designed to remain air-tight over a long period, even under very demanding conditions.

Loss of air-tightness must be easily and quickly recognisable.

3.3 Marking and instructions for use

3.3.1 Marking of the container

The container must be reasonably permanently marked.
The marking must state :

(a) The manufacturer

(b) Type of apparatus

(c) Serial No. of apparatus, month and year of manufacture of apparatus.

3.3.2 Marking of components

The following components must carry a permanent marking of the year of manufacture:

Breathing tube with mouthpiece

Breathing bag

Body of the goggles

Chemical cartridge

Starter Cartridge (if separate from the chemical container).

3.4.1 Instructions for use and Training Model O_2-Self-Rescuers

3.4.1 Instructions for use

The oxygen self-rescuer must be supplied together with instructions for use which give the information necessary for the use of the oxygen self-rescuer by suitably trained personnel:

Intended application

short description

tests

use

maintenance

care

storage

operation

Furthermore, indication of possible user errors should also be given.

The container should also have on it instructions for donning in pictogram form.

3.4.2. Training Model O_2- self-rescuers

The training model makes it possible to practise the donning of the apparatus and to simulate its use. It should, therefore, be just like the actual O_2-self-rescuer in its most important functions, in particular with respect to handling, donning, weight and breathing resistance.

4. <u>Guidelines for the testing of chemical oxygen self-rescuers</u>

4.1 General

Chemical oxygen self-rescuers should be tested to ensure that the conditions and requirements of the Guidelines for the Construction of Chemical Oxygen Self-Rescuers have been fulfilled.

The following test describes only apparatus and test procedures that require explanation. Additional tests can be undertaken by the testing establishments.

During testing allowance shall be made for the effect of the barometric pressure, ambient temperature and humidity.

If the rescuer is provided with a starting device it shall be operated at the start of the test. Otherwise the test in the test rig will be initiated according to the manufacturer's instructions for use.

Components taken from older oxygen self-rescuers which have already been tested and have undergone no changes in design or functional alterations require no further testing in the testing establishments.

If the apparatus to be tested is such that procedures described below are insufficient or can lead to an erroneous assessment, the testing establishments can alter the test procedures.

4.2 Laboratory testing

4.2.1 General guidelines for testing

Normal laboratory procedures and equipment should be used unless specific methods of measurement or equipment are mentioned in the following guidelines for testing.

4.2.2. Test to ensure compliance with physiological requirements.

The purpose of this test is to ensure that the oxygen self-rescuer meets the requirements stated in paragraph 3.1.

4.2.2.1. Testing of oxygen and carbon dioxide content of inspired air.

4.2.2.1.1. Test at breathing rate of 35 l/min. and 70 l/min.

A schematic arrangement of the equipment required for the test is shown in figure 4.5.1. The apparatus consists of an artificial lung with solenoid valves controlled by the lung, a humidifier, a connector, a CO_2 flowmeter, a gas meter, carbon dioxide and oxygen analysers and temperature and pressure meters.

The apparatus subjects the oxygen self-rescuer to a respiration cycle by the artificial lung (set at 1.75 l/inhalation, 20 inhalations/min), the respiratory air remaining in a circuit.

During the test, CO_2 is added to the exhaled air so that it contains 4.5% CO_2 in addition to the residual CO_2 in the air passing through the chemical canister. The CO_2 is fed into the artificial lung via a control valve, a flow meter, a gas meter, compensating bag and a non-return valve.

Immediately behind the humidifier a small quantity of exhaled air is continuously withdrawn through a sampling line and then fed into the exhaled air via a CO_2 analyser in front of the humidifier.

The exhaled air must have a temperature of $37^{\circ}C$ and be saturated with moisture.

The required humidifier is illustrated in fig. 4.5.3. The temperature of the exhaled air is checked and adjusted before starting the test, at a point behind the humidifier and just in front of the solenoid valve.

To measure the CO_2 and O2 content of the inhaled air, 1.57 1/min. of inhaled air is drawn off from the connector (see fig. 4.5.2.) by an auxiliary lung during the inhalation phase and fed to an O_2 meter and a CO_2 analyser. The sample volume is checked by a gas meter. The total dead volume of the gas path, (excluding the artificial lung) of the test installation must not exceed 2000 cm^3.

Test at a respiration rate of 70 1/min.

During one test at 35 l/min after a period of 80 minutes the minute volume is raised to 70 l/min (setting : 2.33 l/inhalation, 30 inhalations/min) for 5 minutes. The CO_2 content of the exhaled air during this test should be 5% and the sampling stream during inhalation 3.5 l/min.

4.2.2.1.2. Test at a respiration rate of 10 l/min.

The test at a breathing rate of 10 l/min is carried out like the test described in 4.2.2.1.1 except for the following changes in the testing conditions :

Setting of artificial lung : 1.0 l/inhalation, 10 inhalations/min.
Amount of CO_2 added to the exhaled air : 4% by volume instead of 4.5% CO_2 v/v.
0.4 l/min drawn off during inhalation phase.

4.2.2.2 Testing of temperature and humidity of inspired air.

The temperature of the inspired air is measured at the connector (diagram 4.5.2) by means of a fast-response thermo-couple and recorded continuously. The assessment of the tolerability of inhaled air is made together with the test under 4.3.

4.2.2.3 Testing of breathing resistance

4.2.2.3.1 Testing of inhalation resistance

The inhalation resistance is measured at the connector (see diagram 4.5.2) by means of an accurate inertia-free recording instrument. Readings should be taken at least every 10 minutes. Any blank readings should be subtracted from the recorded value

4.2.2.3.2 Testing of exhalation resistance

The exhalation resistance test is carried out as described under 4.2.2.3.1.

4.2.2.4 Testing of the operating pressure of the relief valve.

The relief valve is checked in situ in the rescuer when the latter is in its normal position as worn. The operating pressure is measured with an instrument approved for the testing of breathing apparatus, or by other suitable type of precision manometer. The measuring instrument is attached to the breathing connector for the test. 1.5l of oxygen per minute is fed into the apparatus through the connector. The maximum value recorded by the instrument is taken as the operating pressure.

4.2.3 Test to ensure compliance with constructional requirements

4.2.3.1 Testing of materials

In the case of non-metallic containers, the surface resistance R_{OA} should be measured as per DIN 53486 in a normal atmosphere at 23 ± 2°C with a relative humidity of 50 ± 5%. The surface resistance should be measured at ten different places. The reading should be taken immediately after the current has been switched on and after a period of 60 seconds. The measuring voltage must be 100 V.

To check the impact resistance of the oxygen-self-rescuer and the starting device the rescuer is allowed to fall freely from a height of 1.5 m onto a concrete floor. The test must be carried out so as to stress the impact-sensitive parts of the rescuer. At least 3 tests should be carried out on one apparatus. After the test the oxygen self-rescuer must remain airtight and serviceable.

The explosion safety is to be attested by the presentation of a test certificate from a competent institute.

4.2.3.2 Testing of handleability

The opening, donning and operation of the self-rescuer should be tested in a dark room by at least five previously instructed test people.

4.2.3.3 Testing of breathing bag

The useful volume of the breathing bag is the volume available in the pressure range from the operating point of the relief valve to a partial vacuum of 5 mbar. This volume is measured by means of a gas meter.

4.2.3.4 Testing of air-tightness and materials

The OSR's air-tightness is tested by subjecting it to :

an atmosphere at 70°C with 100% humidity for 72 hours;

an atmosphere at 70°C with less than 10% humidity for 72 hours

and a temperature of -30°C for 24 hours.

After exposure to the above conditions the rescuers are allowed to return the room temperature and a leakage test is carried out by a method recommended by the manufacturer. The container must retain its air-tightness; there must be no permanent deformation or other faults. The apparatus must remain fully serviceable.

4.3 Tests with persons (rescue men).

4.3.1 Testing in training galleries

4.3.1.1 General

Purpose of the test

The test in the training gallery involves exercises with the apparatus worn by trained rescue men in order to establish whether the apparatus operates satisfactorily in practical conditions. The test also checks the functioning of the components and the life of the OSR. In the course of the exercises, the person using the self-rescuer is subjected to various forms of physical stress.

Above all, these exercises provide the persons conducting and undergoing the test with the opportunity to detect by observation faults in the equipment which cannot be determined by means of measurements

Location, number and duration of exercises

The test is carried out in a training gallery.

The exercises must be carried out at a temperature of approximately 25°C with normal humidity. The training gallery must contain atmospheric air without smoke and with no appreciable air movement. The exercise prescribed in 4.3.1.2 must be performed at least four times. Further exercises may be conducted at the discretion of the testing establishment. Exercises should be terminated when the generation of oxygen ceases, the oxygen content of the inspired air is less than 21% by volume, or when there is evidence that the person undergoing the test is no longer physically capable of completing the exercise. After particularly high physical stress, the CO_2 limit of 1.5% by volume may be exceeded for a short period. The oxygen and carbon dioxide concentrations in the inhaled air must be determined (see also 4.3.1.1.1).

4.3.1.1.1 Performance of exercises

Before the exercise begins, the test person should be informed, on the basis of the operating instructions, how the self-rescuer is opened, donned and put into operation.

The test person should be accompanied by an assistant during the exercise.

Before the start of the exercise, the following information should be obtained on:

The test person

Surname

Christian name

Age

Height

Weight

Vital Capacity

Occupation (duties underground)

The training gallery

Dry and wet bulb temperatures at several locations

The Test appliance

Air-tightness of the oxygen self-rescuer (as per 3.2.9.1.)

During the exercise:

At the start and conclusion of each exercise, and before and after each special activity in the course of the exercise, the following should be measured:

oxygen and carbon dioxide content of the inspired air

temperature of the inspired air

change of pressure in the appliance during respiration (if necessary).

The following should also be noted during the exercise:

nature and time of the different activities, complaints, e.g. with regard to the manner of wearing the appliance

visibility through the goggles, etc.

After the exercise the following should be noted:

The test person

weight

personal comments

4.3.1.2 Escape exercise in training building

4.3.1.2.1 Definition

An escape exercise is an exercise in which the average rate of breathing of the test person is approximately 35 1/min. *)

During this test, the appliance is examined under the type of conditions that are generally expected to prevail when the appliance is normally used. For this reason a rapid run to the OSR cache before the start of the exercise should also be simulated.

4.3.1.2.2 Performance of the exercise

The escape exercise is divided up into equal sections of 20 minutes, each following immediately. In each of these sections, the test person must perform the following or equivalent activities :

5 min. walking on a moving belt at a speed of 3.3 km/h = 275 m.

The exercise in the training galleries could, for example, include:

13 min. walking through the training galleries.

The training galleries exercises should included level and rising roadways of varying heights and a climb of at least 15 m on a ladder moving at 10 m/min. During this period the average minute volume should be of the order of 35 l/min.

2 mins. walking on belt moving at 2.4 km/h = 80 m inclined at 20%.

After four exercise sections have been completed, the test person should walk on the level until the end of the oxygen self-rescuer's utilization period.

*) For the light-type OSR the escape exercise should be made correspondingly easier.

4.3.2 Test underground

4.3.2.1 General

Purpose of the exercise

The exercise under ground supplements the test in the training gallery as described in 4.3.1 and is performed under operating conditions. It serves the same purpose; in particular, the method of wearing the appliance is put to the test.

Type, number and duration of the exercise.

During the exercises, sections of the mine with unfavourable climatic conditions should also be visited. At least two exercises should be carried out according to the method described below. Further exercises may be performed at the discretion of the testing department. The exercises should be terminated when the generation of oxygen ceases or when there is evidence that the persons undergoing the test are no longer physically capable of completing the exercises.

4.3.2.1.1 Performance of exercises

Before the exercise begins, the test person should be informed, on the basis of the operating instructions, on how the self-rescuer is opened, donned and put into operation.

The test person should be accompanied by an assistant during the exercise.

Before the start of the exercise, the following information should be obtained on:

The test person

Surname

Christian name

Age

Height

Occupation (activity in the mine)

<u>At each location in the mine</u>

Dry and wet bulb temperatures

<u>The test appliance</u>

Air-tightness of the oxygen self-rescuer

The following should also be noted during the exercise:

nature and time of the different activities, complaints, e.g. with regard to the manner of wearing the appliance, visibility through the goggles, etc.

After the exercise, the test person should make an assessment of the appliance with regard to:

physiological aspects of breathing and the wearing of the appliance.

4.3.2.2 Escape exercise underground

4.3.2.2.1 Definition

During the escape exercise underground, the average respiration rate of the test person should be 35 1/min. *)

During this exercise, the appliance is tested under conditions generally to be expected during an escape attempt.

4.3.2.2.2 Performance of the exercise

*) Correspondingly easier conditions should be selected for the light-duty oxygen self-rescuers.

During the escape exercise, the test person must walk along level and inclined roadways, and coal faces. The escape route should be selected to ensure that the test person is obliged to assume a stooped posture, to crawl and to climb ladders along some sections. The route to be taken should be selected by the test department.

4.4 Testing of storage and carrying of self-rescuers underground **)

4.4.1 General

The testing of the storage and the possibility of carrying the appliance underground is an important supplement to the laboratory tests. In order to eliminate the possibility of errors, a large number of oxygen self-rescuers, i.e. at least ten, must be made available for this test. This test can also be carried out under a "provisional approval".

4.4.2 Trial procedure

The oxygen self-rescuers should be "in use" every working day for at least three months. 80% of the appliances in service should be installed where possible on trackless diesel vehicles or on heading machines. The rest of the appliances should be used to establish the possibility of their being carried underground.

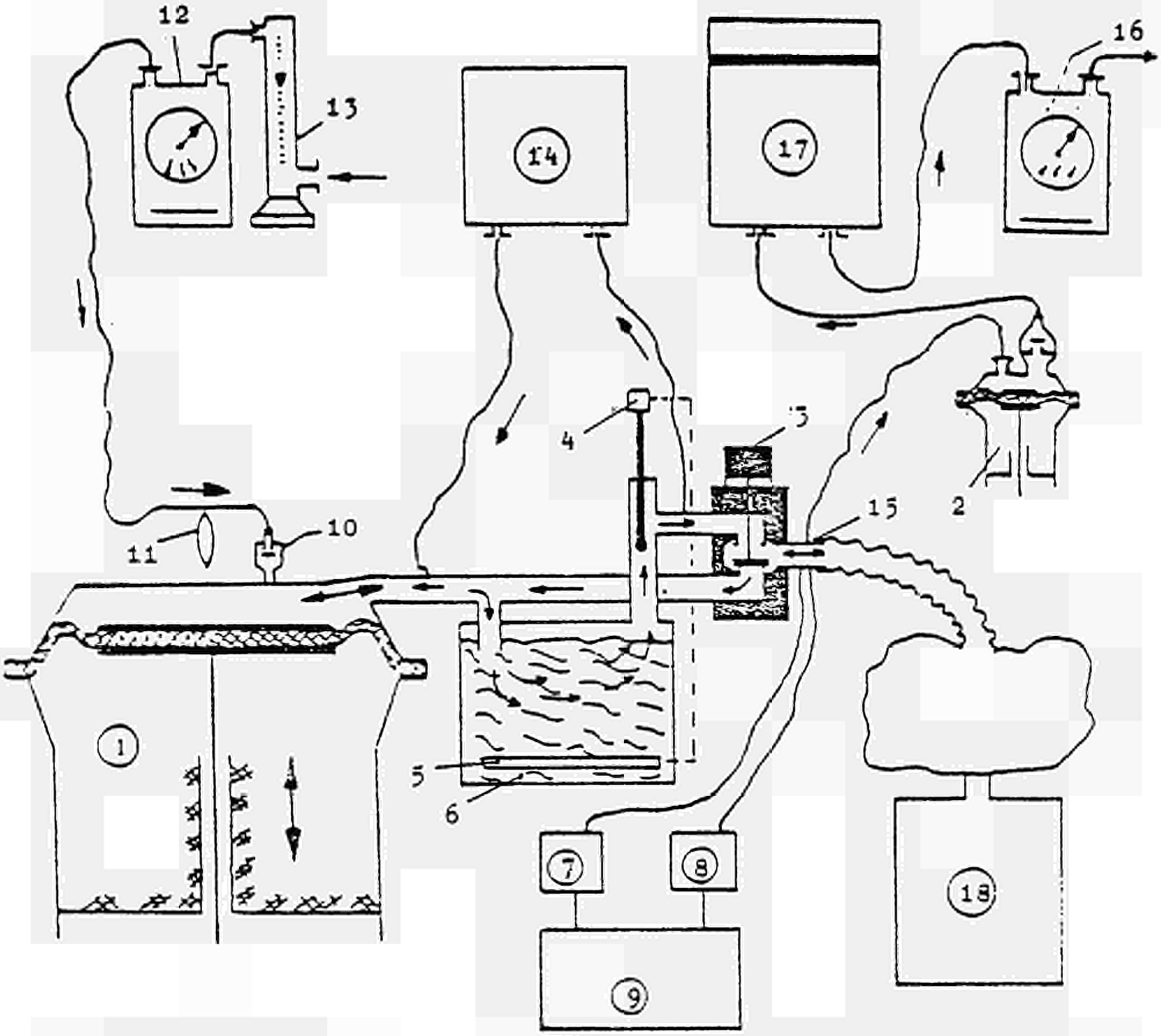
At the end of the trial period, each of the persons concerned should be asked for his comments on the carrying of the appliance.

Afterwards, 60% of the appliances should be tested according to 4.2 and 40% of the appliances tested according to 4.3.1. The purpose of the test is to establish whether the appliances meet the requirements of Section 3.

**) A research programme to investigate these questions is being undertaken in France with financial assistance from the EEC.

4.5 Appendix

4.5.1 Diagram of the Test Rig

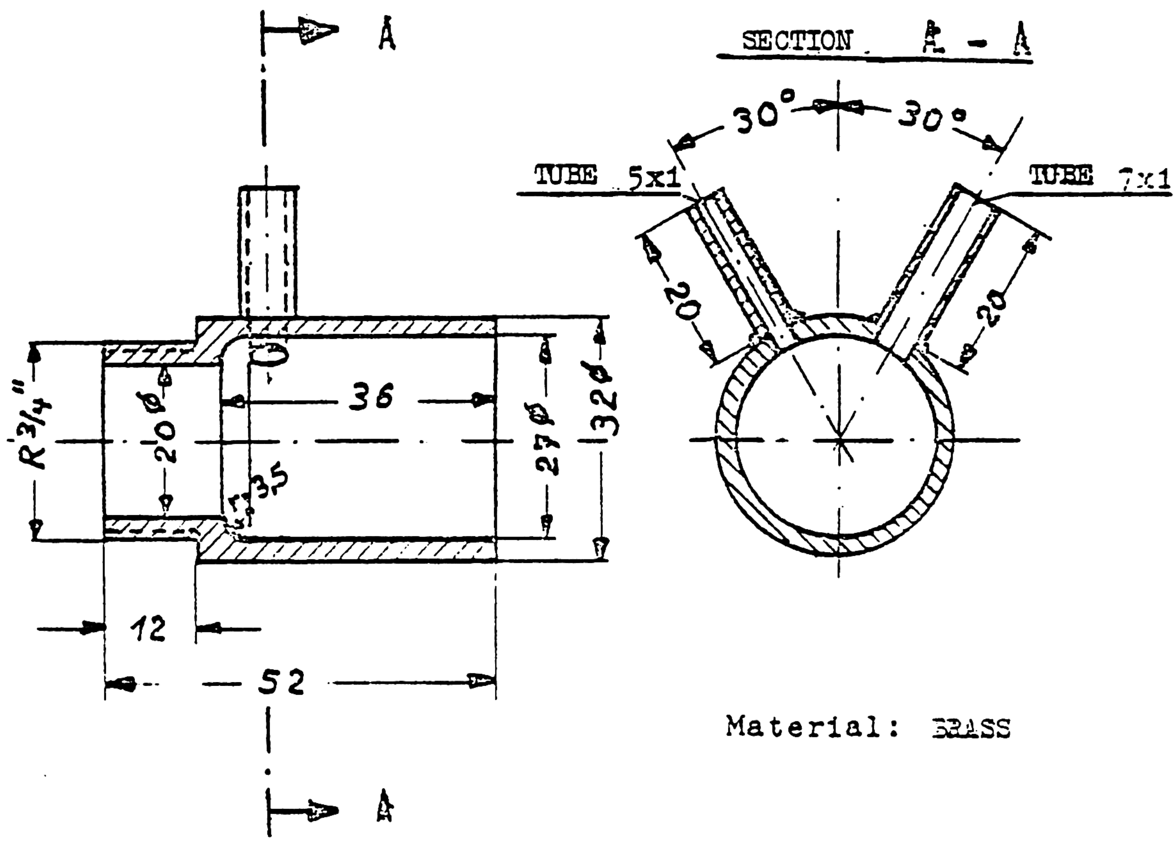


1. Artificial lung
2. Auxiliary lung (controlled by main lung)
3. 3/2-way valve (controlled by main lung)
4. Contact thermometer
5. Heater (controlled by contact thermometer)
6. Humidifier
7. Temperature measuring device
8. Pressure gauge
9. Fast-response recorder for pressure and temperature
10. Non-return valve
11. Balancing bag for CO_2 injection
12.) Measuring and control
13.) devices for CO_2.
14. CO_2-analyser (exhaled air)
15. Connector
16. Meter on air sampling line
17. CO_2-analyser and recorder (inhaled air)
18. Oxygen self-rescuer

A note on the test rig.

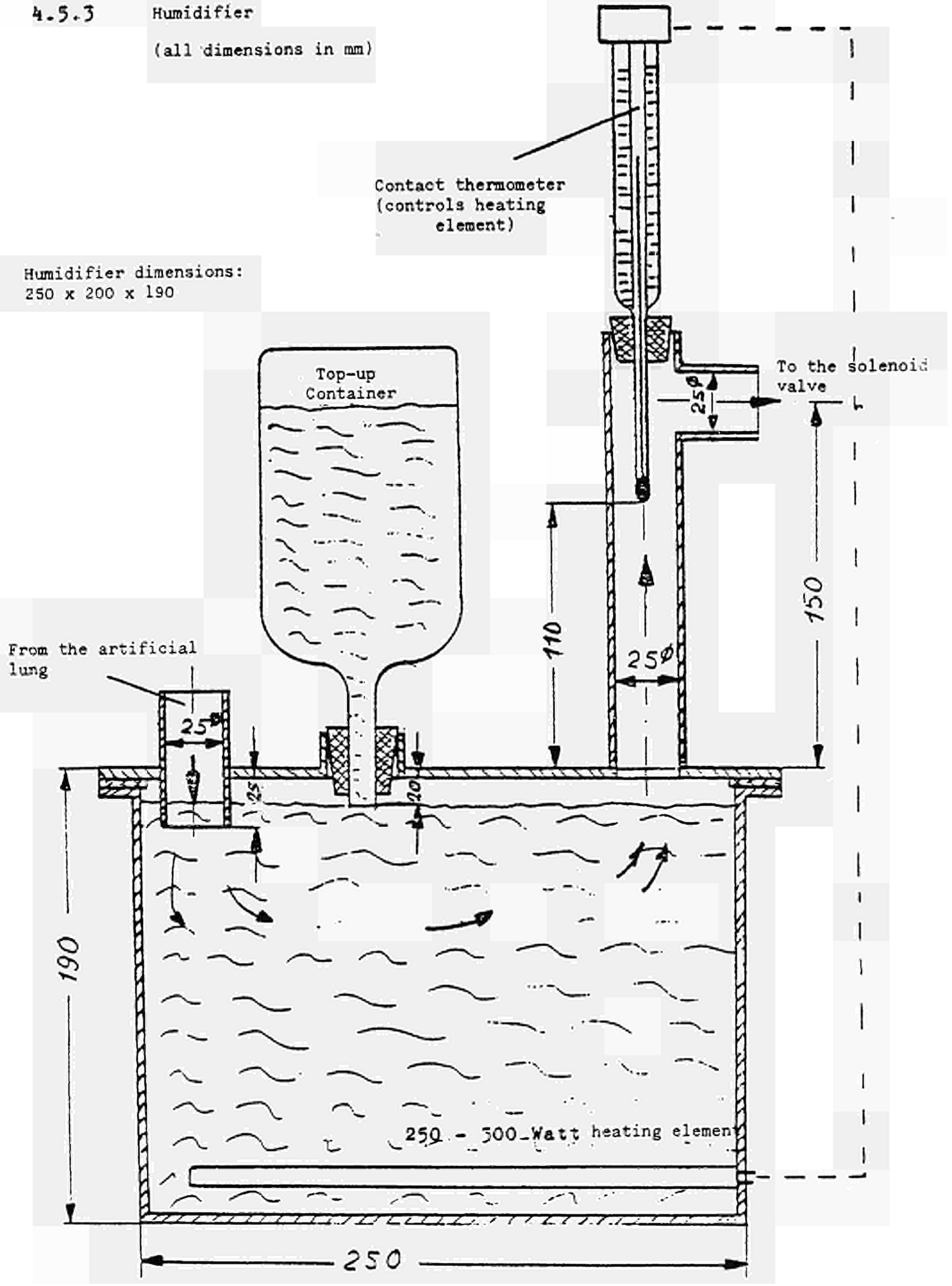
The Experts' Committee assumes that oxygen self-rescuers (escape apparatus) and oxygen breathing apparatus (rescue apparatus) are tested on one and the same test rig. In connection with efforts to establish a European Standard, CEN, TC.79, there is a British proposal to make a few small alterations to the test rig (e.g. to incorporate a cooler). The Experts' Committee agrees formally to include this alteration in the oxygen self-rescuer test rig after CEN deliberations are completed.

4.5.2 Connector



4.5.3 Humidifier

(all dimensions in mm)



SURVEY

relating to

CAGE-ARRESTING DEVICES

CONCLUSIONS

COMMISSION OF THE EUROPEAN COMMUNITIES

SAFETY AND HEALTH COMMISSION FOR THE MINING AND EXTRACTIVE INDUSTRIES

Working Party

on

Winding Engines,

Ropes and Shaft Guides

S U R V E Y

relating

TO CAGE-ARRESTING DEVICES

CONCLUSIONS

Adopted by the
Safety and Health Commission for the Mining and other Extractive Industries
on 7. May 1980
and sent to Governments and interested parties
as an information Report
in accordance with Art. 3 and 6 of its terms of reference

Doc. 2663/1/78 E LUXEMBOURG - 1980 Printed separately 1980

CONCLUSIONS

The above enquiry and the report submitted by the Rope Testing Centre at Bochum (Doc. No 4703/761) provide the following information:

A) Regulations:

Within the European Community, the use of cage-arresting devices is not compulsory in the Federal Republic of Germany, in the United Kingdom and in Belgium; it is, however, compulsory in France and in Italy.

The use of cage-arresting devices is compulsory in the following non-Community countries: Spain, Canada, USA and Australia.

Exemption is granted in the case of multi-rope installations, provided that the safety factor is 10 when men are being conveyed. In Poland, similar exemptions are granted for multi-rope installations.
Exemption is occasionally granted in the case of staple pits or of shafts which are not very deep.

It is permissible to render the cage-arresting inoperative devices when men are not being conveyed; the Spanish regulations specify that such non-operation of the cage-arresting devices must be clearly signalled.

B) Types of cage-arresting devices:

The cage-arresting devices used are apparently the same as those in operation in France (wedge or rotating cam).

C) Effectiveness of the cage-arresting devices

It must first be emphasized that the use of cage-arresting devices implies regular examination: a daily inspection (in France), a trial run at least every month (every week in France) and dismantling (with cleaning and lubrication of parts) every 6 months to a year.

With regard to the effectiveness of cage-arresting devices which are presumed to be in good working order, we may conclude:

a) the question of cage-arresting devices does not apply in installations with rope guides;

b) the cage-arresting devices are most efficient when the shafts are equipped with wooden guides. In the case of shafts with metal guides, their usefulness is questionable, except perhaps where light loads are being wound upwards.

c) whether the guides are made of metal or wood, there is certainly a maximum load, which, if exceeded, renders the efficiency of the cage-arresting device dubious.

For metal guides, this maximum load is small; for wooden guides, it could be as much as 50 t. Apparently, no systematic experiments have ever been carried out to determine this maximum load.

In installations which have a high payload (this may reach 170 t in some installations), there is no doubt that cage-arresting devices are ineffectual whether the guides are made of wood or metal. A factor restricting the use of cage-arresting devices in upcast shafts with metal guides is the risk of sparks, produced by braking, which could ignite any firedamp present.

From the point of view of the effectiveness of cage-arresting devices, the winding systems may be theoretically divided into three groups:

1) those systems which have a low payload with metal guides, and those with a low to average payload with wooden guides; in these cases cage-arresting devices are effective. Unfortunately, there is not enough information to establish the load ceiling beneath which the cage-arresting devices are effective. This ceiling depends on several factors: speed of winding, the kind of guides, the components of the cage-arresting device (the strength of the springs, the kind of claws used, operating gear).

2) those systems which have a high payload. For these, cage-arresting devices are ineffectual. Here again there is not enough information to lay down a lower threshold.

3) winding systems with an intermediate load where the effectiveness of cage-arresting devices is doubtful, especially when they are triggered during downward winding. An examination of the accident statistics makes it clear that very few lives have been saved thanks to the presence of cage-arresting devices (one case in Germany was mentioned during the survey).

   The number of men killed by the spurious operation of cage-arresting devices is certainly no lower than the number saved by them (there was one fatal accident in Belgium following the spurious operation of an arresting device, and injuries have been recorded in the Saar during the past 50 years, again as a result of spurious operation). In such installations, the presence of a cage-arresting device of doubtful efficiency could lull personnel into a false sense of security and encourage negligence in the examination of ropes; it follows from this that, if, for psychological reasons, it is not advisable to discourage the use of cage-arresting devices, neither is it advisable to encourage it. Safety must above all be based on sound engineering as regards the suspension gear, quality manufacture of the ropes and efficient examination of the ropes and suspension gear by appropriate means. Furthermore, even when a cage-arresting device functions properly, rope failure can lead to fatal accidents when the snapped rope whips around the adjacent compartment.

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It therefore seems that cage-arresting devices should be confined to winding installations with low payloads and low winding speeds too. They can be used more widely where shafts are equipped with wooden guides. But even in this case the cage-arresting device must be considered only as a supplementary safety device, basic security being maintained by stringent checks on the ropes and suspension gear. Where cage-arresting devices are in use, care must also be taken that spurious operation cannot create an additional danger; in order to avoid such spurious activation, it is particularly important to check the state of the guides carefully and to ensure that the play between the guide shoes of the ropes and the guides themselves is correct.

The application of cage-arresting devices could be more widespread if shock absorbing devices were installed at the bottom of shafts; such buffers have been developed in the United Kingdom where the use of cage-arresting devices has practically been discontinued. If the cage-arresting device were not able to stop the cage completely (especially in a shaft with metal guides the cage during downward winding), the consequences of such an accident could be moderated by these buffers.

While we may state that the field of application of cage-arresting devices is restricted, we must also acknowledge that we know little about the limits of their use. Cage-arresting devices seem to have been developed empirically and we lack reliable technical data, notably on the coefficient of friction on the guides as a function of the kind and type of guide and as a function of the design and type of the self-gripping devices. A technical examination could also be made of the trigger mechanism. The mechanism may be triggered when tension on the rope slackens or when abnormal acceleration is registered by a mass supported by a spring and subject to inertial force.

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Supplement to 1) "Statutory national provisions relating to cage-arresting devices"

Italy:

The regulation provides for each cage destined for the conveyance of personnel to be equipped with a cage-arresting device capable of stopping the cage without human intervention. The cage-arresting device must be inspected every month by a mechanic to test its efficiency; it is dismantled for examination purposes every year. Cage-arresting devices are not compulsory however in staple pits.

The regulation relating to the Sicilian region also makes the presence of cage-arresting devices compulsory. An exception is, however, made for cages which are normally used for material or mineral winding and which are only used in exceptional cases (in the event of danger) for the conveyance of personnel; in the latter case, the mining authorities may dispense with the cage-arresting device as long as the cage is supported by at least two ropes which must function with a safety factor of 10. The Sicilian regulation also stipulates that the speed of the cage when conveying personnel may not be more than half of the normal speed in material and mineral winding.

Other countries

Spain:

Cage-arresting devices are compulsory for cages conveying personnel; they may, however, be deactivated when material and minerals are being transported; when the cage-arresting devices are not in use, a clear notice to this effect is compulsory. Preference is given to cage-arresting devices with progressive braking which limit the speed of the cage to 3.0 m/sec.
The same provisions exist in the Uruguayan regulation but here the speed of the cage is limited to 2.0 m/sec.

Canada (Quebec)

In shafts which are deeper than 120 m, cages must be equipped with cage-arresting devices capable of stopping them in the event of rope failure.

Australia (Queensland)

Cages must be equipped with cage-arresting devices of a type approved by the mines inspectorate. The latter may grant exemptions in the case of shafts fitted with metal guides.

The functioning of cage-arresting devices must be checked every month. The cage-arresting devices have to be taken to pieces every six months for the purposes of examination and maintenance (cleaning and lubrication).

USA:

There are legal provisions which require the use of cage-arresting devices.

In some states, the rule that a cage-arresting device shall be fitted is waived for multi-rope winders. In this case the safety factor for man winding must be about 10.

The cage-arresting devices used in the USA are the same type as those which are used in France.
It is pointed out that the cage-arresting device can be effective when rope failure occurs as the cage is being wound upwards; during lowering operations, its effectiveness has already been seen to be at fault.

ANNEX X

STATISTICAL TABLES

FOR THE OTHER

THAN COAL INDUSTRIES FOR 1978

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

ANNEX X. - 1 - 1

Year : 1978 FEDERAL REPUBLIC OF GERMANY

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL	S	43	83 964 899	t saleable	187 219
	O				
LIGNITE	O	48	123 596 863		18 465
OIL	D	150	5 058 943	t	7 087
NATURAL GAS	D	240	19 382 638	1000 m^3	
IRON	S	10	1 600 781	t	913
ALUMINIUM (ores)	S	1	280	t	
COPPER (ore)	S		821	t Cu	
LEAD (ore)	S	3	23 181	t Pb	1 233
ZINC (ore)	S		97 405	t Zn	
POTASH SALTS	S	11	5 018 001	t K_2O	8 513
ROCK SALT (except sea salt)	S	8	6 845 765	t	1 670
MARBLE FOR POLISHING					
MARBLE FOR SEDIMENTARY ""					
MARBLE IGNEOUS					
Total MARBLE					
SANDS (SLATE, FOUNDRY AND OTHER INDUSTRIAL SANDS)	S + O	24	80 054	t	548
ALLUVIAL SANDS AND GRAVEL		1 398	178	Million t	25 048

S : deep mining O : opencast mining or quarring D : boreholes

Year : 1978

FEDERAL REPUBLIC OF GERMANY

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
HARD DIMENSION STONE		1 280	51 833	m^3	34 495*
- BUILDING STONE					
- PAVING STONE					
- MONUMENTAL STONE					
HARD CRUSHED STONE		?	135 000 000	m^3	?*
- FOR CONCRETE					
- ROAD BASES					
- SURFACING					
Chalk and Lime		113	68 000 000	t	10.577
Gypsum	O	40	1 749 136	t	1 421
Steatite		4	9 673		51
Kaolin	O	29	520 982	t	1 676
Pegmatite	O	12	88 570	t	133
Calcspar	O	5	11 817	t	19
Sandstone	O	1	37 600 000	piece	25
Dolomite	O	2	636 001	t	35
Sulphur	D	3	767 790	t	178
Pyrite	S	3	501 696	t	837
Graphite	S	1	11 927	t	192
Fluorspar		13	75 722	t	171
Feldspar	S	18	385 590	t	171
Uranium	S	13	9 770	t	147
Talc	O	5	5 773	t	16
Natural Stone					
Limestone	S	9	2 614 617	t	182
Barytes	O/S	7	182 948	t	272

* Combined Workforce

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

ANNEX X - 2 - 1

Year : 1978 BELGIUM

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL	S	9	6 590 268	t saleable	23 023
	O				
LIGNITE	S	1	450		
OIL					
NATURAL GAS					
IRON	S	1	42 540	t	16
ALUMINIUM (ores)					
COPPER (ore)					
LEAD (ore)					
ZINC (ore)					
POTASH SALTS					
ROCK SALT (except sea salt)					
MARBLE FOR POLISHING	S	1	3 608	m^3	13
MARBLE FOR SEDIMENTARY ""	O	5	211 002	m^2(20 mm)	21
MARBLE IGNEOUS					
Total MARBLE					
SLATE	S	2	no fig.available		87
	O	6	id.		3
SANDS (SLATE, FOUNDRY AND OTHER INDUSTRIAL SANDS)	O + D	429	19 030 355	t	2 070
ALLUVIAL SANDS AND GRAVEL					
			Total		25 233

S : deep mining O : opencast mining or quarring D : boreholes

Year : 1978

BELGIUM

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
HARD DIMENSION STONE	0	65	1 057 419		1 269
- BUILDING STONE					
- PAVING STONE					
- MONUMENTAL STONE					
HARD CRUSHED STONE	0	112	31 324 026		2 383
- FOR CONCRETE					
- ROAD BASES					
- SURFACING					
HARD STONE FOR CALCINATION	0	24	10 902 261		1 743
- FOR LIME					
- FOR CEMENT KILNS					
CHALK and MARL	0	13	4 274 157		136
GYPSUM					
OTHER ROCKS :					
DOLOMITE	0	11	3 655 855		421
KAOLIN	0	5	39 717		10
CLAY	0	114	5 200 000*		4 576

* estimations

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

ANNEX X - 3 - 1

Year : 1978

DENMARK

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL					
LIGNITE					
OIL	D		no fig.available		no figures available
NATURAL GAS			id.	1 000 m^3	id.
IRON					
ALUMINIUM (ores)					
COPPER (ore)					
LEAD (ore) (1)	S	1	621 000	t Pb Zn	300
ZINC (ore) (2)					
POTASH SALTS or sea salts NACl	D	1	338 000	t	id.
ROCK SALT (except sea salt)					
PEAT (for soil improvement)	O	18	322 953	m^3	id.
MARBLE FOR POLISHING					
MARBLE FOR SEDIMENTARY "					
MARBLE IGNEOUS					
Total MARBLE					
SLATE	O	2	795		id.
SANDS (SLATE, FOUNDRY AND OTHER INDUSTRIAL SANDS)	O	926	30 049 205		id.
ALLUVIAL SANDS AND GRAVEL (sea)	O		4 584 219		id.

(1) Pb 42.000 t concentrate (with silver)
(2) Zn 148 000 t

S : deep mining O : opencast mining or quarring D : boreholes

Year : 1978

DENMARK

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM * ORE OF MINERAL	PERSONS
SUPPLEMENTARY INFORMATION					
HARD DIMENSION STONE	0	?	55 492		?
- BUILDING STONE					
- PAVING STONE					
- MONUMENTAL STONE					
HARD CRUSHED STONE					
- FOR CONCRETE					
- ROAD BASES					
- SURFACING					
HARD STONE FOR CALCINATION					
- FOR LIME					
- FOR CEMENT KILNS					
CHALK : LIME		28	3 175 417	m^3	?
GYPSUM					
OTHER ROCKS :					
FIRE CLAY	0	11	119 121	m^3	?
CLAY, BRICKS, TILES	0	123	2 311 676	m^3	?

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

ANNEX X - 4 - 1

Year : 1978

IRELAND

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL	S	8	24 000*	t ROM	265
	O	4	7 059	t ROM	12
LIGNITE					
OIL	D	8	no production	-	911
NATURAL GAS	D	no figures ~~available~~	no fig. available	1000 m^3	no figures ~~available~~
IRON					
ALUMINIUM (ores)					
COPPER (ore)	S O	1 ~~3~~	777 955 ~~20 196~~	t ROM ~~concentrate~~	222
LEAD (ore)			74 155	~~concen-~~ trate	
ZINC (ore)	S	3	312 185		1 635
POTASH SALTS					
ROCK SALT (except sea salt)					
MARBLE FOR POLISHING	O	no figures available	no fig. available	no fig. avail.	17
MARBLE FOR SEDIMENTARY ""					
MARBLE IGNEOUS					
Total MARBLE					
SANDS (SLATE, FOUNDRY AND OTHER INDUSTRIAL SANDS)					
ALLUVIAL SANDS AND GRAVEL	D	380	no fig. available	no fig. avail.	919

* Shortfall due to prolonged industrial dispute

S : deep mining O : opencast mining or quarrying D : boreholes

Year : 1978

IRELAND

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION dry metric tons	TONS ROM ORE OF MINERAL	PERSONS
HARD DIMENSION STONE	0	22			
- BUILDING STONE					
- PAVING STONE	0	5	no fig.available	no fig. avail.	13
- MONUMENTAL STONE	0	17	no fig.available	no fig. avail.	114
HARD CRUSHED STONE	0	64	no fig.available	no fig. avail.	613
- FOR CONCRETE					
- ROAD BASES					
- SURFACING					
HARD STONE FOR CALCINATION					
- FOR LIME					
- FOR CEMENT KILNS					
CHALK					
GYPSUM	S	2	385 791	R.O.M.	74
OTHER ROCKS :					
LIMESTONE	0	92	no fig.available	no fig. avail.	1 308
SHALE	0	6	no fig.available	no fig. avail.	9
BARYTES	S	1	42 542 12 473	R.O.M. concetr.	60
PYRITE	?	3	338 100 41 793	R.O.M. concetr.	75

* byproduct of copper ores (already included under 'copper')

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

Year : 1978

I T A L Y

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL	S	1		t ROM	163
	O				
LIGNITE	O	2	1 868 078		676
OIL					
NATURAL GAS					
IRON	S+O	3+1	348 972	40 % Fe	533
ALUMINIUM (ores)	O	2	24 410	t	6
COPPER (ore)	S	3	1 932		190
LEAD (ore)					
ZINC (ore)		24 (1)	73 558	t Zn	2 674 (1)
POTASH SALTS	S	5	1 636 304	tK_2O (12%	1 353
ROCK SALT (except sea salt)	S	7 }	3 721 258		303
	O	4 }			
MARBLE FOR POLISHING					
MARBLE FOR SEDIMENTARY ""					
MARBLE IGNEOUS					
Total MARBLE					
SLATE		100	100 000		400
SANDS (SLATE, FOUNDRY AND OTHER INDUSTRIAL SANDS)		100	4 200 000		560
ALLUVIAL SANDS AND GRAVEL		2 500	120 000 000		8 650
SAND OF volcanic origin		15	150 000		20
EARTH COLOURS		14	170 000		55
POZZOLANA (sand)		100 (2)	5 000 000		250 (2)

S : deep mining O : opencast mining or quarring D : boreholes

Also included in activity and work force : 1) lead ores
2) hard stone for calcination
(see following page)

Year : 1978

I T A L Y

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
HARD DIMENSION STONE					
- BUILDING STONE		50	22 060 000		250
- PAVING STONE					
- MONUMENTAL STONE		2 900	9 326 000		16 000
SEDIMENTARY MARBLE		135	1 044 000		1 350
METAMORPHIC MARBLE		1 010	1 935 000		7 250
HARD CRUSHED STONE					
- FOR CONCRETE					
- ROAD BASES					
- SURFACING					
HARD STONE FOR CALCINATION		*	35 400 000		*
- FOR LIME					
- FOR CEMENT KILNS					
CHALK		90	4 050 000		550
GYPSUM					
OTHER ROCKS :					
CLAY		1 050	36 000 000		2 500
DOLOMITE		13	1 100 000		100
GRAVEL		included under other headings	65 920 000		included elsewhere

* Combined

ANNEX X - 5 - 3

Year : 1978

ITALY

MINERAL	MINE, QUARRY OR BORE HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
PYRITE	S	5	786.666	37,8% S	873
MANGANESE	S	1	9 741	39 % Mn	13
SULPHUR	S	12	357 444	12 % S	1 758
ANHYDRITE	O	15	49 531		124
ASBESTOS	[illegible]	2	135 402		323
BARYTES	S	14	236 613		343
FELDSPAR	S	7	251 083		105
FLUORSPAR	S/O	11	171 216	85%CaF2	871
GRAPHITE	S	1	4 108		19
MARL	O	27	10 309 239		307
ASPHALTIC ROCK FOR SURFACING	O	3	68 560		27
BITUMINOUS ROCK	O	1	46 638		16
HYDRATED ALUMINIUM SILICATES	s/O	40	663 879		212
TALC AND STEATITE	S	16	175 157		460
MERCURY	S				811
ANTIMONY	O		1 855	50,2% SS	54
CELESTITE	O	1	365		2
STEAM	D	12	29 104 120		261
CLAY	O				
PEAT	O				

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

ANNEX X - 6 - 1

Year : 1978

NETHERLANDS

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL				t ROM	
LIGNITE					
OIL	D	1	1 402 254	t }	± 2 400
NATURAL GAS	D	6	94 995 x 10^6	m^3 }	
IRON					
ALUMINIUM (ores)					
COPPER (ore)					
LEAD (ore)					
ZINC (ore)					
POTASH SALTS	D	1	6 407	t K_2O	10
ROCK SALT (except sea salt)	D	1	2 936 858	t	53
MARL	O	3	2 992 755	t	79
SANDSTONE	O	1	196 000	t	4
MARBLE FOR POLISHING					
MARBLE FOR SEDIMENTARY ""					
MARBLE IGNEOUS					
Total MARBLE					
SANDS (SLATE, FOUNDRY AND OTHER INDUSTRIAL SANDS)					
ALLUVIAL SANDS AND GRAVEL	O	?	34 429 000	t	?

S : deep mining O : opencast mining or quarring D : boreholes

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

ANNEX X - 7 - 1

Year : 1978

UNITED KINGDOM

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL	S	411	107 696	t ROM	248 100
	O	173	14 730		8 477
LIGNITE	S	1	8		2
OIL					
NATURAL GAS				1000 m^3	
IRON STONE	S	2	584		292
	O	11	3 670		622
ALUMINIUM (ores)					
COPPER (ore)					
LEAD (ore)					
ZINC (ore)					
POTASH SALTS	S	1	945	t K_2O	1 228
ROCK SALT (except sea salt)	S	1	1 311		363
MARBLE FOR POLISHING					
MARBLE FOR SEDIMENTARY ""					
MARBLE IGNEOUS					
Total MARBLE					
SANDS (SLATE, FOUNDRY AND OTHER INDUSTRIAL SANDS)	O	1 395	6 224		1 330
ALLUVIAL SANDS AND GRAVEL	O		90 146		10 533

S : deep mining O : opencast mining or quarring D : boreholes

Year : 1978

UNITED KINGDOM

MINERAL	MINE, QUARRY OR BORE HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
LINESTONE	S	6	557		101
	O	489	85 797		12 264
CLAY SHALE	S	1	218		26
	O	230	25 473		1 660
CHALK & CHERT	O	26	16 373		1 020
IGNEOUS ROCK	O	303	27 807		5 476
SANDSTONE	S	2			212
	O	241	10 424		2 119
CLAY	S	29	705		397
	O	158	4 920		4 117
CALCSPARE	S+O	3	13		38
GYPSUM & ANHYDRITE	S+O	12	3 322		680
BARYTES	S+O		54		?
OTHER ROCKS :					
CHALK	O	16	16 321		1 011
GYPSUM	S+O		3 230		661

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

Year : 1978

FRANCE

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL	s	24	18 351 000	t ROM	
	O	3	1 339 000		54 814
	O	1	1 167 000	t ROM	
LIGNITE	S	1	1 565 000		1 668
OIL	S	-	1 117 000	t ROM	-
NATURAL GAS	S	5	11 297 000	1000 m^3	-
IRON ORE	S	25	33 454 000	t	6 036
ALUMINIUM (ores)		12	1 977 000	t	676
COPPER (ore)					
LEAD (ore)		4	35 200	t Pb	737
ZINC (ore)		3	39 900	t Zn	
POTASH SALTS		3	1 795 000	t K_2O	4 542
ROCK SALT (except sea salt)		20	6 169 000	t	1 020
MARBLE FOR POLISHING		132	?		6 345
MARBLE FOR SEDIMENTARY ""					
MARBLE IGNEOUS					
Total MARBLE					
SLATE		18	84 000	t	2 000
SANDS (SLATE, FOUNDRY AND OTHER INDUSTRIAL SANDS)					
ALLUVIAL SANDS AND GRAVEL		1 962	228 140 000	t	14 621

S : deep mining   O : opencast mining or quarring   D : boreholes

ANNEX X - 8 - 2

Year : 1978

FRANCE

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
HARD DIMENSION STONE			not available		
- BUILDING STONE					
- PAVING STONE					
- MONUMENTAL STONE					
HARD CRUSHED STONE		853	122 360 000	t	9 500
- FOR CONCRETE					
- ROAD BASES					
- SURFACING					
HARD STONE FOR CALCINATION		65	4 519 600	t	3 416
- FOR LIME					
- FOR CEMENT KILNS					
CHALK		?	?		?
GYPSUM AND PLASTER		< 55	6 071 100	t	4 266
OTHER ROCKS :					
URANIUM	S		2 561	t	2 106
TUNGSTEN	S		767	t WO_3	200
GOLD			185	t	161
FLUOSPAR			260 000	t	604
BARYTES			225 000	t	173
TALC			275 000	t	561

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

ANNEX X - 9 - 1

Year : 1978

LUXEMBOURG

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
COAL					
LIGNITE					
OIL					
NATURAL GAS					
SILICIOUS	S	2	834 905	t 32,55%	282 (1)
IRON ORE	O	2		t	
ALUMINIUM (ores)					
COPPER (ore)					
LEAD (ore)					
ZINC (ore)					
PHOSPHATES				0,67 %	(1)
POTASH SALTS					
ROCK SALT (except sea salt)					
MARBLE FOR POLISHING					
MARBLE FOR SEDIMENTARY ""					
MARBLE IGNEOUS					
Total MARBLE					

(1) Combined

S : deep mining O : opencast mining or quarring D : boreholes

STATISTICAL TABLES FOR EXTRACTIVE INDUSTRIES OTHER THAN COAL

ANNEX X - 9 - 2

Year : 1978

L U X E M B O U R G

MINERAL	MINE, QUARRY OR BORE-HOLE	NUMBER OF SITES WHERE MINERAL IS WORKED	PRODUCTION	TONS ROM ORE OF MINERAL	PERSONS
HARD DIMENSION STONE					
- BUILDING STONE			6 630	m^3	
- PAVING STONE			14	1000 p	?
- MONUMENTAL STONE			460	m^2	
SIZED STONE	O		72	m^3	
FACING STONE		35	2 717	m^3	
			714 958		
SAND			614.623		
GRAVEL			212.687		
FOUNDRY SAND			2 771		
HARD STONE FOR CALCINATION					
- FOR LIME					
- FOR CEMENT KILNS					
CHALK					
GYPSUM		?	4 476		?
SLATE	S	1	1 363	1000 p	
POLISHED MONUMENTAL STONE			3 283	1000 p	54
MONUMENTAL STONE			568	t	

BIBLIOGRAPHY OF THE WORK OF THE SAFETY AND HEALTH COMMISSION

updated 1.12.1979

C **VENTILATION, FIREDAMP AND OTHER MINE GASES**

Printed separately

1. Study of the group of Experts on Ventilation Stabilization of Ventilation in Pit Fires - investigation in the light of Prof. Budryk'y theory (this study consists of two separate parts : the Report itself and Annex III to the 6th Report of the MSHC, September 1966

2. Practical conclusions of the application of the theory of stabilization of ventilation

   6th Report of the MSHC, Annex III, September 1969

3. Circular 181 of the Belgian Ministry of Economic Affairs relating to the prevention of outbursts of Firedamp

   11th Report of the MSHC, Annex X, May 1974

4. Conditions under which exemption might be granted to raise maximum permitted CH_4 limits in Member States

   12th Report of the MSHC, Annex V

5. Notes for guidance on the measures to be taken to stabilise ventilation in the event of open fires underground (Except in shafts)

   14th Report of the MSHC, Annex IX, June 1977

6. First Report on Ignitions of Firedamp by Power loaders and Heading Machines

   14th Report of the MSHC, Annex X, June 1977

7. Information report on two accidents (explosions) arising from the use of hand-held gas monitoring instruments in the Ruhr and Saar Coalfields — Doc. 4582/1/77 E F D I N DK

D WINDING ROPES AND SHAFT GUIDES, WINDING ENGINES AND WINCHES

		Printed separately
1.	Report on the electro-magnetic examination of winding ropes 3rd Report of the MSHC, Annex VI November 1966	
2.	Final report on electro-magnetic tests carried out with the financial aid of the High Authority in the Bochum Rope-testing Station 3rd Report of the MSHC, Annex XIa, November 1966	
3.	Report on the use of accelerometers for testing winding installations 3rd Report of the MSHC, Annex V, November 1966	
4.	Report on measurement and testing procedures for shaft and roadway winding ropes and for guides for shaft and roadway haulage installations 7th Report of the MSHC, Annex VII, September 1970	
5.	Report of the Rope Testing Office of the Westfälische Berggewerkschaftskasse Bochum on rope testing means and procedures for improving safety in mine shafts and roadways employing rope haulage 10th Report of the MSHC, Annex V, June 1973	
6.	New aspects of the testing of ropes in winding installations subject to high and maximum stress (Arnold's report 1975) Printed separately - 1980	Doc. 4044/74 E F D I DK
7.	Safety requirements for brakes on winding engines and winches in the shaft winding plant of the German mining industry (HAEUSLER - 1975) Printed separately - 1980	Doc. 3254/74 E F D
8.	Shaft winding and safety (HOISCHEN - 1975) Printed separately, July 1975	Doc. 4046/74 E F D

9. Minimum safety requirements for winding and balance rope suspension gear, for shaft winding and sinking installations

13th Report of the MSHC, Annex VII

10. Information report "New aspects of the testing of ropes in winding installation subject to high and maximum stress" by Dr. Ing. ARNOLD, Seilprüfstelle der Westfälischen Berggewerkschaftskasse, Bochum

13th Report of the MSHC, Annex VII

E STRATA CONTROL AND STABILITY OF GROUND

1. Notes concerning the statistical comparison of serious and fatal accidents due to falls of ground in the bituminous coal ming industry of the European Communities and Great Britain

   11th Report of the MSHC, Annex XII
   May 1974

2. Notes on operating statistics in the coal mining industry of the European Community countries as established for 1972

   11th Report of the MSHC, Annex XIII
   May 1974

3. Strata reinforcement by bolting, dowelling and injection techniques

   15th Report of the MSHC, Annex VII
   July 1978

4. Strata reinforcement by bolting and injection techniques
   Printed separately 1979 — Doc. 1612/3/76
   E F D

5. Construction of gateside pachs for longwall faces

   16th Report of the MSHC, Annex VIII
   Printed separately 1980 — Doc. 2196/4/77
   E F D I N DK

F ELECTRICITY

1. Decision on the removal of oil from resistors, condensers, transformers, switches and relays used underground

   1st Report of the MSHC, April 1959

2. The use of non-flammable materials for the manufacture of electric cables and leads for underground use

   2nd Report of the MSHC, p. 5, June 1961

3. Requirements which must be met by electrical shotfiring leads

   2nd Report of the MSHC, p. 8, June 1961

4. Protection of the underground electrical network against the danger of electric shocks

   2nd Report of the MSHC, p. 11, June 1961

5. Report on investigations into the protection of underground electrical network against dangers arising from fires or from firedamp explosions

   3rd Report of the MSHC, Annex VII November 1966

6. Report on firedamp-proof electrical switchgear for nominal voltages above 1100 volts

   3rd Report of the MSHC, Annex VIII November 1966

7. Notes on the problem of heat transmission in an insulated conductor

   3rd Report of the MSHC, Annex IX November 1966

8. Report on characteristics and the electrical protection of power feed cables for mobile machines (cutters, loaders, etc.) used underground in the coal mines of the countries of the Community

   7th Report of the MSHC, Annex V September 1970

9. Comments and recommendatinns arising out of the report adopted by the Mines Safety and Health Commission on 20 June 1969 on the characteristics and electrical protection of cables supplying mobile machines (coal cutters, loading machines etc.) used underground in coal mines in the Community countries

8th Report of the MSHC, Annex IX
June 1971
Printed separately 1980 Doc. 1145/3/70

10. Policy statement on the deleterious effects of dust-binding processes using saline pastes and powders upon electrical plant underground

9th Report of the MSHC, Annex IX
July 1972

11. Comparison of safety provisions concerning electric trolley locomotives underground and in particular, possibilities of reducing the incidence of trolley sparks

9th Report of the MSHC, Annex X
July 1972

12. Report and conclusions on overvoltages caused by lightning

9th Report of the MSHC, Annex XI
July 1972

13. Report on trends in the use of explosion-proof electrical apparatus for nominal voltages above 1100 volts ; conclusions and recommendations

10th Report of the MSHC, Annex VIII,
June 1973

14. Report and conclusions on Haulage powered by linear motors

11th Report of the MSHC, Annex IX
May 1974

15. Decisions of the Mines Safety and Health Commission concerning materials to be used, and specifications for the construction of electrical apparatus for use in mines which are liable to be affected by firedamp ;

- Surface temperatures of caseings
  12th Report of the MSHC, Annex VIII
  July 1975
- Oil immersed contacts in switchgear
  12th Report of the MSHC, Annex VIII
  July 1975
- Provisions for locking off aparatus
  in the opencircuit condition
  12th Report of the MSHC, Annex VIII
  July 1975
- Use of Light Alloys
  13th Report of the MSHC, Annex IX
  1976

which will be taken into account in the preparation of a European Standard by the CENELEC committee (European Committee for Electrotechnical Standardization).

16. Harmonization of construction requirements of the rules covering the design, installation and use of electrical equipment

Final report - 1979 Doc. 3272/5/78

3)

G HUMAN FACTORS

1. Psychological and sociological factors in mine safety

1.1. Report on the psychological and sociological factors affecting safety

3rd Report of the MSHC, Annex XII
November 1966

1.2. Recommendations on the psychological and sociological factors affecting safety

3rd Report of the MSHC, Annex XIII
November 1966

2. Effects of remuneration methods on safety

2.1. Report on the implications of payment at piece rates for mine safety

4th Report of the MSHC, Annex III
December 1967

2.2. Recommendations as to principles to be observed in view of the possible influence of payment at piece rates on safety in coal mines

4th Report of the MSHC, Annex IV,
December 1967

3. Medical problems

3.1. Report on pre-entry and routine medical examinations and recommendations

2nd Report of the MSHC, p. 74, June 1961

3.2. Colliery medical services in the countries of the Community and the United Kingdom

2nd Report of the MSHC, Annex C
June 1961

4. Safety training

4.1. Report on the study "Measures relating to the safety training of mine workers employed in the mines of the European Community."

Report ROETTGER
Printed separately 1978 Doc. 4372/3/77
E F D

I MECHANIZATION

1. Recommendations concerning the equipment of locomotives

   1st Report of the MSHC, April 1959

2. Recommendations concerning the neutralization of exhaust gases from diesel engines

   1st Report of the MSHC, April 1959

3. First Report on Safety in the winning area

   15th Report of the MSHC, Annex VIII July 1978

K PETROLEUM, GAS AND OTHER SUBSTANCES EXTRACTED BY DRILLING

1. Basic information which should be contained in drilling programmes of offshore wells

16th Report of the MSHC, Annex XI — Doc. 3318/6/77
E F D I N DK

2. Drilling wellhead safety installations offshore

16th Report of the MSHC, Annex X — Doc. 3767/4/77
E F D I N DK

3. Workover programme offshore

17th Report of the MSHC, Annex ... — Doc. 4945/3/78
E F D I N DK

4. Production well completion offshore

17 Report of the MSHC, Annex ... — Doc. 2487/5/78
E F D I N DK

L COMBUSTIBLE DUSTS

1. Report on work done on the neutralization of combustible dusts and dust barriers

   7th Report of the MSHC, Annex VIII
   September 1970

2. Memorandum on information necessary for the examination of coaldust explosions or ignitions of firedamp in mines

   10th Report of the MSHC, Annex VII
   June 1973

3. Information Report on 'Dust binding by means of salt pastes, powders and flakes'

   11th Report of the MSHC, Annex VI
   May 1974

4. Information Report on 'Water trough barriers' for protection against underground explosions of coal-dust

   11th Report of the MSHC, Annex VII
   May 1974

5. Report on triggered barriers and recommendations for their use underground

   11th Report of the MSHC, Annex VIII
   May 1974

6. Recommendations on the application of dust binding by hygroscopic salts as a means of combatting coal dust explosions

   14th Report of the MSHC, Annex V
   June 1977

7. Recommendations for the use of water trough barriers for containing coal-dust explosions underground

   15th Report of the MSHC, Annex VI
   July 1978

M HEALTH IN COAL MINES

1. Explanatory notes to the recommendation on 'Fixing of climatic limits'

   3rd Report of the MSHC, Annex X
   November 1966

2. Recommendation on 'Fixing of climatic limits'

   3rd Report of the MSHC, Annex XI
   November 1966

3. Recommendation embodying directives on means of suppressing dust concentrations in underground workings

   8th Report of the MSHC, Annex VI
   June 1971

4. Recommendation on the organization of special services responsible for the inspection of dust conditions in underground working

   8th Report of the MSHC, Annex VII
   June 1971

5. Statement on the need to reduce the dust concentration resulting from the use of coal-cuttings and getting machinery and roadway drivage

   8th Report of the MSHC, Annex VIII
   June 1971

6. Guidelines concerning the Design and use of Coal Getting and Heading Machines, relating to the reduction of airborne dust

   11th Report of the MSHC, Annex XI
   May 1974

7. Examples of proven and effective methods of installing and operating water sprays on plough faces (Annex to the guide lines concerning the design and use of coal getting and heading machines, relating to the reduction of airborne dust, which were printed as Annex XI to the 11th Report

   12th Report of the MSHC, Annex VII
   July 1975

N RESCUE ARRANGEMENTS, FIRES AND UNDERGROUND COMBUSTION

I. Mine rescue

1. Organization of mine rescue arrangements

1.1. Report on tour of central rescue stations in the Community countries and Great Britain
(First Report on the organization of mine rescue services 1958/59)

2nd Report of the MSHC, Annex B, June 1961

1.2. Second Report on the organization of mine rescue services, 1960

3rd Report of the MSHC, Annex Va November 1966

1.3. Third Report on the organization of mine rescue services, 1961

3rd Report of the MSHC, Annex VIa, November 1966

1.4. Fourth Report on the organization of mine rescue services, 1962

3rd Report of the MSHC, Annex VIIa November 1966

1.5. Fifth Report on the organization of mine rescue services, 1963 and 1964

3rd Report of the MSHC, Annex VIIIa November 1966

1.6. Sixth Report on the organization of mine rescue services, 1965/66

5th Report of the MSHC, Annex V October 1968

1.7. Seventh Report on the organization of mine rescue services, 1967/68

7th Report of the MSHC, Annex IV September 1970

1.8. Eighth Report on the organization of mine rescue services, 1969/70

9th Report of the MSHC, Annex IV

1.9. Recommendations regarding the provision of advice from foreigh experts in the case of major accidents

3rd Report of the MSHC, Annex III November 1966

1.10. Communication links between the rescue base and the rescue team

3rd Report of the MSHC, Annex IV
November 1966

1.11. List of regulations and directives concerning the organization of mine rescue services in the countries of the Community and the United Kingdom

9th Report of the MSHC, Annex VI Doc. 3845/1/70

1.12. Ninth Report on Mine Rescue Services, Organization, Personnel, Apparatus available, and recent developments for rescue work in irrespirable atmospheres, giving the position in Member States of the Community as at 31.12.1975

14th Report of the MSHC, Annex VI
June 1977

2. Rescue equipment

2.1. Interim report on the continued development of the CO-filter self-rescuer
10th October 1968 — D — Doc. 1872/68 E F D

2.2. Results of the research carried out with financial assistance from the Commission of the European Communities into the improvement of the physiological conditions for the wearing of breathing apparatus

8th Report of the MSHC, Annex IV
June 1971

2.3. First report on filter self-rescuers for use in coal mines in the European Community countries - Part I : minimum design requirements and testing procedures

13th Report of the MSHC, Annex X, 1976

2.4. The Use of Filter Self Rescuers in European Coal Mines Part II. Maintenance and Training

14th Report of the MSHC, Annex VII
June 1977

2.5. The Use of Filter Self Rescuers in European Coal Mines Part III. Future developments

16th Report of the MSHC, Annex IX

2.6. The Use of Filter Self Rescuers in Coal Mines in Member States of the European Community
Part I - Minimum design requirements and testing procedures

Part II - Maintenance and Training

Part III- Future developments

Printed separately - 1979 — Doc. 3919/79 E F D I N DK

3. Research work at high temperatures

3.1. Final report on research into the establishment of simple criteria for the selection of rescue team personnel for heavy work in high temperatures

3rd Report of the MSHC, Annex IXa
November 1966

4. Rescue with boreholes

4.1. List of specialists for borehole rescue work and equipment available in Community countries

8th Report of the MSHC, Annex III
June 1971, revised giving position as at 1.1.1976

13th Report of the MSHC, Annex VI,
1976

II Fires and underground combustion

1. Shaft fires at great depth

1.1. Recommendation on the equipment having regard to the prevention of open fires

1st Report on the MSHC, April 1959

1.2. Fighting of fires in shafts by bringing in water

2nd Report of the MSHC, p. 24
June 1961

see also modification contained in 10th Report of MSHC, Annex VI, June 1972

1.3. Final report on experiments with shaft fires carried out by the Experimental Roadway Association in Dortmund, with the financial aid of the High Authority, at Dorstfeld Colliery, Dortmund

3rd Report of the MSHC, Annex IIIa
November 1966

1.4. Explanatory notes and views of the Working Parties on Underground Combustion and Fires and Mine Rescue Organization, and their expert sub-committees, concerning the final report of the Experimental Roadway Association, Dortmund, on the shaft fire experiment at Dorstfeld Colliery

3rd Report of the MSHC, Annex IIIb
November 1966

1.5. Memorandum on the Neutralization of Mine Fires by the Injection of Nitrogen

14th Report of the MSHC, Annex VIII
June 1977

2. Fire stoppings (dams)

2.1. Sealing-off of mine fires and underground combustion by dams

2nd Report of the MSHC, p. 51
June 1961

2.2. Report on trials with explosion-proof dams carried out by the Experimental Roadway Association in Dortmund at the request of the Safety Commission and with financial aid of the High Authority - Statement of policy regarding the erection of advance dams of plaster as a fire fighting measure

3rd Report of the MSHC, Annex I
November 1966

2.3. Final Report on trials with explosion-proof dams, carried out by the Experimental Roadway Association in Dortmund with the financial aid of the High Authority

3rd Report of the MSHC, Annex Ia
November 1966

2.4. Instructions for the construction of plaster stoppings by the method developed by the Essen-Kray Main Rescue Station

3rd Report of the MSHC, Annex Xa,
November 1966

2.5. Instructions for the hydro-mechanical method of constructing plaster stoppings developed from the Central rescue station of the Saarbergwerke AG

8th Report of the MSHC, Annex V
June 1971

3. Fire-resistant fluids

3.1. Report on the establishment of criteria for fire-resistant fluids for power transmission (Hydraulic fluids) and on the tests to be carried out for that purpose

2nd Report of the MSHC, Annex A, June 1971

3.2. Second Report on specifications and testing conditions relating to fire-resistant fluids used for power transmission

3rd Report of the MSHC, Annex IVa November 1966

3.3. Third Report on specifications and testing conditions relating to fire-resistant fluids for power transmission

pamphlet 10th October 1967

3.4. Fourth Report on specifications and testing conditions relating to fire-resistant fluids for power transmission

pamphlet 26th March 1971

3.5. Fifth Report on specifications and testing conditions relating to fire-resistant fluids for power transmission

pamphlet November 1974

4. The reopening of fire areas

4.1. Report on the opening of sealed-off fire areas and the rules applicable thereto

3rd Report of the MSHC, Annex II November 1966

4.2. Study on the reopening of sealed-off fire areas by Bergassessor a.D.G. Lehmann

3rd Report of the MSHC, Annex IIa November 1970

5. Use of urethane foam for sealing

5.1. Opinion on the use underground of polyurethane foam in the coal mining industry

7th Report of the MSHC, Annex VI
September 1970

6. Conveyor belts

6.1. First report on tests and criteria of flammability of conveyor belts with fabric cores used in the coal mines of the European Community

12th Report of the MSHC, Annex VI
July 1975

6.2. The check testing of conveyor belts with textile carcas for use underground in coal mines. Resistance to flame.

16th Report of the MSHC, Annex VI
Printed separately 1979 — Doc. 1479/8/77
E F D I N DK

6.3. Comparative testing of conveyor belts during 1976.
Report and test result.
Printed separately 1980 — Doc. 142/7/77
E F D I N DK

0 COMMON STATISTICS ON VICTIMS OF ACCIDENTS

1. Report and Recommendations on the preparation of common statistics on victims of accidents underground, in accordance with Community Definitions

9th Report of the MSHC, Annex V, July 1972

X MISCELLANOUS

A. CONGRESSES

1.1.	Safety and health in mines for inspectors of Member States of the EEC 9-10-11 december 1975 - Bochum Printed separately	without No of doc.
1.2.	20th Anniversary of the Mines Safety and Health Commission 21/22 November 1977 in Luxembourg Printed officially	EUR 6360 E F D I N DK
1.3.	International conference for safety representatives (Workmen's inspectors) responsible for inspection underground 28/29 September 1978 in Luxembourg Printed officially 1980	Doc. 4282/79 f
1.4.	Medical aspects of diving accidents 12/13 October 1978 Printed separately 1979 Available in 1980	Doc. 5204/79 E F D

B. DIVERS

1.4.	As above	
1.5.	Guidance notes for safe diving Volume I - General recommendations Printed separately	Doc. 3735/78 E
1.6.	Volume II - Directory of information sources for diving operations in Western Europe only available in E	Doc. without No

C. SIGNS AT WORK

1.	Harmonization and applications of safety signs at work in coal mines 16th Report of the MSHC, Annex VII Printed separately 1979	Doc. 3040/3/78 E F D I N DK

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