EUROPEAN COAL AND STEEL COMMUNITY

SECOND REPORT OF THE MINES SAFETY COMMISSION

JUNE 1961

C O N T E N T S

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INTRODUCTION

In April 1959, the Mines Safety Commission issued its First Report on its activities, covering the period May 1957- December 1958.

This, the Second, Report covers the years 1959 and 1960.

Like its predecessor, it consists of three parts :

1. - The Activities of the Commission,
2. - Developments in the field of Mine Safety in the Community Countries,
3. - Safety Statistics.

Annex D reproduces the terms of reference and rules of procedure of the Commission; Annex E records the meeting of the Restricted Committee, of the full Commission, and of the various working parties and sub-committees, and contains a complete list of the members of the Commission and the various outside experts called in to assist it in its work.

The second Report (+) was duly laid before the Council of Ministers and the High Authority, in accordance with Article 8 of the Commission's terms of reference.

(+) Copies of this Report may be obtained on request from the Secretariat of the Commission (Secrétariat de l'Organe Permanent pour la Sécurité dans les Mines de Houille, Haute Autorité de la C.E.C.A., 29 rue Aldringer, Luxembourg).

PART ONE

ACTIVITIES OF THE COMMISSION

The Commission's activities during the period under review related mainly to matters discussed earlier at the Conference on Safety in Coalmines but referred by the Governments to the Commission for further attention.

In addition, as requested by certain of the competent mining authorities, the Commission studied certain urgent problems, including in particular those arising out of accidents presenting special features.

1. Technical questions were handled by the working parties referred to the first report

"On Electricity",
"On Fires and Underground Combustion," and on
"Winding-Ropes and Shaft Guides"

and their various sub-committees.

Points in connection with rescue operations were dealt with by the "Working Party on Rescue Organization."

The High Authority's competition for the improvement of mine safety equipment is being conducted under the supervision of a panel of judges specially appointed for the purpose.

2. For the study of problems connected with human factors, the Commission set up working parties on :

a) Medical Problems of Safety Policy;
b) Psychological and Sociological Factors Affecting Safety;
c) Effects of Working Hours on Safety;
d) Effects of Methods of Payment on Safety.

Each of these working parties consists of Government, employers' and workers' representatives from each country, with a Government representative in the chair.

The Working Party on Medical Problems also includes a medical expert from each country.

The members of the technical working parties are selected solely for their technical knowledge and experience.

SECTION ONE

TECHNICAL PROBLEMS

I

WORKING PARTY on ELECTRIFICATION

A.- The use of non-flammable materials for the manufacture of electric cables and leads for underground use

The Conference on Safety in Mines put forward the following recommendations with regard to cables and leads, to serve as a basis for the issue of appropriate regulations :

1) - "The outer sheathing of armoured cables must be of a type which cannot possibly help to spread a fire. The same applies to the external sheathing of leads. All new cables and leads should be constructed to comply with these requirements."
(Recommendation 6 - E, page 63 of the Conference Report)

This recommendation was accepted at the time by all countries.

2) - In the section on Research of its Report the Conference furthermore recommended :

"In connection with the manufacture of armoured and flexible cables and their use belowground, research work and other efforts should be continued with a view to replacing flammable materials such as rubber, jute and impregnated paper by non-flammable or flame-resistant materials such as neoprene, glass wool or polyvinyl chloride."
(Recommendation 12 - E, page 147 of the Conference Report)

In its first report the Commission stated that it was concerned only with Recommendation 2, since Recommendation 1 was approved by all the governments. It also reported on the then state of investigations, its conclusions being that

- a) not everyone is convinced of the necessity of using non-flammable materials for the internal insulation of cables;
- b) no sufficiently conclusive experimental data are available, which could have served to provide a clear picture of the danger which might in certain circumstances result from the use of such substances.

The cable-manufacturing firms of the individual countries were consulted during the discussion of this problem. The aim of this recommendation was more clearly defined as being to guarantee that electric cables and leads do not propagate fire when exposed to an open flame.

With this in mind further consultations and experiments were undertaken.

The Commission formed the view that the stipulated non-flammability or flame-resistance of the outer casing of the cables and leads gives adequate protection against propagation of the fire.

It nevertheless decided to investigate, by means of suitable experiments, whether it is in addition necessary to use flame-resistant materials in the interior of the cables and leads.

A large number of practical tests were therefore carried out under conditions corresponding to those to which cables and leads are exposed during an underground fire, to see whether the types of cable and lead at present in use underground, and incorporating non-flammable or flame-resistant sheathings, act like a slow-match and propagate the fire, or whether, on the contrary, they do not transmit the flame.

These tests were carried out in such a way that the cables and leads were :

a) - exposed to the affects of an open fire (coke fire, gas-burner flame or welding-torch flame) or

b) - heated to ignition in the heated section of a pipe (ventilation duct), or

c) - exposed to the effects of a fire in the timbers of a roadway, as simulated in the fire sections of an experimental gallery.

The intention in applying the method under c) was to simulate faithfully the conditions obtaining underground, while test method b) was intended to provide comparable values for a cable of the same manufacture in several different tests.

During these tests it was found that the types of cable and lead investigated - and in general use underground - transmitted the fire only a few metres away from its source.

In the case of the cables and leads investigated - the composition of which is detailed below - the outer sheathing consisted of non-flammable or flame-resistant materials. The internal parts of the cables and leads contained the usual types and quantities of flammable materials.

The following cables and leads were investigated :

1) - <u>Lead-covered cable</u>

Insulation with oil-impregnated paper or else with rubber;

lead sheathing;

inner protective sheath of bituminized textile or similar material;

wire or tape armouring;

without external sheathing or with a PVC-based thermoplastic material or flame-resistant wax or varnish, both as protection against corrosion.

2) - <u>Plastic-covered cable</u>

Insulation of PVC-based thermoplastic material, common conductor sheathing consisting of a rubber-containing filling compound;

wire armouring or braiding;

external sheathing consisting of PVC-based thermoplastic material.

3) - <u>Rubber-covered lead</u>

Insulation of rubber;

common conductor sheathing of rubber or of conductive rubber with or without wire braiding;

outer sheathing of Neoprene.

The tests in the experimental roadway, which are still in the initial stages, are to be continued, first of all with the object of determining with sufficient accuracy under what conditions (inter alia, the duration of pre-heating, the temperature and the ventilation-air velocity) a given type of cable can be set on fire, together with special, systematic investigations on the behaviour of certain types of PVC-based plastic-covered cables. It is also intended to develop further the heating system of this experimental roadway so that in subsequent tests the temperature gradient produced will faithfully simulate real conditions.

The Commission has formed the view that, leaving out of account the results (still not available) from the projected wind-tunnel test - the results obtained from the tests listed under a), b) and c) allow it to make the following declaration, which it accepted in its plenary session of December 20, 1960.

- DECLARATION WITH REGARD TO THE USE OF NON-FLAMMABLE OR AT LEAST FLAME-RESISTANT MATERIALS FOR THE MANUFACTURE OF ELECTRIC CABLES AND LEADS FOR USE UNDERGROUND

"The tests carried out have shown that the flammable materials in the interior of the cables and leads do not increase the danger of propagation of fire, which is principally - if not exclusively - dependent upon the characteristics of the external sheathing.

"There is therefore no necessity - in the case of the investigated and above-described types of cable and lead - to replace in accordance with Recommendation E - 12 the flammable materials by non-flammable or flame-resistant material."

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B. - Requirements which must be met by electric shotfiring leads

Experience gathered in Belgium has indicated the dangers which may arise in the use of duplex shotfiring leads insulated with plastics. Very slight damage, such that it is virtually invisible to the inspecting shotfirer and cannot be determined by the use of a ohmmeter, can produce sparks which can ignite a mixture of air and firedamp especially when used in moist places. This risk occurs both with improved igniters and those in which the igniting current is of longer duration. Damage of this nature frequently occurred to shotfiring leads after a certain period of use.

On the basis of the study of reports of accidents caused by shotfiring leads, the Commission concluded that serious accidents of this kind could be attributed to damaged shotfiring leads in which non-insulated parts came into contact with pipes or metal support components.

Without wishing to trespass upon the province of inspectorate regulations, the Commission has prepared recommendations for minimum standards, which should at all times be fulfilled by shotfiring leads and which should, in the wiew of the Commission, be the criterion by which shotfiring leads should be judged for certification or acceptance.

Several recommendations of a general nature applicable to all shotfiring leads are supplemented by recommendations regarding permanent and temporary shotfiring leads used in gassy pits and, finally, by further recommendations regarding fixed shotfiring leads in gassy pits.

In that part of the recommendation which advised measurement of the ohmic resistance of the circuit before firing each round using several detonators, the Commission - bearing in mind the possible results of a faulty ignition - has confirmed the proposal regarding the same question advanced in the Conference Report. This report envisaged testing the total resistance only where a fairly large number of shots was involved (15 or 20 shots).

The Commission emphatically points out that the precautions taken in the manufacture of shotfiring leads constitute only a part of the safety precautions which must be taken overall to avoid accidents during shotfiring. Above all, shotfiring must be avoided in places where an explosible mixture of air and firedamp is present.

In its plenary session of April 8, 1960 the Commission accepted the following recommendation :

RECOMMENDATIONS FOR SHOTFIRING LEADS

1 : DEFINITIONS

For the purposes of the present recommendation, the following terms are to be understood as defined below :

Shotfiring lead : the link between the igniter and a point in the vicinity of the shot-holes.

Temporary shotfiring lead : a shotfiring lead which does not serve at one working-place for longer than one shift; this designation does not apply to extention leads which connect shotfiring leads with the detonator wires.

Permanent shotfiring lead : all other shotfiring leads.

Conductor : the metal part of an electric lead. The conductor is said to be solid, if it consists of a single wire, or multi-wired, if it consists of several wires twisted together.

Insulation : the sheathing around any conductor for purposes of insulation.

Core : the entire conductor with insulation.

A distinction is drawn between single-core leads, twisted leads, leads and cables (or rubber-covered leads).

Cables or rubber-covered leads : the totality of several electrically separated and mechanically solid cores, surrounded by a common protective sheathing.

Protective sheathing : the continuous envelope with which the cable or rubber-covered lead is provided as a protection against damage.

A single-core lead can also be provided with a protective sheathing.

2 : RECOMMENDATIONS FOR ALL SHOTFIRING LEADS

Every conductor must be provided with at least one good-quality insulation.

All connections must be properly insulated.

Every shotfiring lead must have the appropriate degree of flexibility.

The conductors must be of such cross-sectional area that they do not occasion an excessive voltage drop.

The shotfiring leads must be made up and laid in such a way that the risk of any fault current - especially resulting from contact with metal objects - is reduced to a minimum.

Before any shotfiring operation in particular workings and before the simultaneous firing of a fairly large number of shots (to be laid down in each country by the responsible authority), the responsible shotfirer must measure the ohmic resistance of the circuit.

The movable shotfiring leads must :

1) be carefully inspected before every firing, by the responsible shotfirer;
2) be regularly subjected to thorough checking by an expert at the surface or in an underground workshop.

A thorough checking must consist of at least :

a) a careful inspection of the shotfiring lead over its whole length;
b) measurement of the insulation between the two conductors, if the shotfiring lead consists of a rubber-covered lead;
c) measurement of the ohmic resistance of the shotfiring lead.

Similarly the permanent shotfiring leads must regularly be thoroughly checked by an expert. The insulation between the two conductors need however only be measured if the shotfiring lead is to be re-used elsewhere.

It is advisable to make a written record of every thorough check, with the date.

3 : FURTHER RECOMMENDATIONS FOR PERMANENT AND TEMPORARY SHOTFIRING LEADS USED IN GASSY MINES

The shotfiring leads must fulfil conditions which ensure sufficient safety, with regard to :

a) mechanical strength and in particular tensile strenght;
   bending and abrasion strength;
b) electrical insulation;
c) impermeability (to moisture) of the insulation and the sheathing.

It is advisable to prepare checking standards which correspond to the conditions laid down.

4 : SUPPLEMENTARY RECOMMENDATIONS FOR PERMANENT SHOTFIRING LEADS USED IN GASSY PITS

The permanent shotfiring leads should be so arranged that, as far as possible, damage during firing of the shots or from other causes is avoided.

If the shotfiring lead consists of two separate conductors, these should be arranged sufficiently far apart and in such a way that inspection is possible.

In shafts and dipping roads, the shotfiring leads must have an adequate mechanical strength to withstand the strain put on them by the method of arrangement employed.

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These recommendations consequently serve exclusively to the use of fairly frequently-used shotfiring leads. They are completely general in nature, and do not go into details of construction or of checking of the leads. Nevertheless they emphatically underline the necessary for the insulation to be in good condition and for the points of connection to be satisfactorily insulated.

Measurement of the insulation is to be included in the thorough checks of shotfiring leads which have to be carried out in regular intervals. This measurement cannot be carried out by means of an ohmmeter, but calls for comparatively high voltages which may cause dangerous conditions underground. Consequently, measurement of the insulation must only be carried out at the surface or in an underground workshop. Regular measurement of the condition of the insulation of permanent shotfiring leads is not possible. In this instance therefore the measurement should be carried out only when the leads are shifted.

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C.- Protection of the underground electrical network against the danger of electric shocks

Investigations carried out in Belgium after an accident have indicated that, in spite of the familiar safety regulations normally applied in the pits, currents which can be dangerous to the workers can be produced in certain circumstances. This particular accident was caused because part of the metal equipment in the face became live.

The Commission considered it necessary to investigate the possibility of providing protection against electric shocks from underground leads.

In doing so it concentrated on the medium-tension underground networks (380-1,100 V), which are principally used in coal-winning workings, without taking into account the type of star connection employed. These networks of leads which have to be carried along in the immediate vicinity of the working-places and faces are subject to far worse conditions when faults arise than is the case for networks carrying higher voltages. The measures applied to the latter category of network, as also to the compulsory shorter networks carrying voltages below 380 V, can be dispensed with provided that certain simplified precautions based on similar principles are taken. The investigations were therefore concerned solely with the voltage range indicated.

After studying the measures taken to ensure protection against electric shocks from underground distribution networks in various countries, and the experience gained in recent years with various technical improvements in this field, the Commission worked out in the form of recommendations various categories of protective measure to increase the protection of underground distribution networks against the risk of electric shocks.

It further considered it necessary to provide a brief description drawing clear distinctions between low tension, medium tension and high tension; this is included as a preface to ensure better understanding and to avoid varying interpretations of the recommendation in the different countries of the Community, as these concepts are frequently referred to in the text.

These prefatory remarks must however not be considered as a generally-valid series of definitions and are without prejudice to the classifications normally used in the individual countries.

The Commission emphasises that the recommended categories of precautions will only provide an adequate degree of safety if they are applied simultaneously.

No single group of recommendations applied alone is sufficient to guarantee that there is complete safety for the workmen against the dangers of electric shocks, although it must be borne in mind that the urgency and value of these measures differ.

In its plenary session of April 8, 1960 the Commission approved the following recommendations :

R E C O M M E N D A T I O N S
regarding the
PROTECTION OF UNDERGROUND DISTRIBUTION NETWORKS AGAINST THE DANGER OF CAUSING ELECTRIC SHOCKS

I.- DEFINITIONS AND GENERAL REGULATIONS

A - The concepts used hereafter are by agreement to be understood as follows :

Network : Any installation of electically connected current sources, means of transmitting current and current-consuming apparatus. Thus e.g. the secondary winding of a transformer (or the secondary windings, if several transformers are present with secondary windings in parallel) and the components fed thereby constitute a network.

Voltage : Effective voltage between phases in the case of three-phase alternating current.

Designation of the Voltages

N.B. The following designations are used solely for the purpose of the present recommendation and are without prejudice to the classifications normally used in the individual countries.

Weak tension (WT) : Voltage range which may be considered safe (generally between 40 - 65 V according to country).

Low tension (LT) : Voltage range for lighting purpose, drilling operations, telephone installations etc. (65 - 380 V).

Medium tension (MT) : The normal voltage range for working equipment used underground with three-phase A.C. (between 380 and 1,100 V).

High tension (HT) : The normal voltage range for the primary winding (between 1,100 and 12,000 V) of the transformers supplying the MT- and LT-networks.

B - The following recommendations refer only to the MT networks defined above. These networks should fulfil all the recommendations set out below.

As against this, these recommendations refer neither to the HT networks, nor to voltages which are lower than the medium-tension range and are used for particular purposes (lighting, drilling apparatus, telephone installations, etc.). Some easing of the restrictions may be allowed in such cases. Overheadwire networks with bare trolley wires are also excluded.

II - PROTECTION AGAINST THE RISK OF ELECTRIC SHOCKS

A - FIRST ORDER PRECAUTIONS

(Protection against direct contact with a live phase)

1 - Every chance contact with a live phase should be avoided as far as possible, this being done by laying the conductor out of the workmens' reach, by interposing effective barriers or even by sheathing the phase or by insulating it.

2 - The cables and leads used in medium-tension underground networks should be protected either by means of a metal armouring connected to the pilot lead, or given mechanical protection by a flexible envelope of the best possible design. Leads without metal armouring must be electrically protected by separate or common protective screens, which trip safety devices in the event of a fault.

3 - Only trained men should be allowed to open the housings of accessible live parts (medium-tension voltage range) and this only under conditions which have been clearly laid down in advance.

4 - The repair and maintenance of the electrical equipment should be entrusted only to trained personnel.

B - SECOND ORDER PRECAUTIONS

(Equipotential connection between conductive parts of the installation)

1) All underground networks must be provided with an equipotential connection between the conductive (not live in normal operation) components of the installation and the other metal elements connected thereto, such that its conductance is sufficient to prevent the occurrence, between any two points accessible to a workman simultaneously, of a voltage higher than the weak voltage.

2 - This equipotential connection (protective lead) must ensure electric connection between the conductive elements of the installation over the whole length of the network. It must be maintained in satisfactory condition and must be inspected as often as is necessary to ensure this.

3 - The above-mentioned equipotential connection (protective lead) must be earthed at at least one point of the network via an earth connection of the lowest possible resistance.

4 - This earth connection must be combined with the star-point earth connection, if a star-point is employed.

C - THIRD ORDER PRECAUTIONS

(Reduction of fault duration)

1 - Any fault current must be considered dangerous in underground medium-tension networks if - when the fault current flows through the protective lead and connected conductive components of the installation or earth - there is produced between any two points accessible to a workman simultaneously a voltage exceeding the level of a week voltage, regardless of whether it occurs only between parts of the installation or between such parts and earth.

2 - If the star-point of a network is earthed via a weak impedance or without any impedance, so that the presumed fault current is not restricted to a low value, then the network must be provided with safety devices which can at any time automatically isolate the damaged section of the network from the current source (or render it completely dead)+, before the fault current flowing through the protective lead and connected conductive components of the installation or earth reach a dangerous value.

Only when the line has been repaired or the fault eliminated, or at the direction of a specialist who has taken all necessary precautions, may that section of the network be brought under voltage again.

3 - If the star-point of a network is insulated or earthed via some impedance, which restricts fault currents to a low value, the network must be fitted with supervising devices which are always in a state of readiness and which are suitable :

a) either to check the insulation of the various parts of the network and to indicate any damage they may have suffered or - which is preferable - automatically to cut off the damaged section of the network from its source of current (or render the entire network dead)+.

If no automatic out-off device is installed, the responsibility for cutting-off should be entrusted to an expert man, who can intervene as soon as the warning signal of the supervisory system is tripped or the fault assumes major dimensions.

If cutting-off has been necessitated by one of the two cases cited above, the restoration of current may be accepted only after repair of the line or elimination of the fault, or only at the direction of an expert official, who has taken all necessary precautions.

If no automatic cut-off device is installed, the rubber-covered leads of mobile machines must be fitted with an automatic device which renders them dead as soon as there occurs a fault current which is caused by

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+Since the complete or partial cutting-off of a line voltage can have serious effects on the current supply to important equipment, suitable preventive measures should be taken.

damage to the external installation or by damage of the insulation to an individual phase;

b) or automatically to cut off the damaged section of the network from its current source (or render the entire network dead), as soon as a double fault occurs leading to a dangerous fault current in the protective lead and connected parts of the installation.

In this instance the current may be switched on again only after the line has been prepaired or the fault eliminated.

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The Working Party feels it necessary to give the following explanations as a comment on the present draft recommendation.

The recommendation refers to the protection against electric shocks of medium-tension (380 to 1,100 V) electrical networks installed underground, whatever the star connection used. Similar principles can if necessary also be applied to other voltage ranges.

In other networks, e.g. high-tension networks (3 to 5 kV, or even in some instances 12 kV), which generally use armoured cables and are almost exclusively installed in roadways which have been in service for longer than is the case with medium-tension leads, there are far fewer possibilities of faults occurring. In such cases an earth fault is generally only possible if the cable is broken or if moisture penetrates the connections. If the star point of the network is earthed, an overload relay inserted at this point as a protective device can give timely warning of faults and can switch off the currents. If a network has an insulated star point, the devices normally used with medium voltages can be employed (e.g. testing by means of an earth voltmeter, superimposition of rectified current or directional protection relay).

It must however be pointed out that at these voltages faults can very quickly lead to open short-circuits, which can trip the adjustable protective devices without delay and much more easily than is possible in the medium-tension range.

Accordingly, three categories of precaution are here proposed to ensure the safety of the workmen handling apparatus in the medium-tension range.

The purpose of the first order precautions is to prevent all direct contact with a live phase; second order precautions are intended to make any possible contact with a conductive part of the installation safe. The third order precautions are intended to ensure that the current is cut off as quickly as possible if, where the insulation is inadequate, connection between the conductive parts of the installation becomes imperfect or a serious fault occurs (single faults in the case of network with earthed star point and double faults in the case of networks with insulated star point).

None of the precautions proposed will be sufficient by itself to protect the workmen at all times from electric shocks; only if all these precautions are applied in combination can a satisfactory degree of safety be guaranteed.

Consequently it is essential that the precautions defined here as first order, second order and third order precautions should be applied simultaneously.

A - FIRST ORDER PRECAUTIONS

PROTECTION AGAINST DIRECT CONTACT WITH A LIVE PHASE (MEDIUM-TENSION NETWORK)

Direct contact with a bare live phase in this range of voltages is pratically always fatal. The fault current circuit is closed via the network capacities and the other insulation faults. However, it is not possible in the operating conditions which obtain in a pit to limit it to roughly 10 to 15 mA, the figure which a man of normal physical constitution can tolerate for some time.

In practical conditions, the danger is low only when the voltage to which a man can be subjected drops below a figure of 40 to 50 V, i.e. to a voltage which his internal resistance is still high enough to meet. Nevertheless, direct contact with live conductors should be absolutely avoided in all networks with higher voltages.

Consequently, the underground electrical equipment must - regardless of the star connection - be so constructed or disposed that direct contact with a live phase is impossible, except in the event of gross neglicence. For this reason use is made of locked or armoured switch boxes, which can be opened only after the current is cut off or with special keys which are entrusted to the trained operators, and opened only by them, in addition to insulating cut-outs, cables with protective leads or metal armouring, warning displays etc.

If these regulations are observed, the danger of fatal electric shocks can occur only in the case of earth faults leading to a local increase in the voltage in the conductive parts of the installation which can be touched by the workmen. The protection against this "indirect" earth current consists essentially in providing an equipotential connection between the conductive parts which can be touched simultaneously and the earth, and naturally, the quickest steps possible to eliminate the fault.

The safety envisaged is based on two main principles :

- reduction to safe values of potential voltages between conductive parts and earth in the area where conductive parts are simultaneously accessible to the workmen;
- reduction of the fault period, achieved by switching off the current before the danger increases.

This leads again to two categories of precaution : the first consists in forming an equipotential connection between the conductive parts (second order precautions) and the second limitation of the duration of the fault (third order precautions).

B - SECOND ORDER PRECAUTIONS

EQUIPOTENTIAL CONNECTION BETWEEN CONDUCTIVE PARTS OF THE INSTALLATION

1) When contact with a live phase is possible only via a conductive part of the installation, the danger of an electric shock is in consequence present only if this part is brought to a dangerous potential (as compared with the simultaneously accessible conductors or the earth). But this happens only if the electric connection linking this part with the other insulation faults, with the star point earthing lead - if one is used - and with the network capacities offers sufficient resistance. The voltage of electric shocks is practically only a function of the resistance of the protective lead circuit between the fault point and the star point (or the other points, where the insulation is faulty) and not a function of the earth resistance as such.

Put in more general terms, the total voltage gradient in the fault current circuit is proportional to the series of successive impedances. This is where the superiority of distribution networks using an insulated star point (or more precisely a star point earthed via a strong impedance) comes out clearly. Raising the star point resistance can reduce the voltage gradient in the protective current circuit, even if the latter is incomplete, because the fault current is restricted to very low values. If on the other hand the star point earthing resistance is weak and the total resistance of the pilot lead and the connected conductive parts (or of the earth and the latter) is relatively high, the conductive part can be brought under a high potential.

Whatever the arrangement chosen, efforts must in every case be made to produce equipotential conditions as extensively as possible between earth and the conductive parts which can be touched simultaneously by the workers. It is therefore not sufficient that the earthing lead(s) should have low resistance values. Above everything else it is essential that the conductive parts should be connected satisfactorily to each other.

Finally, it would be desirable to build in the desired connection of the conductive parts, unless very grave disadvantages should preclude it, e.g. a disturbance of the capacitive equilibrium which might result from such measures.

2) Connection of the protective lead and star point

In networks in which the star point is earthed via a weak resistance or without any resistance, the question finally arises whether the conductive parts and the star point should be connected to the same earth lead.

If they are kept separate,

- the star point current will, in the event of a fault, be limited by reason of the resistance of this earth lead and its connection to earth;
- the danger of electric shock will increase, if the ratio between the earth resistance of the protective lead to the earth resistance of the star point becomes too high. In bad cases in fact the conductive parts may be brought under a potential approaching the value of the voltage in the distribution network.

If they are connected,

- the star point current increases in the event of a fault (since the earth resistance are shunt connected); the risk of an increase in the potential of the conductive parts is however reduced thereby, except when very heavy fault currents occur;
- the adjustment and the tripping of circuit-breakers is made easier (star point cut-out, core balance, etc.).

The special structure of our underground networks, in which the active conductors are surrounded by sheathing connected to the freely-conductive protective lead, and in which protective lead and star point lead cannot be very widely separated, makes it illusory to try to separate them in practical operations. Anyway, this could in fact be justified only in the case of a surface distribution network which is subjected to atmosphere over-voltages or which do not possess a sensitive fault current circuit-breaker.

If the two elements are not separated, the devices of the core balance type or the star point relay can operate more precisely (because they are not affected by variations in earthing resistance). Here once again the deciding factor is that the continuous connection of the conductive parts should possess adequate conductivity to conduct away the maximum possible short-circuit current of the network without any appreciable voltage increase. It is understandable that its value must be restricted.

It is also understandable that it is in everybody's interest to connect the earthing lead with the star point.

C - THIRD ORDER PRECAUTIONS

REDUCTION OF FAULT PERIOD

1) The electrically continuous connection of the conductive parts is also the best protection against electric shocks in the event of double earth connection in networks with a star point insulated via a high resistance. In this case there is no distinction between the maximum value of the possible fault current in the protective lead and the highest possible short-circuit current.

   It is naturally possible that the conductivity of the protective lead circuit or the earth, through which such a current must pass, is frequently not sufficient to avoid dangerous voltages in the conductive parts or between these and earth (especially if we bear in mind the other factors affecting short-circuits). It is therefore important to maintain the maximum possible fault current and its duration period within narrow limits.

2) In networks with a star point earthed via a weak resistance or without any resistance, the conclusion is the same, but the fault current must be restricted as soon as the insulation of a single-phase of the network drops too heavily.

   This explains, e.g., the British practice which envisages that the network must automatically be cut off from current as soon as the fault current reaches either 15% of the nominal current of the network or 5A. It is therefore sufficient to provide a conductivity of the protective lead sufficient for the higher of these two values to ensure that the network is completely safe.

   The same is true for a 500-V network in which an impedance of the star point of, e.g., 30 ohms restricts the possible fault current : in this case even a protective lead of inadequate capacity will be sufficient.

D - CHOICE OF THE TYPE OF STAR POINT

The above remarks show :

1) that the obligation to install protective devices for all networks becomes even more binding, the worse the electrical connection between the conductive parts;

2) that with comparable effectiveness of the protective lead the average voltage distribution networks are, in the event of single faults, so much the less dangerous the stronger the impedance of the connection between star point and protective leads. Networks with a star point insulated via a strong impedance are the least dangerous; networks with a freely-earthed star point are the least safe:

3) with networks with a star point earthed via a weak impedance or without any impedance, in which any possible fault current cannot be restricted to safe values, it is indispensable to provide automatic protective devices which are tripped as soon as the first fault occurs;

4) with networks with an insulated star point (or a star point earthed via an impedance which restricts the fault current to a safe value), these networks corresponding to the first two categories of precaution defined above, the danger of an electric shock on contact with a mass can now only occur if an earth connection which can be classified as twice the true short-circuit value is present.

   There must therefore be an automatic cutting-off before the double-value earth connection becomes operative. Such cutting-off can however be dispensed with (solely with regard to the risk of electric shock) as long as there is only a single-value earth connection. These facts must be borne in mind in the choice of star point and of precautions to be taken, to ensure the appropriate degree of protection in every case.

As can seen from the investigation described above, it is consequently a question of seeing that the automatic protection is tripped immediately the second fault occurs, if the networks with insulated star point are not automatically cut off as soon as the first fault occurs - and one of their advantages is after all precisely this possibility of "working to the end of the shifts ."

A general, permanent check of the insulation of the network with respect to the protective lead makes it possible to get an appropriate indication of the development of the first fault, but not of the occurrence of the second. It is therefore necessary - and this is the purpose of the proposed third order precautions -

a) either to check the insulation continuously and, if it is found to be too weak, to cut off the damaged strand (either automatically or not) or to render the network dead). This amounts to saying that steps must be taken before the first fault becomes too serious;

b) or to employ an automatic protective device which cuts off the damaged strand (or renders the whole network dead), as soon as there is an earth short-circuit. This amounts to saying that steps are taken only when the second fault occurs, but then they must be taken immediately.

Since there are other reasons (danger of fire) favouring the use of automatic cutting-off, it should in fact be simplest to ensure that the automatic fault protection - even if it is resistance loaded - is tripped as soon as these faults occur. This will give in addition protection against the danger of electric shocks which could be caused by a double fault. But this is only one means among many.

However that may be, this last precaution gives a network with insulated star point a protection which is comparable with the safety of networks controlled by core balance and having an earthed star point.

E - RESTORATION OF CURRENT, RESTRICTION OF FAULTS

a) If the fault current is not restricted to a safe value by a suitable star point resistance, then restoration of the current after the occurrence of a fault should be absolutely forbidden. If the limitation of the fault does not take effect immediately, attempts should be made to reduce it by the normal means (e.g. using an ohmmeter). For practical reasons however it must be possible to restore current after a fault; when this is done, however, special precautions must be taken by an experienced official.

b) If the star point is insulated (or earthed via a strong resistance) and if a single fault is present (e.g. cutting-off by an insulation-checking device, which functions at a few thousand ohms), then - provided that the conductivity of the protective lead is good - restoration of the current is not likely to have serious disadvantages with respect to the danger of electric shocks. This step is not to be recommended, but neither should it be forbidden: among other things it is in fact inevitable for precise restriction of the fault.

c) If the star point is insulated (or earthed via a strong resistance), and there is a double fault, restoration of the current after the occurrence of a fault should be made impossible or should be forbidden. The responsibility for restoration of current should be entrusted to an expert, who will only restore it once the fault has been eliminated or the damaged component has been replaced.

F - PROTECTION OF MOBILE UNDERGROUND MACHINES SUPPLIED WITH CURRENT VIA RUBBER-COVERED CABLES IN THE CASE OF NETWORKS WITH INSULATED STAR POINT

In the case of rubber-covered leads, which are subjected to heavy stress (mechanical stress, danger of rupture from external blows, etc.) and are in addition set in bad conditions (steadily advancing faces, dusty or gassy working-points, etc.), one generally tries to work with selective protection against internal and external damage.

This selective protection[1] frequently consists of a protective pilot lead or control lead around each individual conductor or around all conductors as a group. According to time or place, this lead (in the case of networks with insulated star point) is used in one of the three forms described below :

1) The protective lead connects only the conductive parts of the machine and the switch box. It is only a mechanical protection (like the armouring of cables), and plays no part when damage occurs to the outer insulation, while in the case of a contact-phase protective lead it breaks the circuit of the insulation checking device only "upstream."

   If no special device is provided (e.g. a reactive wattmeter protection), it does not constitute a selective protection.

2) The control lead is insulated on the machine side (or connected to the conductive parts via a sufficient impedance) and subjected to a certain voltage on the switch box side. The fact of earthing it initiates the release of a relay and the cutting off of the protection. If the impedance of the circuit allows it, a contact-phase control lead can play the same role (ring connection via protective lead, impedance of the star point, capacities and any insulation faults which may be present).

3) The control lead is subjected to a certain voltage, but the circuit is closed via a rectifier to the machine, which is shunted by any fault which may occur between earth and control lead, initiating the release of a fault relay. The same tripping operation is produced in the event of a fault between phase and control lead.

   This supplementary "electrical" protection of the lead quoted in the last two paragraphs may in some cases seem superfluous and even considered to represent a hindrance to operations (e.g. in wet working-point), particularly by reason of its sensitivity. It should therefore not be prescribed for every eventuality. The connection of the protective lead with the conductive parts in general supervision of the insulation does in fact provide sufficient safety, at least where there is automatic cutting-off from the current source in the event of earth connections. In the case of a network controlled only by signal apparatus, the electrical protection of rubber-covered leads would nevertheless best be preserved as a precautionary measure.

CONCLUSIONS

The present investigation leads to the following conclusions with regard to the protection of underground networks against electric shocks.

1) With all types of network direct contact with a live lead must be rendered impossible.

2) All low-tension networks must have the best possible equipotential connection between conductive parts and earth. This precaution is the most important of all.

3) To attain the same degree of safety with all medium-tension networks, it is necessary :

   a) automatically to cut-off from the current source all networks (or parts of networks) whose star point is earthed via a weak impedance or without any

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1) Independently of the remote control of the underground machine being supplied with current and of the electric interlocking of the starting switch - functions which are often performed by the same circuit.

impedance, so that the fault current is not restricted, as soon as the fault current reaches a value of a few amperes;

b) to check continuously the insulation of the networks with insulated star point or (either partially or completely) to render them dead automatically, as soon as a double faut occurs.

It goes without saying that automatic cutting-off on the occurrence of a single fault would make the networks even safer; a regulation to this effect is however not necessary.[1]

It is obvious that the protection must come into action automatically and as rapidly as possible, as soon as a double fault occurs in networks with insulated star point and a single fault in networks with earthed star point.

If in a medium-tension network[2] with insulated star point there occurs a single fault, the tripping of the protective device is desirable, but not indispensable, except perhaps in very extensive networks; an absolute prerequisite for this is however that there should be an effective automatic protection against double faults, acting as quickly as possible. If this is so, it is sufficient if the intervention takes place before the total insulation resistance of the network drops to too low a value. It can on occasion also be accepted, purely and simply with regard to the danger of electric shocks, that working of the shift should be completed with an earthed phase.[3]

4) Consequently, three categories of precautions can be derived from the foregoing, these precautions providing an adequate degree of safety only if they are employed simultaneously. No single one of them - used alone - is sufficient to provide full protection for the workmen against the danger of electric shocks.

It must however be emphasised that the urgency and value of these precautions differ.

- the prevention of direct contact with a live phase by means of insulation, by using barriers or by setting the cable at a suitable distance is one of the most important protective measures to be taken in connection with electrical networks. As soon as the voltage exceeds the limit of low-tension current, no other precautionary measure is suitable to protect the men. The majority of accidents caused by electric shocks are in practice due to negligent handling of these protective devices or the failure of the material - with the same results; this can be avoided only if the workers are obliged to refrain from touching the parts of the installation until they have checked by direct inspection that they are not live.

- after this, equipotential connection between the conductive parts of the installation is the most important measure; if this connection is suitably ensured and continually maintained, the risk is exceedingly slight of an electric shock caused by a fault between the phase and the conductive components of the installation resulting from contact with such a part of the installation, at the normal voltages and with the normal extent of underground distribution networks. At all events this connection of the conductive parts of the installation offers to those members of the working team who do not have to maintain the installations, but only to use them, what is virtually an absolute protection (at least with networks with an insulated star point, as long as there is only a single fault). This makes the establishment and maintenance of this connection so much the more important.

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1) As against this, with high-tension networks it might be necessary if the capacity currents reach too high a value.

2) In the sense defined earlier in this recommendation.

3) It goes without saying that special precautions must be taken in gassy mines.

A desirable precaution finally is to cut off the damaged parts of the network from the voltage source; this is absolutely essential as soon as the conductance of the fault current reaches an excessive value. The safety of the workers must nevertheless not depend solely and exclusively on precautions of this kind, in which one is obliged to use complicated technical devices which often are not properly selected, are incorrectly adjusted or are not kept in a satisfactory condition and which cannot function sufficiently rapidly. It is therefore necessary to be sure in the first place that the first and second order precautions have been actually taken and are fully effective at any time.

5) Some of the third order protective devices already on the market are of new design; their distribution in use is uneven, and the tests carried out with them were not run for the same period of time. There is therefore no question of prescribing their use indiscriminately.

Moreover, in the present state of technology it would not be advisable to bring them into service too quickly, since the simple fact of simultaneously applying protective devices does certainly not contribute to raising safety, but may on occasion rather reduce it. The technological imperfections of the apparatus put into service, on the one hand, together, on the other hand, with their response time (which is frequently considered inadequate) may under certain circumstances oblige the user to circumvent them, a procedure which brings far greater risks in its train than if the devices were not installed at all. Every administrative regulation must take account of this danger and must limit itself to codifying what is possible in practical operations, without occasioning mistakes which might have regrettable consequences.

6) Finally, there is one thing which must not be forgotten :the criterion of the value of the best installation is the weakest point of the installation and the reliability of the men who use and maintain the equipment.

In other words, the safety of the workers depends not only on the safety precautions outlined above, but also to a great extent on the technical quality of the equipment used and the care with which this equipment is installed, maintained and employed. It goes without saying that a prerequisite is to give appropriate training to a sufficient number of electro-technical staff, altough this does not dispense with the need for expert instruction of the operating personnel.

x

x x

D - Protection of underground distribution networks against dangers arising from fire or firedamp

When the Commission prepared the recommendations on the protection of underground distribution networks against electric shocks, it was pointed out that these networks also require protection against the risk of fire and the danger of firedamp explosions.

The occurrence of a serious accident in Britain - due to short-circuit which occurred at the damaged part of a cable - in which a firedamp explosion occurred despite the devices installed to protect the network against electric shocks, seemed to emphasize this need.

It was therefore considered necessary to extend this investigation beyond undergroud medium-tension networks, which were studied in connection with the risk of electric shocks, so as to cover in particular networks with voltages above 1,100 V.

On the basis of invèstigations into protective measures against firedamp explosions as applied in various countries, and on the basis of progress made in recent years in this field, the Commission is in course of preparing recommendations on the protection of underground distribution networks against

- the danger of fire,
- the danger of firedamp explosions, and
- the danger of explosions accompanying outbursts of gas

This work is nearing its conclusion.

E. - Removal of oil from electrical apparatus underground; flameproof electrical devices for nominal voltages of more than 1,100 Volts

Having accepted a recommendation with regard to switches and protective relays for underground use with a voltage of less than 1,100 Volts, the Commission stated in its first report (page 7) that "in the present situation the use of flameproof oil switches and oil insulation at places subject to firedamp risk cannot be dispensed with when working at voltages above 1,100 Volts, by reason of the advantages of these devices with regard to safety in gassy conditions."

The Commission has therefore come to the conclusion that, to do away with the risk of fire which is occasioned by the presence of oil, research into the manufacture of high-tension switches and high-tension relays, etc., requiring little or no oil should be continued, such devices to have the required properties for completely safe use in gassy mines; it further recommends in connection with this a detailed investigation into the increasing of safety which can be gained by using an explosionproof housing for components which normally emit sparks, or by designs of the "increased safety" type for the remainder of the equipment.

The Commission has in the meantime gone into this question in detail, on the basis of data provided by all the countries of the Community and by the United Kingdom. It is at present in course of preparing the tabulation which takes into account the present state of development and research in the field of flameproof equipment for nominal voltages above 1,100 Volts.

II

WORKING PARTIES ON FIRES AND UNDERGROUND COMBUSTION
and
CO-ORDINATION OF MINE RESCUE ORGANIZATIONS
(Common Working Programme)

A.- Fighting fires in shafts by bringing in water

In the first report of its activities (pages 11-13) the Commission reported on the first results obtained from its investigations based on the following recommendation of the Conference:

"In all shafts, and particularly in downcast shafts, it is necessary to provide equipment either for
- permanent spraying of inflammable sections, or
- for instantaneous sprinkling operated from the surface and landings".

(Recommandation 2-b, Page 54 of the Conference Report).

The above-named Working Parties are continuing their investigations into this question - and in particular with regard to the effect of spraying in a shaft on the ventilation air - drawing upon the knowledge of ventilation experts, and have also carried out a series of practical tests.

On the basis of the test results, the Commission came to the conclusion that a continuous wetting of the combustible elements which would be adequate to prevent fires in shafts is difficult to achieve in practice and is not to be generally recommended, in certain circumstances, for reasons concerning the mine climate and because of its bad effect on the ventilation.

It was however pointed out that this constant wetting can be achieved in shafts which are not normally moist, without continuous spraying equipment having to be installed.

With regard to the spraying down of water to fight shaft fires, the Commission has accepted a series of guiding principles (which are reproduced in detail below) as a supplement to the recommendation of the Conference which is under review.

In these guiding principles no attempt is made to deal with the basic question as to whether spraying is to be used in a shaft or not as a means of fighting a fire.

The problem of those shafts in which the risk of fire may be judged to be slight was dealt with in particular. This particularly refers to wet shafts, or to dry shafts which are lined with fireproof material.

It was pointed out that one could not eliminate the possibility that even in such shafts combustible or ignitable material might be present,even if this might happen only during transport in the shaft, and that as a consequence it was also impossible to exclude from the very beginning that, in certain circumstances, one might be obliged to resort to spraying as a means of fighting fires in such shafts.

Since the effect of spraying on the ventilation brings certain dangers in its train, it was also emphasised that in the event of a limited fire, one must choose the lesser danger.

In the light of these considerations it was agreed to include the remarks made in the introduction to the text of the guiding principles, these remarks making it clear that the guiding principles are to be observed only if the necessity of spraying from an installation erected at the surface was not expressly excluded by the fire-fighting plans.

These guiding principles for the fighting of fires in shafts by sending down water represent basic rules for the serious emergency of fires in downcast and upcast shafts. The principles contain descriptions of the devices to be provided. They are explained by means of a commentary and cite practical examples of the determination by calculation of the effect of falling water on the ventilation.

It was also pointed out that the first precautionary measure to avoid the occurrence of shafts fires is to remove all ignitable or combustible materials from the shafts. It was considered advisable that in the introduction to the guiding principles, reference should be made to the text of the recommendation agreed in this connection by the Conference, as well as to the explanations already added by the Commission.

It was also found necessary to state clearly that the term "leader of the rescue operation" used in the Recommendation was not intended to be taken to refer to any particular person. Not only could the designation of leader of the rescue operation be defined differently in different Member Countries, but even during the course of rescue operations an entirely different person might be involved. The intention in referring to this in the text of the guiding principles was simply to lay down the possibility that spraying with a large quantity of water should be an operation which could only be set in train by one person, who is capable of assessing the effect of such quantities of water on the ventilation; this is the reason for providing that the amount of water released by damming device should be restricted until the leader of the rescue operations has been able, with full knowledge of all the facts, to decide on the spot whether a larger quantity of water should be released for spraying.

The proposal of the Conference recommended providing the possibility that the spraying installation erected at the surface should be capable of being controlled from the pit bottoms and also from the surface. The guiding principles approved by the Commission have not taken up this proposal again, as far as the possibility of control from the pit bottoms is concerned. This obviously does not exclude the possibility of providing control from the pit bottoms in a given country, as long as this was included from the beginning as a provision in addition to control from the surface.

In addition these guiding principles are not concerned with the spraying devices fitted in the pit bottoms; they refer to fire-fighting in shafts. Normally this spraying is carried out by an installation which is erected at the surface, any spraying equipment being installed in the draft itself. The recommendation obviously does not exclude the possibility that - independently of this installation erected at the surface - other devices may be provided and installed in the pit bottom. Neither does it exclude the possibility that, in certain circumstances, the equipment installed on a lower horizon in the shaft should be brought in service to fight a mine fire which has broken out in the lowest level of the shaft but has not spread to the whole shaft.

The recommendations approved by the Commission on April 8, 1960, had the following form of words:

GUIDING PRINCIPLES

FOR FIGHTING MINE FIRES BY SENDING DOWN WATER

Important Preliminary Remarks

1) These principles are to be observed only in cases in which the spraying down of water from a surface installation has been included in the fire-fighting plans.

2) It was pointed out with the very greatest emphasis that the sending down of a large quantity of water may have the most serious consequences because of the very strong propulsion effect of falling water.

INSTALLATIONS

1) At the top of every shaft reaching to the surface there must be a device wich can send down at least 50 litres of water per minute and per square metre of shaft cross-section.

2) This device must be installed in such a way that the supply of water can at no time be seriously affected by drawing-off or flowing-away of water at other points.

3) The water pipes and the spray jets must be set in such a way that they are protected from frost.

4) The damming device(s) must be set outside the shaft-top building in such a way that they can be operated at any time. They must be marked by means of an instruction plate.

BASIC RULES FOR EMERGENCY

I

Fires in Downcast Shafts

A. Immediate measures

Independently of the regulations and guiding rules which obtain in the Community countries with respect to fire-fighting, it is essential to indicate at the earliest possible moment in the fire-fighting plan laid down for each pit in respect of mine fires the maximum amount of water which can be sent down each of the downcast shafts, without creating additional dangers for the workers by its effects on the ventilation.

The damming device which can be operated at this stage must not release more than this prescribed quantity of water.

Until the leader of the rescue operations has issued his instructions and as long as there has been no reversal of ventilation, water may be sent down by opening the damming device prescribed for this purpose.

B. Measures to be taken on the instructions of the leader of rescue operations

The leader of the rescue operations must therefore decide - taking into account all the circumstances - either to send down an increased quantity of water - or he must give orders that reversal of the ventilation be brought about or encouraged.

To facilitate the reversal of the ventilation in the burning downcast shaft, water can be sent down the upcast shaft, once this has been opened and the main fan stopped.

If reversal of the ventilation has already occurred - either as a result of the upward current produced by the heat of the fire or deliberately - downcast shafts should be treated as though they were upcast shafts.

II

Fires in upcast shafts

In upcast shafts water may sent down only on the instructions of the leader of the rescue operation.

As long as there are still any workers in the pit, only so much water may be sent down as will allow the fumes of the fire to continue to be extracted whilst the water is falling.

x

x x

C O M M E N T A R Y

1.-Pits, Point 1 : Quantity of water

Detailed experiments carried out at the Tremonia experimental pit in Germany, have shown that the discharge of a quantity of water of 50 litres per minute per square metre of shaft cross-section is sufficient to extinguish a fire. This conclusion is also confirmed by Russian technical literature.

The experiments carried out at the "Arenberg-Fortsetzung" pit on October 30, 1959, gave a convincing picture of the effect of sending down a quantity of water of this order of magnitude.

2. - Pits, Point 4 : Damming devices

If two damming devices are needed on the basis of the directives contained in the immediate measures, the instruction plates must give clear indication as to which damming device is to be used immediately and which to be used only on the instructions of the leader of rescue operations.

3. - Immediate measures

When a fire has broken out in a downcast shaft, fumes penetrate into the pit to a continuously-increasing extent with the fresh air drawn in, until the fire has spread so far that the thermal lift it produces causes reversal of the ventilation or until reversal of the ventilation is produced by suitable measures.

In view of the continuously-increasing danger to the men underground up to this point in time, it is absolutely essential to counter this danger by the earliest possible action.

It goes without saying that these "immediate measures" are only provisional and that further steps can be ordered only by the leader of the rescue operation.

Since the leader of the rescue operations is the only man who can order the reversal of ventilation, a dangerous spread of the fire can be prevented by the sending-down of water until he arrives.

If there are several downcast shafts, there is however the possibility that the sending-down of an excessive quantity of water in a downcast shaft which is on fire will allow fumes to penetrate into ventilation districts which do not in the normal course of events receive fresh air from this downcast shaft; in the worst conditions, there may even occur a reversal of ventilation in the other downcast shafts.

For such cases the directives provide that for each downcast shaft that quantity of water must be calculated in advance which is the maximum quantity which can be sent down without causing additional danger to the men underground.

As the following remarks show, the quantity of water for each shaft can be calculated with the aid of the nomogram (see figure 1), i.e. the quantity of water which can be used without a deleterious effect on the ventilation.[x)]

This figure indicates a coefficient which make it possible to establish the characteristic curves of the impulsion on the ventilation air caused by a given quantity of water in a given shaft (internal cross-section and depth).

To calculate the maximum permissible quantity of water it is now necessary to have only those measurements which are normally used for a ventilation network calculation. These are:

- the ventilation-air resistance of the mine working,
- the characteristic curve of the fan and (if required)
- the magnitude of the "natural impulsion".

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x) These mathematically-determined values were checked by measurements in downcast shaft 2 of the Arenberg-Fortsetzung pit on October 30, 1959. The result of this checking operation have been included in the nomogram and confirm - to a degree which is sufficient for practical purposes - the figures given in the range of existing ventilation-air velocities and quantities of added water.

The calculations to be performed are te same as those which would be needed if an additional fan were set in the ventilation network, instead of the falling water; they are thus of the type familiar to every ventilation specialist.

The use of the nomogram and the calculation of the effect of the falling water on ventilation networks is explained in the Appendix by means of examples.

Figure 2 reproduces a part of Figure 1 - namely the pressure produced in downcast shafts by falling water, per 100.m of fall, with ventilation-air velocities of up to 12 metres/second.

Figure 3 plots the pressure produced by falling water in a downcast shaft 5.8 m. in diameter and 730 m. deep; Figure 3 is derived directly from Figure 2, in the following manner: the ordinate scale of Figure 2 is multiplied by $\frac{730 \text{ m}}{100 \text{ m}} = 7.3$ because of the change from 100 m of fall; the abscissa of Figure 2 is multiplied by the internal shaft cross-section $F = \frac{\pi \cdot 5.8^2}{4} = 26.4 \text{m}^2$ and by the factor $\frac{60 \text{ s}}{\text{min}}$ - because of the change from air velocity expressed in metres/second to air quantity expressed in cubic metres/minute.

x

x x

N O T E

It goes without saying that these directives refer only to fires in the shaft itself, and cannot without modification be applied if the fire has already spread into the pit bottom.

x

x x

E X A M P L E S

of calculating the effect of falling water on the ventilation

First example:

Figure 4 is a schematic diagram of a pit with one downcast and one upcast shaft. This example was chosen because the effect of water on the ventilation in a pit of this layout is particularly easy to explain. The pit shown in Figure 4 has a downcast shaft 5.8 m. in diameter and 730 m. deep. These are the same values which were used for Figure 3. The air resistance of the mine is taken as R = 16.1 mWb (0.0161 kg x s^2/m^8) corresponding to an equivalent orifice of the mine of A = 3 m^2.

The characteristic curve representing this resistance is plotted in Figure 5, as is also the characteristic curve of the fan which produces the movement of ventilation air in the pit drawn in Figure 4. Without the addition of water the normal duty of the fan, and consequently the total water quantity as well as the total pressure gradient of the pit (as drawn in Figure 5) lie at the point of intersection of the fan characteristic with the mine characteristic. The total water quantity is 8350 cu.m./min with an underpressure of 312 kg/sq.m.

If water is sent down the downcast shaft of the pit to which Figures 4 and 5 refer, the pressure produced by the falling water is added to the pressure produced by the fan. Figure 6 shows the cumulative characteristics of the fan pressure (taken from Figure 5) and the pressure produced by the falling water (taken from Figure 3) for water quantities of 10, 30 and 50 litres/min.m2. The total air quantities and the total underpressure are again found from the point of intersection of these cumulative characteristic curves with the characteristic curve of resistance of the mine (Figure 6). The total quantity of water rises from

8350 cu.metres/min
to 8450 cu.m./min. with water sent down at the rate of 10 litres/min/sq.m.
to 8600 cu.m./min. with water sent down at the rate of 30 litres/min/sq.m.
to 8800 cu.m./min. with water sent down at the rate of 50 litres/min/sq.m.

Second example

For the second example, a ventilation network was selected which approximates to the actual layout of a coal mine (Figure 7). This ventilation network is assumed to have two downcast shafts, again of 5.8 m. diameter and 730 m. depth (shafts 2 and 3) and two upcast shafts (shafts 1 and 4).

The fan mounted on shaft 1 is assumed to have the same characteristic curve as that shown in Figure 5 for the first example. Shaft 4 is assumed to have a radial fan which produces a constant pressure of 230 kg/sq.m. The ventilation-air resistance of the individual airways is plotted in Figure 7 in Milliweisbachs or Murgues $\left(\frac{1}{1.000} \cdot \frac{kg \cdot s2}{M8}\right)$.

The calculations required for working out this example were carried out by us with the aid of an analogue computer. In making ventilation network calculations, the ventilation specialists tend to prefer different methods.

Figure 8 shows what quantities of air the fans must pass through the pit without the addition of water. The mass unit used in Figure 8 and in the subsequent illustrations to express the quantities of air plotted is cubic metre/minute.

Figure 9 shows how the quantities become distributed when water is sent down downcast shaft 3 to fight a fire at the rate of 50 litres/min/sq.m.- this is the minimum discharge rate of German shaft-fire-fighting equipment. The quantity of downcast air in shaft 3 rises from 5600 to 6610 cu.m./min., while the quantity in shaft 2 falls from 6160 to 5650 cu.m./min.

It must be noted that the fumes occurring in the event of a fire in downcast shaft 3 (Figure 9) become mixed with all the intake air in the mine and therefore penetrate to every district, whether fire-fighting water is sent down shaft 3 or not, and independently of the quantity of water used.

Figure 10 shows the distribution of quantities in the case of a fire in downcast shaft 2 with water sent down at a rate of 50 litres/min/sq.m. for fire-fighting. This quantity of water produces reversal of the direction of ventilation in the roadway connecting the downcast shaft. Without the addition of water, a quantity of 465 cu.m./min. is drawn from shaft 3 to shaft 2, and with a fire in shaft 2 only the district ventilated via shaft 2 becomes filled with fumes, the district ventilated by shaft 3 remaining unaffected. As against this, sending down water at the rate of 50 litres/min/sq.m. causes 390 cu.m. per minute of fumes to move from shaft 2 to shaft 3, and these fumes become mixed with the intake air coming down the latter shaft shafts. As a consequence the fumes penetrate into all the working-points in the pit.

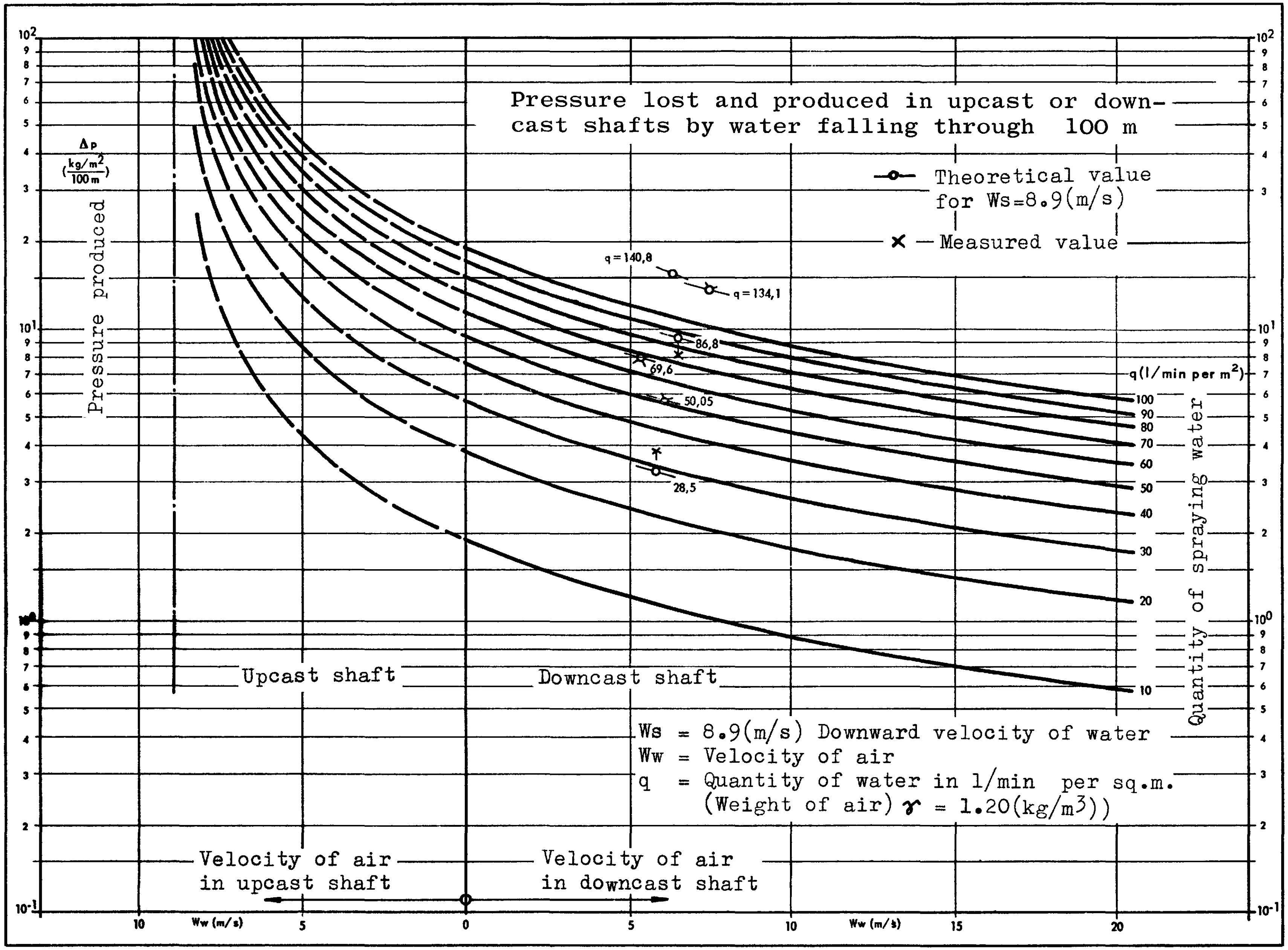
In order to avoid this, care must be taken that there is no reversal of ventilation in the roadway connecting shaft 2 to shaft 3. If a small quantity of air of 100 cu.m./min. is maintained in the original direction of ventilation, the ventilation-network calculation shows that the pressure produced by the fire-fighting water in shaft 2 may be allowed to reach 23 kg/sq.m. Figure 3 indicates that this corresponds to a quantity of water of 25 litres/min./sq.m. The distribution of ventilation air when this quantity of water is sent down is plotted in Figure 11.

Only those districts which are ventilated in the normal way via shaft 2 are penetrated by fumes, and the quantity of fire-fighting water causes no further spread of the fumes, if it is limited to 25 litres/min/sq.m.

In the ventilation-network calculations carried out here, a change in the underpressure caused by the upward impulsion due to the hot fumes from the fire has not been allowed for, since it was intended to discuss only measures for fighting fires in their initial stages. Since the upward impulsion of the fumes counteracts the pressure produced by the falling water in the case of fires in downcast shafts, the calculation will give, according to the extent of the fire, too low a figure for the maximum permissible quantity of fire-fighting water if this upward impulsion is ignored; in this way, there is an additional margin of safety against obtaining excessively high figures for the quantity of fire-fighting water.

If the quantity of water calculated appears too low for immediate extinction of the fire or for preventing it spreading any further, additional precautionary measures must be included in the fire-fighting plans, e.g.:

- simultaneous sending-down of water in all downcast shafts,
- partial closing of the burning shaft at the surface,
- closing of fire-doors underground, etc.


Pressure lost and produced in upcast or downcast shafts by water falling through 100 m
Theoretical value for Ws=8.9(m/s)
Measured value
q=140,8
q=134,1
86,8
69,6
50,05
28,5
q(l/min per m²)
100
90
80
70
60
50
40
30
20
10
Quantity of spraying water
Δp (kg/m²/100 m)
Pressure produced
Upcast shaft
Downcast shaft
Ws = 8.9(m/s) Downward velocity of water
Ww = Velocity of air
q = Quantity of water in l/min per sq.m.
(Weight of air) γ = 1.20(kg/m³))
Velocity of air in upcast shaft
Velocity of air in downcast shaft
Ww (m/s)
10
5
0
5
10
15
20

ANNEX 1

ANNEX 2

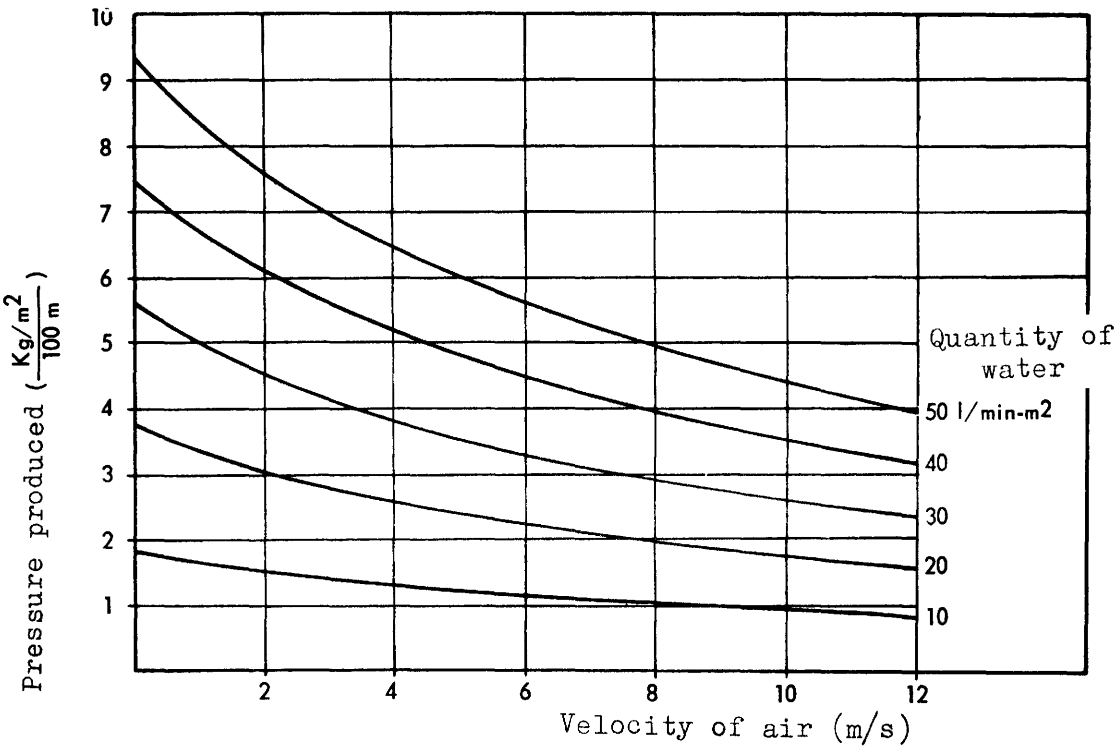


Fig. 2

PRESSURE PRODUCED IN DOWNCAST SHAFTS BY WATER FALLING THROUGH 100 M.

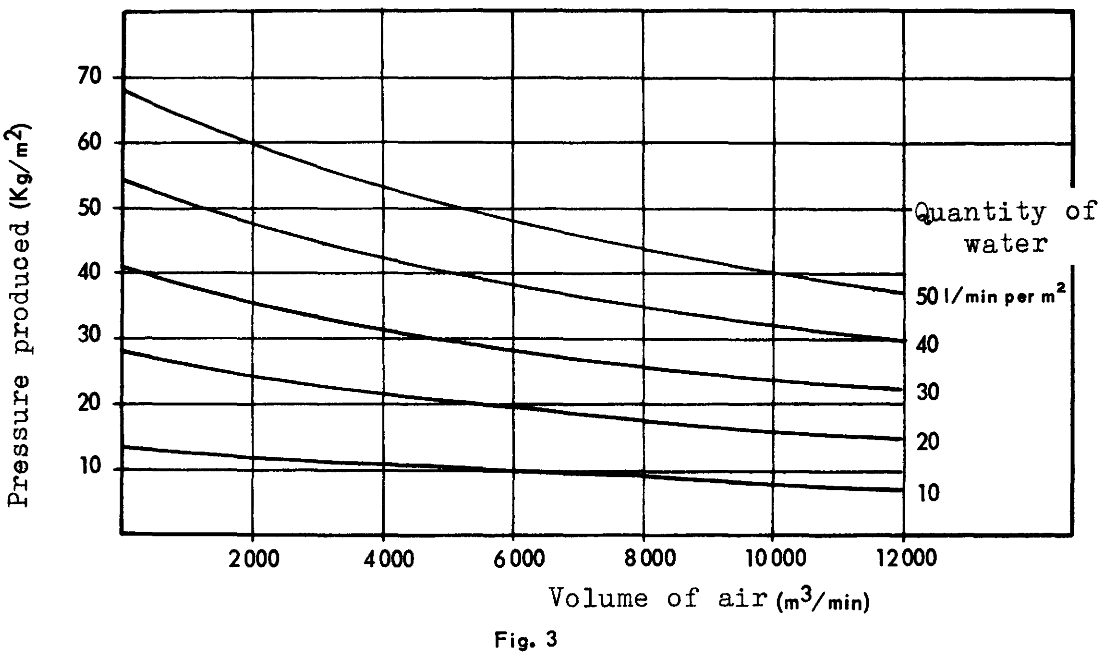


Fig. 3

PRESSURE PRODUCED IN A DOWNCAST SHAFT 5.8.M. IN DIAMETER AND 730 M. DEEP

ANNEX 3

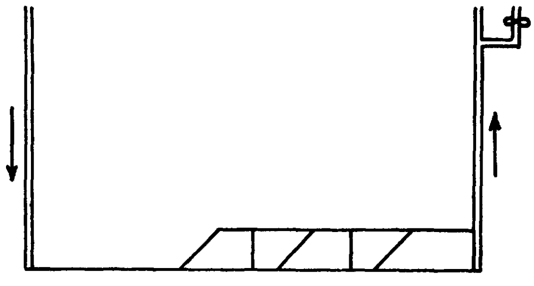


Fig. 4

DIAGRAM OF A MINE COMPRISING A DOWNCAST AND AN UPCAST SHAFT

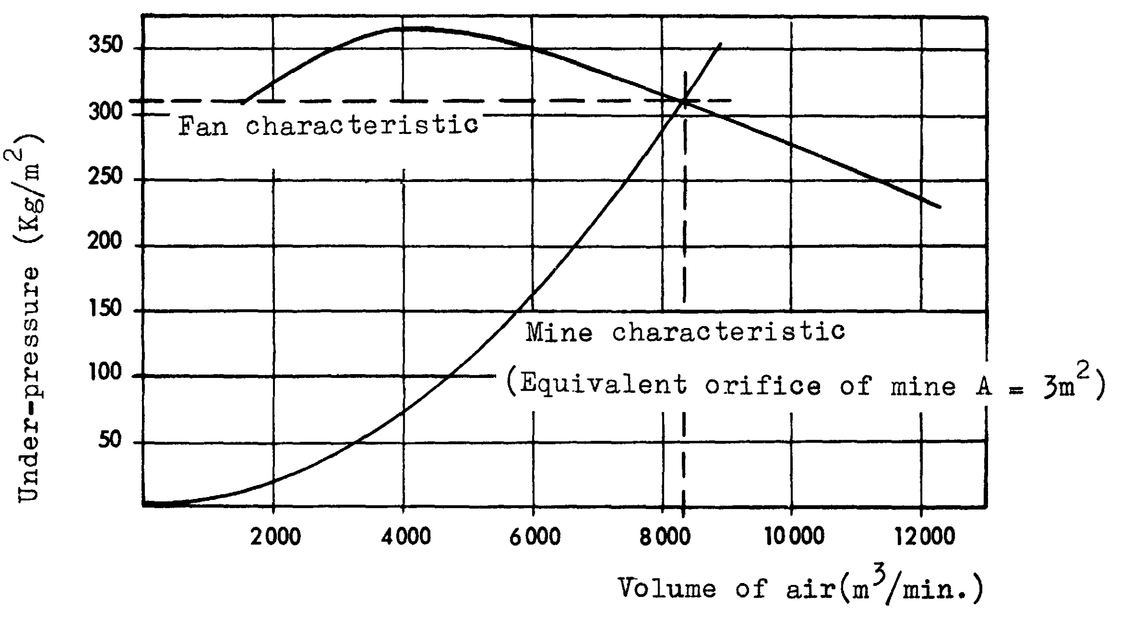


Fig. 5

DETERMINATION, BY MEANS OF THE CHARACTERISTIC CURVES OF THE FAN AND OF THE RESISTANCE OF THE MINE, OF THE UNDER-PRESSURE AND OVERALL VOLUME OF AIR IN A MINE OF THE TYPE SHOWN IN FIG.4.

ANNEX 4

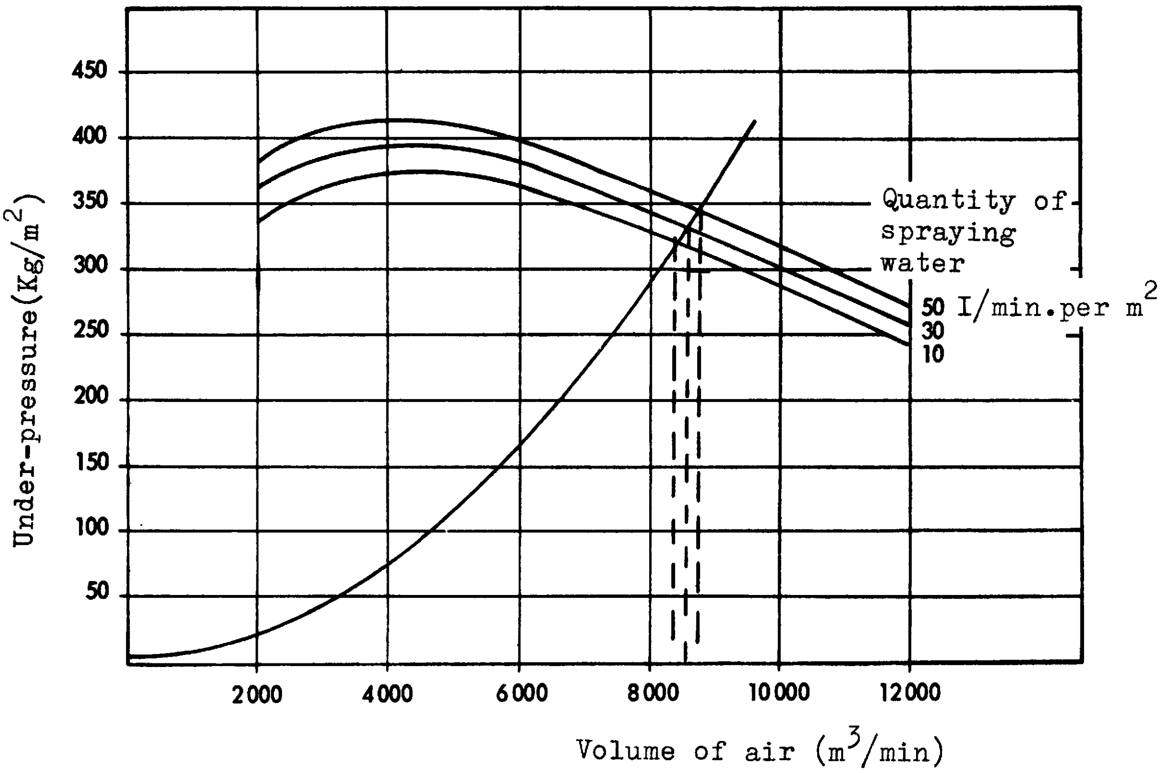


Fig. 6

DETERMINATION OF THE OVERALL UNDER PRESSURE AND OVERALL VOLUME OF AIR IN MINE OF THE TYPE SHOWN IN FIGS. 4 AND 5

ANNEX 5

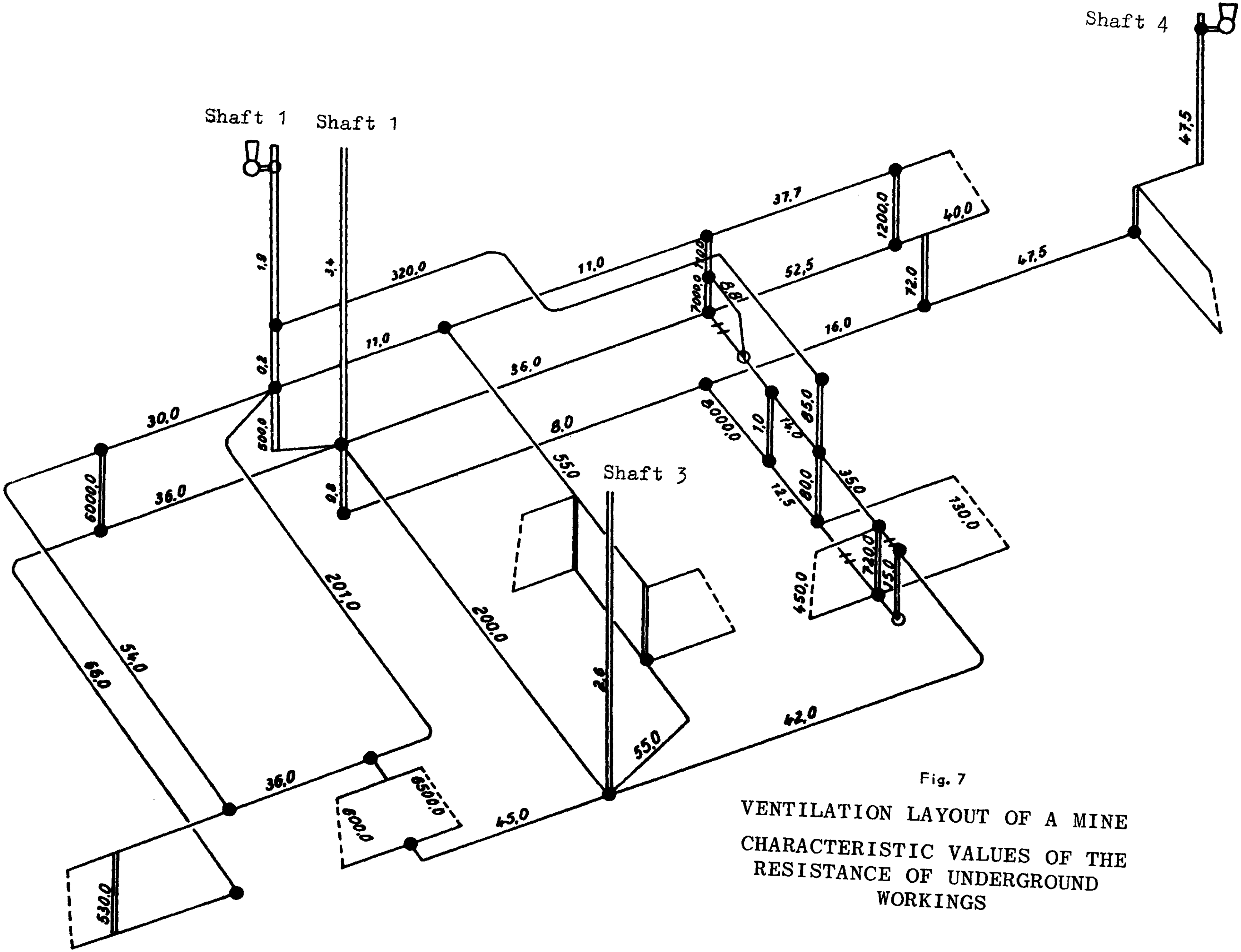


Fig. 7

VENTILATION LAYOUT OF A MINE

CHARACTERISTIC VALUES OF THE RESISTANCE OF UNDERGROUND WORKINGS

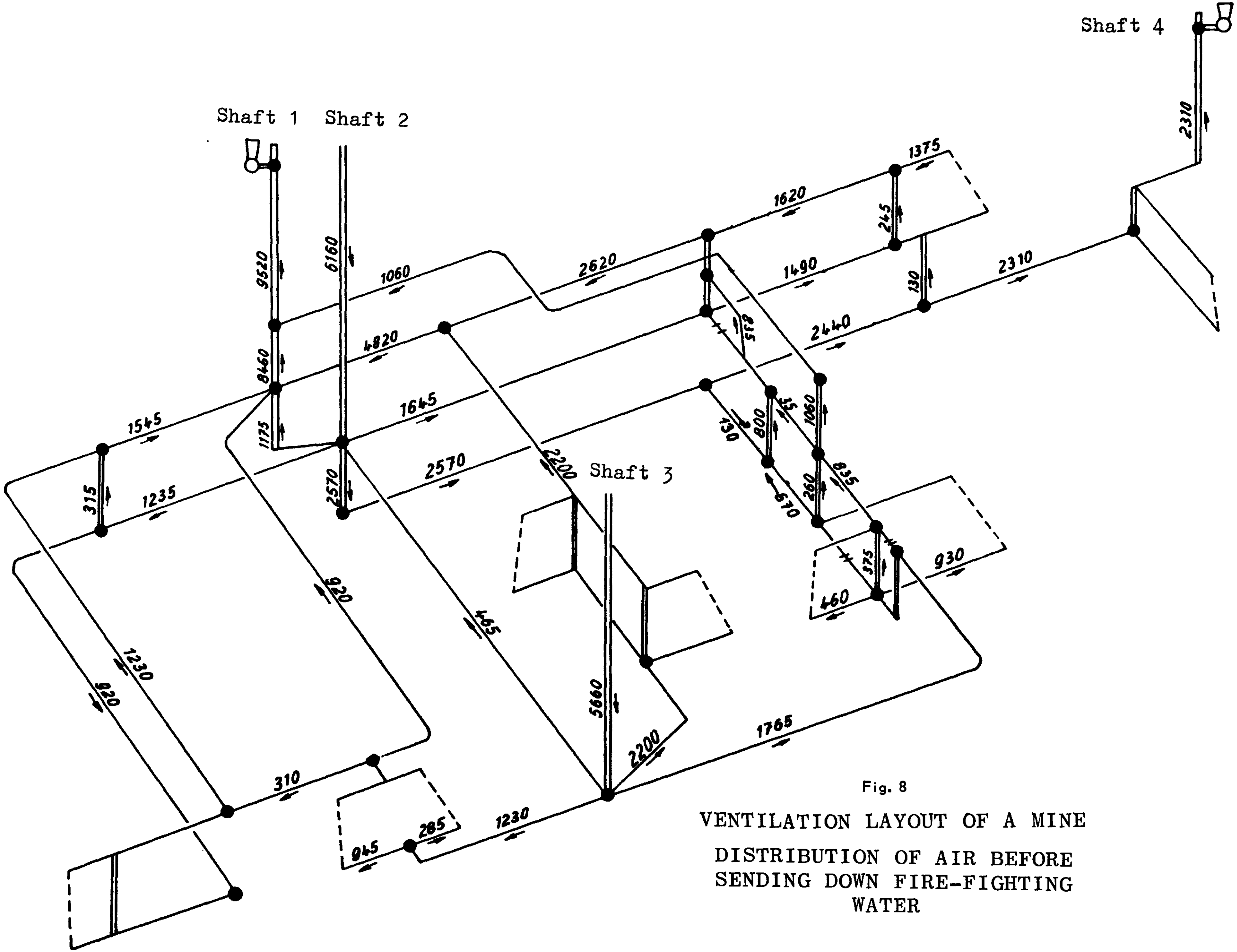


Fig. 8

VENTILATION LAYOUT OF A MINE

DISTRIBUTION OF AIR BEFORE SENDING DOWN FIRE-FIGHTING WATER

ANNEX 6

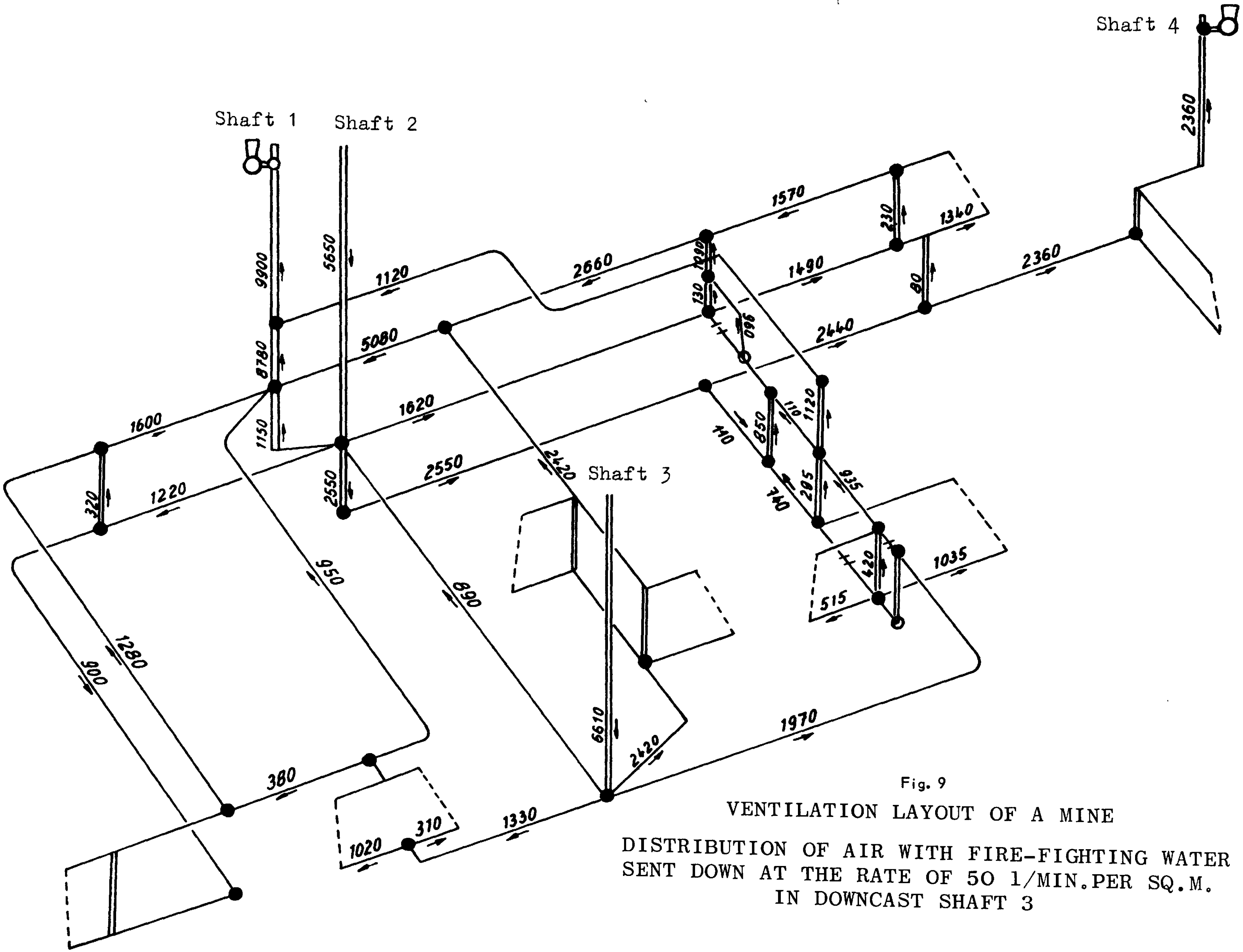


Fig. 9

VENTILATION LAYOUT OF A MINE

DISTRIBUTION OF AIR WITH FIRE-FIGHTING WATER SENT DOWN AT THE RATE OF 50 l/MIN.PER SQ.M. IN DOWNCAST SHAFT 3

ANNEX 7

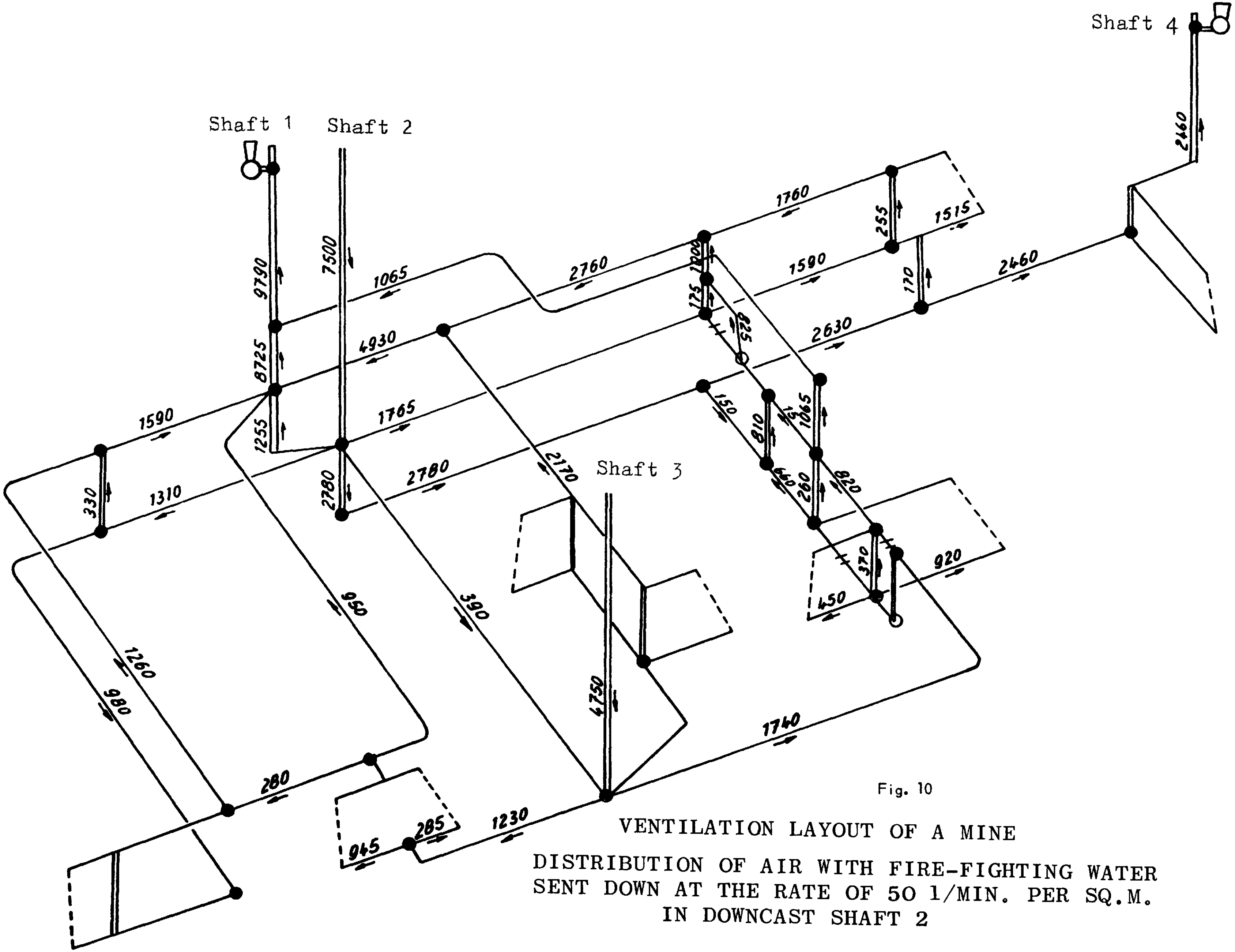


Fig. 10

VENTILATION LAYOUT OF A MINE

DISTRIBUTION OF AIR WITH FIRE-FIGHTING WATER SENT DOWN AT THE RATE OF 50 l/MIN. PER SQ.M. IN DOWNCAST SHAFT 2

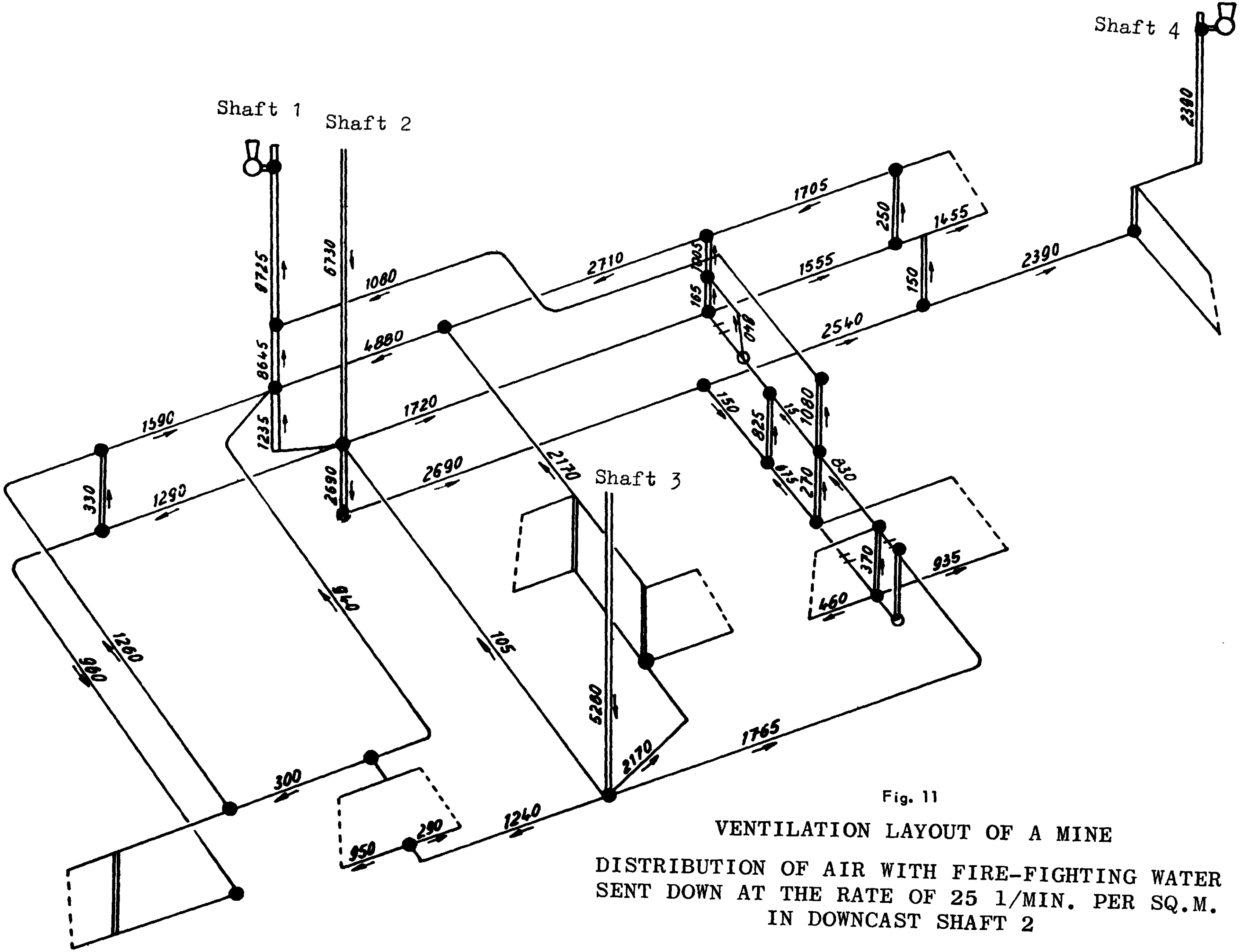


Fig. 11

VENTILATION LAYOUT OF A MINE

DISTRIBUTION OF AIR WITH FIRE-FIGHTING WATER SENT DOWN AT THE RATE OF 25 l/MIN. PER SQ.M. IN DOWNCAST SHAFT 2

ANNEX 9

B.- Sealing-off of mine fires and underground combustion by dams

Prompted by the occurrence of a group accident in the Sainte-Fontaine pit in the Houillères du Bassin de Lorraine, the Commission instructed the Working Parties to investigate the problem of the erection of dams as a means of fighting mine fires.

The experts considered that sealing-off of mine fires by means of dams involved certain risks for the men responsible for building the dams. They therefore came to the view that it was advisable to prepare recommendations regarding the erection of dams for fire-fighting purposes.

The detailed investigations of this problem were supplemented by practical explosion tests carried out in the Tremonia experimental gallery. The Working Parties prepared the recommendations which are set out below and accompanied by a commentary; their view was that the assessment of the problem of rescuing the men and the question of whether a fire should be fought directly or by means of dams should be left open, since the responsibility of these questions should in detail be reserved for the leaders of rescue operations. In addition the question of evaluating the analyses of the mine-air samples in the event of a fire, and the measures to be taken after opening a fire dam, should be subject of a special examination.

The experts' first concern was to give to those persons charged with fighting a fire a series of indications - in the form of guiding principles - to be borne in mind in an emergency. They should be put into practice only when direct fighting of the fire by means of water, sand, fire extinguishers, etc., had been found to be useless, and no other possibilities of fighting the fire are left.

The experts were quite clear that these recommendations should not be made binding, by reason of the variety and many-sidedness of the factors involved in a mine fire and the importance to be given to peculiar characteristics in each case in the individual pits.

This raised the problem as to whether the note that "the following recommendations are not to be considered as binding" might not lead to certain difficulties in interpreting the recommendation in the event of an emergency. This was particularly true in respect of the application of the proposal (para. Al. General Considerations) that "when a mine fire has broken out it is indispensable to take the necessary preparatory steps for any later sealing-off by dams which may be necessary while the direct fire-fighting operations are still going on".

The objection was raised that the proposal quoted could not be applied in all mine fires, especially not in cases of fires which were of a nature such that experience taught that they had hitherto been amenable to successful treatment by direct methods.

On the basis of the discussions which took place around this question, the Commission reached the conclusion that, to clarify the question of the application of this recommendation, it should clearly state its own position, namely that these recommendations were not put forward with the intention of providing the Mines Inspectorates with a "ready-made" regulation. On the contrary, the responsible Inspectorates must themselves decide how they should bring these recommandations into application by means of Regulations, Circulars or Official Instructions. The persons responsible for fire-fighting operations will, as a result, have to apply guiding principles or regulations which their Mines Inspectorate would have issued in an appropriate form on the basis of the recommendations "in full knowledge of the factors affecting a mine fire and the peculiar characteristics in particular pits."

The Commission approved the recommendations set out below, together with a commentary, in its plenary session of December 20, 1960.

RECOMMENDATIONS FOR THE SEALING-OFF BY DAMS OF MINE FIRES AND UNDERGROUND COMBUSTION

These recommendations refer only to the actual fighting of the fire or combustion; they do not refer to the measures to be taken as a matter of priority to rescue men following the outbreak.

A.- GENERAL CONSIDERATIONS

1.- When a mine fire has broken out or underground combustion developed it is indispensable to take the necessary preparatory steps for any later sealing-off by dams which may be necessary while the direct fire-fighting operations are still going on.

In the event of sealing-off by dam becoming necessary, as a general rule the first stoppings to be erected must be advance dams, so as to allow the main dams to be built in safety and without disturbance.

These advance dams are in fact the real subject of the present recommendations.

II. - a) The type of stopping is to be chosen according to whether there exists, in the area to be sealed-off, a risk of an explosion or not.

The responsibility for this exceedingly important decision depends on:

- the conditions obtaining in the affected pit (gas emission, type of coal etc.) and
- the results of the analyses of the samples of fire fumes, which must be taken continuously, starting at a moment before the beginning of the fire-fighting operations.

b) It is emphasized that the erection of stoppings can, in certain circumstances, cause disturbances in the ventilation. In the case of fierce fires, there may even be a reversal of ventilation.

B.- STRUCTURE AND ERECTION OF THE ADVANCE DAMS

I.- The important thing is to make the advance dams themselves as impermeable as possible and to create the closest possible seal between the dam and the surrounding walls. There is nothing against shutting off first of all the intake air, in which the work of erecting the stopping can be performed more easily.

II.- If there is a risk of explosion, the important tasks are,

a) to be at all times in possession of the most precise information possible regarding the degree of explosion risk in the fire zone, to ensure the safety of the teams working on erecting the stopping; this may make it necessary to provide the men with fire-proof clothing;

b) to ensure that the advance dams are not only as impermeable as possible, but also strong enough to resist an explosion;

c) to ensure that for the entire period during which the stopping is being erected, there is sufficient ventilation of the fire zone to counter as far as absolutely possible the formation of an explosive gas mixture. This can be done by leaving sufficient openings in the dams;

d) to ensure that all suitable measures are taken to reduce as far as possible the effects of any explosion which may occur;

e) to ensure that, if at all possible,the dams on the intake and return sides are finally sealed simultaneously. Since the erection of the dams on the return side is generally more difficult and time-consuming, work must be done on them at the latest simultaneously with the erection of the dams on the intake side.

When the dams are finally sealed, only a small group of workers and officials should be allowed to remain in the vicinity of the dam - only those whose presence is essential for the work. As soon as the dams have been sealed, the danger area must be completely evacuated.

C.- FINAL DAMS

The final dams must be durable built of brick or concrete under the protection offered by the advance dams.

x

x x

COMMENTARY

On A. General Considerations

1.- The sealing-off operation is intended to extinguish the fire by sealing-off the fire centre as tightly as possible.

A sufficient degree of impermeability can be achieved only if

- the surrounding rock itself is firm and durable; fissured rock must be carefully sealed (wet or dry),

- the dams must be erected with a good tight connection to the rock, which must be trimmed if necessary beforehand.

The operation of sealing-off will, in certain circumstances, involve abandoning a fairly large area. Consequently, the decision to proceed with sealing-off should be taken only when no other possibility exists, i.e. when all directs methods of fire-fighting have failed.

The erection of a satisfactory stopping is a long and difficult task; it is therefore advisable to reduce the number of these dams to a minimum, to erect them at easily-accessible points and to begin the preparatory work immediately.

Advance dams should

- stop, as far as possible and rapidly, the ingress of air into the fire zone or

- where there is a risk of explosion, protect the teams working on the erection of the main stoppings against the dangers of any explosion which might occur.

II.-a) When a mine fire or underground combustion is detected, immediate measures must be taken to institute a watch on the fire by means of analysis of the gases in the ventilation air, in order to

-1) watch the progress of the fire;

-2) observe whether there is a probability that an explosion will occur. In assessing this, it is, however, necessary to take into account other factors, e.g. gas emission, type of coal, working method used etc.;

-3) locate the danger zone, as well as those zones which can only be entered by men wearing anti-gas respirators (or, if appropriate, filter respirators).

Consequently, it is necessary to determine as precisely as possible from the earliest possible moment;

1) at what points gas samples should be taken. These points must themselves be clearly marked, and indicated on a specially-prepared plan, using the same letters or other symbols.

Samples of fire fumes may be drawn from the goaf or from dry stoppings only by means of tubes or flexible hoses, which should be let in to such an extent that the samples are not affected by the passing current of ventilation air;

2) at what intervals of time the samples of fire fumes are to be taken at each individual point.

At each base underground and at the working points threatened by noxious gases, the following devices must be maintained: at least 1 carbon-monoxide indicator, 1 mine-gas analysis apparatus, 1 flame lamp and, if required, 1 air-quantity meter.

The flame lamp must not be taken into region of concentrated fire fumes. Various mine-gas analysis devices are liable to show inaccurate readings if used in concentrated fire fumes.

II.-b) Reversal of the ventilation is particularly likely to occur with descensional ventilation. In addition, it must be borne in mind that ventilation reversal can also occur if parallel air currents are present.

On B.- Construction and Erection of the Advance Dams

Independently of the normal fire-fighting measures, the following precautions must be taken for any sealing-off operation:

1) Determination of the points at which advance dams and dams are to be erected (Dam Sitting Plan)

The proper selection of the points at which dams are to be built is of decisive importance for the further development of fire-fighting operations. It calls for very careful consideration and must therefore be the subject of a good deal of clear thinking.

The following data are necessary to enable the correct choice of the stopping points to be made:

- Complete, precise and absolute up-to-date plans of the workings proposed or in course in the seam where the fire has broken out and in adjacent seams. Thirlings, faults,etc., through which there might be a connection between the workings must be indicated in these plans.
- Detailed information about the types of rock in the roads in the vicinity of the access-ways to the zone which is to be dammed off.

On the basis of these plans and data, it is possible to decide the points for the advance dams and for the permanent stoppings.

In choosing these locations, one must be guided by the following factors:

- The places chosen for the advance dams must be such that an adequate degree of impermeability can be attained.
- The permanent stoppings can be made impermeable only if they are built in firm rock or at points where careful cementing will ensure that the possibility of satisfactory sealing-off can be assured.

There should be as few dams as possible, so that the sealing-off of the fire zone - especially in pits with a risk of explosion, where the conditions are correspondingly more difficult - can be carried out as quickly as possible. The ideal solution is that only one dam on the intake side and one on the return side should be needed.

It is advisable to provide in the dam-sitting plan from the very beginning points for emergency or substitute stoppings, to be used in the event that the sites first chosen for the erection of dams are unsuitable either because of the nature of the surrounding rock or because the fire or combustion has developed in an unforeseen manner.

2) Inspection of the sites for the erection of advance dams

It is advisable to check the nature of the rock at these points. This step is necessary since the nature of the rock can, in certain circumstances, even bring about fundamental changes in the dam-sitting plan.

3) Inward transport of the material required for the erection of advance dams

Since the advance stoppings - especially where there is a risk of danger - call for large quantities of material, it is important to provide the earliest possible inward transport of everything that is needed.

Steps must be taken to guarantee that dam-building material is held ready at each pit or at a central point situated conveniently near.

The storage points for dam-building material must be drawn in or indicated in the fire-fighting plan.

I.-If no risk of explosion is to be expected the sealing-off operation can be restricted to the affected working and can be carried out as near as possible to the heart of the fire.

The advance stopping can, e.g., consist of a simple tamped concrete wall or a filling of loose stone-dust between two board partitions. Very good results have also been obtained with "fire-stopping cushions" made of mineral wool.

Although complete sealing-off of the fire zone can be expected only when the permanent stoppings are in place, care must be taken to ensure that the advance dams are as impermeable as possible.

In addition at least one sampling pipe should be inserted in the dam. If inrushes of water can be expected in the zone which is being dammed-off, a tube fitted with a siphon must be set in the floor.

II.-If a risk of explosion can be expected, the safety of the dam-building team requires that these stoppings should - without consideration of any material losses which may occur - be further away from the heart of the fire than in the above-mentioned case.

a) Up to now the aim has been to provide strength by the mass of damming material used - the minimum thickness of the normal sandbag stoppings being about 4 m. in a roadway with a cross-sectional area of 8 sq.m., about 5 m. with a cross-section of 8 to 10 sq.m. and a thickness of about 6 m. above that. Moreover; the stopping must be keyed very firmly into the rock.

(At the present time experiments are being made at the Tremonia Experimental Gallery, Dortmund, to develop a stopping which is at the same time resistant to explosions, and can be erected more easily and more quickly than the conventional sandbag dam.)

Although complete sealing-off of the fire zone can be expected only when the permanent stoppings are in place, care must be taken to ensure that the advance dams are as impermeable as possible. An insufficiently impermeable advance dam is capable neither of extinguishing a fire by stopping the penetration of oxygen, nor of reducing the risk of explosion.

Impermeability is achieved by:

1) removing the lagging as far as possible to provide a good connection between the stopping and the rock;

2) emptying some of the sandbags where these are used to build the stopping, to fill up the interstices between the bags and to make it possible to tamp the sand tight at the roadway walls and above all at the roof;

3) inserting an injection tube in the stopping, every 2 m. round the circumference, the far end of these tubes opening around the periphery of the dam, i.e. at the roadway walls and roof, and at a depth about half way into the dam. These injection tubes can be used to inject dust, slurry or suitable sealing material to ensure a tight and impermeable connection with the rock. When slurry is being injected, however, it is necessary to make sure that the inner face of the dam is not washed away.

b) The erection of such stoppings is inevitably rather time-consuming and explosions during the erection work must be avoided. Consequently, for the entire period of erection, every care must be taken to provide adequate ventilation of the fire zone to eliminate as far as is absolutely possible the formation of an explosive mixture of gases. This objective can be attained if one or two tubes of 0.6 to 0.8 mm. diameter are set in each dam (It is recommended to use special dam tubes of at least 60 cm diameter, with a wall thickness of 4 mm. Such tubes can be negotiated by men wearing anti-gas respirators). At the worst, openings of equivalent cross-sectional area can be left in the stopping. The first method is to be recommended, since it allows of a more rapid and stronger sealing-off,

If it is intended to use dam pipes, it must be remembered during the inward transport of material that two runs of pipe will be needed per dam.

In addition at least one sampling pipe should be inserted in the dam. If inrushes of water can be expected in the zone which is being dammed-off, a tube fitted with a siphon must be set in the floor.

c) To reduce as far as possible the effects of any explosion which might occur during the construction of the advance dams, it is advisable either to erect between the advance dams and the fire zone a stone-dust barrier carrying

100 kg of stone-dust per sq.m. of roadway cross-section or to cover the roadways being sealed off very thickly with stone-dust.

Water-trough barriers can also be used, if of adequate size, in place of the stone-dust barriers or stone-dusting.

d) Once the dams on the intake and return sides have been finished - with adequate ventilation devices - the openings must be closed up.

Since it is from this moment onwards that an explosion can occur very rapidly, everything must be done to seal the advance dams on the intake and return sides rapidly and simultaneously.

A close approach to simultaneity can be attained by using watches,or, even better, by employing a telephone connection.

It is necessary to ensure that the plugs closing the dam tubes are strong enough to resist any explosion.

No one must enter the vicinity of the sealed-off zone for at least 8 hours. Only after this period has elapsed may the first samples be taken, directly in front of the dam on the return side, at the roof, and from the sampling pipe. If there are several dams on the return side, such samples must be taken at each of these dams.

The evacuated zone can only be entered by persons other than those engaged in sampling if there is no longer any risk of explosion in the sealed-off part of the district.

If it is not possible to complete the dams simultaneously for overriding reasons (if the sealing-off work on the return side is made impossible by reason of the heat or if the fire is advancing in the line of the return air current,etc.) the dams on the intake side must be completed and sealed-off, after the men on the return side have been evacuated.

If, after the closing of the dam on the intake side, the conditions on the return side have so far improved that there is no objection to resuming work there, then the return-side dam should be finished and sealed-off as quickly as possible.

On C.- Permanent Dams

The impermeability of the advance dams must be maintained during the whole period of erection of the permanent dams.

It is advisable to construct the dams in such a way that they can be sealed-off anew from time to time, experience having shown that the impermeability of a dam can never be maintained indefinitely.

As was the case with the advance dams, the following devices must also be built into the permanent dams:

- sampling pipes, connected to the sampling pipes of the advance dams;

- if required, water drainage pipe with siphon seals, which are accessible if they become blocked.

Finally, it is advisable to build in dam pipes or explosion-proof dam doors, to enable men wearing anti-gas respirators to enter the fire zone without having to break up the dams to do so.

After the completion and sealing-off of the permanent dams, tests should be made to see whether the ventilation pressure drop between the individual stoppings can be reduced by suitable measures. This objective must not be attained by stopping the main ventilator.

The stoppings must be kept under continuous observation.

C.- Execution of practical tests regarding the power of resistance of certain f a materials or of a given type of fire stopping

The above-listed recommendations regarding the damming of mine fires have - as has already been pointed out - left several questions open to examination.One such question is that regarding the material to be used and the designs to be employed in erecting fire stoppings.

The Commission has come to the view that practical conclusions regarding the resistance of a given material or a given design of dam can be drawn only after a series of experimental explosions.

It directed the Working Parties on Mine Fires and Underground Combustion and on Co-ordination of Rescue Organizations to continue the practical tests already begun, and further suggested that the High Authority should support these practical tests financially.

The Tremonia Experimental Gallery of the Versuchsgrubenberggesellschaft m.b.H. (Experimental Gallery Company), Dortmund-Derne, which had already carried out on the first two tests, was requested to draw up the necessary experimental programme in conjunction with the Working Parties.

D.- Determination of criteria for flame-resistant fluids used for power transmission (hydraulic fluids)

The Conference on Safety in Mines emphasised fhe danger of fire which might result from the use of ignitable lubricants in machines used underground.

In the section on "Research" of its Report it recommended that

"research should be continued with the object of developing fluids to be used in place of inflammable oils for mechanical purposes, e.g. in hydraulic equipment, couplinge, decking gear, props etc."

(Recommendation 36-M, page 150 of the Conference Report).

In its efforts to reduce the danger caused by the use of combustible hydraulic fluids in coal mines, the Commission set up a Committee, consisting of well-known experts, including among others chemists and doctors, to study the question of the determination of criteria for non-flammable fluids and for tests to apply to such fluids. The committee of experts presented an interim report in December 1960 on its first discussions and findings regarding the criteria in respect of

- fire-resistance measuring technique
- mine safety and
- technical characteristics

to be fulfilled by non-ignitable or non-flammable hydraulic fluids for use underground (see Annex A)

The tests referred to in the attached report, which were necessary to provide a basis for the establishment of criteria in respect of fire-resistance measuring technique, were designed to conform with safety requirements in coal mines.

The following remarks are intended to serve as an explanation of the comments made regarding the criteria in respect of fire-resistance measuring technique.

- With regard to the test in which dust was blown through a flame, the experts consider that the requirements laid down in the information report should be supplemented by stating that the jet should not in any case continue to burn once the flame or heat source has been removed, and that as far as is possible the igniting flame should not extend itself into the jet, while in no case must the flame in the jet itself extend as far as the protective screen.

- With regard to the test intended to determine the propagation of fire in a mixture of coal dust and fluid, it seemed to the experts desirable to ensure that the flame did not spread beyond some 70 mm.

No precise test arrangements have been laid down for the determination of criteria affecting health and safety in mines. The health and safety experts took the view that the execution of such investigations must be suited to each fluid examined in turn.

As far as technical criteria are concerned, twelve different tests were necessary to assess the technological suitability of the fluids. The major part of these tests were taken either from existing standards in the individual countries or existing standards were slightly modified to suit them for this particular purpose. In other instances, it was however necessary to develop new testing methods and devices.

The committee of experts is fully aware that these considerations, cited in the informative report, can make no claim to completeness by reason of the exceedingly complex nature of the subject and that a further series of detailed investigations and experiments will be necessary.

The Commission attaches great importance to the implementation of this recommendation - accepted by the Conference on Safety in Mines - by reason of its importance in raising mine safety to the highest possible level; the Commission at its plenary session of December 20, 1960, came to the conclusion that it would be useful to distribute this informative report to interested groups 1) as soon as possible, to keep them informed of development trends in this field and of the lines being followed by the work begun by this committee.

The Commission charged the committee of experts to continue the work it had begun. It is envisaged that this work will be terminated by the publication of a compilation of stipulations and of testing methods (load records) this compilation to be supplemented from time to time to bring it in line with the latest development.

The committee of experts hopes that the publication of its interim report will prompt others to make useful remarks or suggestions, which may be useful to the Committee in the continuation of its work.

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1) E.g. mines inspectorates, mining companies, lubricant manufacturers, manufacturers of hydraulic apparatus, research centres, universities, laboratories.

III

WORKING PARTY ON CO-ORDINATION OF MINES RESCUE ORGANIZATIONS

The Conference on Safety in Mines paid special attention to the problem of mine rescue organisation, and adopted the following recommendation :

- That the rescue services be organized on a geographical bases broad enough for them to dispose of adequate equipment and personnel;
- That a functional liaison must be established first between the rescue services of the different coalfields in each country, and then between one country and another, to enable the rescue services of the different countries to assist one another and to ensure maximum speed and efficiency in any emergency;
- That a regular exchange of experience should be organized among the rescue centres of the different countries in regard both to the improvement and to the co-ordination of the methods and means employed (training of rescue personnel, equipment used, etc.).

  (Page 162 of the Conference Report).

At the very beginning of its activity the Commission set up a Working Party consisting of the Directors of the principal rescue centres and recognized experts in mine rescue matters of the Community countries and of the United Kingdom. The Working Party visited the principal rescue centres of the Community countries and of the United Kingdom and submitted a report to the Commission (see Annex B).

This report provided a comparative survey of the state at that time of the technique of mine rescue work in the Community countries and in the United Kingdom (organization, training and instruction, preparatory measures for emergency, giving the alarm, execution of a rescue operation, rescue plans, anti-gas and closed-circuit respiratory apparatus, rescue equipment, etc.).

The Working Party discovered from its visits to the rescue centres in the Community countries and in the United Kingdom, from the personal contacts made during these visits, and from the discussion and exchange of experience made possible by this as well as the evaluation of the reports and data presented, that the organization of mine rescue operations in the different countries no longer exhibits any marked differences and that any minor deviations which still exist are to be attributed to local conditions and peculiarities.

The comparative tabulation of the state of the technique of mine rescue work at that time given in the report shows, inter alia :

- that the ratio of the number of mine rescue men to the total number of underground workers is roughly the same,
- that the training of mine rescue men is carried out on the same principles and that the methods used are similar, although local conditions have to be allowed for,

- that the rescue equipment available is of the latest kind provided by the most recent progress in techniques, and
- that the regional plans for giving the alarm and for calling for assistance are such as to meet the requirements of an emergency.

The Working Party noted with satisfaction that various improvements to rescue training and equipment have been introduced as a result of the personal discussions which have taken place in recent years within framework of the Working Party in different countries.

The Working Party came to certain conclusions which the Commission discussed in its plenary session of December 20, 1960. The Commission directed the Working Party to examine more deeply those conclusions which contain suggestions, in order to convert them into recommendations.

The following were the problems to receive detailed attention :

1.- Preparation of a supranational plan for providing assistance

- For each country or for each mining district, emergency plans must be drawn up for use in the event that supranational assistance was called for by reason of a catastrophe, the plans to contain the following data :
  - the location of the central office of the mine rescue organisation;
  - names, official and private addresses and telephone or teleprinter numbers of the Directors of the central offices and their representatives;
  - general maps of the districts indicating the location of collieries.

Major changes or supplements to this plan should be notified to the Secretariat of the Commission without delay, so that this plan is always maintained completely up-to-date.

2.- Improvement of breathing apparatus for mine rescue teams

The Working Party considered that it should suggest offering a prize for the development of a freely-portable breathing apparatus independent of the external air.

This apparatus should be characterized by considerable advances in

- simplicity of use,
- reliability of operation

and in particular

- possibility of extending the period of use for special application.

At the same time efforts should be made to achieve improvements in

- the breathing attachment (mouth-piece or mask) and
- the possibilities of cummunication.
- In addition, particular attention should be paid to the problem of optimum adaptation to respiratory-physiological conditions.

3.- Frontier formalities and Customs duties for mine rescue men and equipment

The Working Party considers it very important role for purposes of mine rescue operations that action should be taken

- to facilitate frontier crossing for rescue teams and rescue apparatus in the event of a catastrophe;
- to abolish duties and simplify frontier formalities with regard to the import and export of rescue apparatus and equipment.

The latter step would help to ensure that equipment with the best technical characteristics, with a direct influence on the further improvement of mine rescue techniques, could be ordered as rapidly as possible and at the most favourable prices; it would also be of great value in connection with the repairing of apparatus bought from other countries.

For these reasons the Working Party considers it essential that every effort should be made to secure the implementation of these proposals.

4.- Insurance of mine rescue men

The Working Party is convinced of the necessity of studying the question of insurance of the rescue teams working outside their own country within the framework of reciprocal assistance, in order to reach a uniform and binding arrangement.

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In addition to this, the Commission instructed the Working Party to maintain the contacts made and to continue the discussion and exchange of experience.

This was to be done in particular by

- exchanging and discussing the Annual Reports of the central rescue stations;
- holding meetings in connection with particular occurrences (accidents which might provide new information, new technical developments in equipment and devices, etc.);
- preparing an annual report on the state of mine rescue techniques in the Community countries, including reports on particular occurrences and an account of the work carried on by the individual mine rescue organizations.

IV

WORKING PARTY ON WINDING ROPES AND SHAFT GUIDES

A. - Electro-magnetic inspection of winding ropes

The studies of this Working Party on the Conference recommendation below, which the Commission had directed it to consider are not yet complete :

> "Methods of inspecting winding ropes during operation, e.g. with electro-magnetic rope-testing devices, should be further developed"
>
> (Recommendation 31-M, page 148 of the Conference Report).

To date several series of comparative tests on winding ropes in use have been carried out at one pit each in Germany, Belgium and France, using three electro-magnetic inspection devices, the ACMI apparatus of AIB[1], the Integra apparatus of AIF[2] and the testing device developed in Bochum by the Rope-Testing Station.

The experts' discussions revealed that there were broadly speaking two basic principles in the assessment of the inspection diagrams.

With the first principle, the rope is judged principally by the number of internal and external broken wires, and in addition the "disturbance level" of the diagram permits of a qualitative assessment. In making this assessment, however, it is not assumed that there is any relation between the "disturbance level" and the rope' s loss of load-bearing capacity, since those who hold to this particular principle claim that the "disturbance level" is built up of the sum of several factors differing in nature from one another, it being impossible to distinguish these factors individually - quite apart from the characteristics of the measuring devices used - so as to determine their proportional effect and their general importance.

The second principle is that of assessing the load-bearing capacity of a rope in essence on any increase in the "disturbance level," thus assuming a close relation between any increase in disturbance level and the rope's loss of load-bearing capacity.

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[1] Association des Industriels de Belgique.

[2] Association des Industriels de France.

Present information indicates that the electro-magnetic inspection of ropes is an exceedingly useful aid in inspecting and assessing winding ropes. True, it cannot replace the conventional visual inspection of the rope, but it can provide a very valuable supplement. The Working Party came to the wiew that it would be premature to lay down regulations regarding the removal of ropes or the extension of the service time on the basis of results obtained by electro-magnetic inspection. This method should in the first instance remain an auxiliary method in the hands of the experts. The Commission agreed during its discussions that continuation of the practical trials would be worthwhile and necessary.

Accordingly, it approved an experimental programme to this end. The objective of these tests is to establish the correctness of one or other of the principles of assessment of the diagrams on the basis of a fairly large number of investigations on discarded winding ropes and to make a fundamental investigation of the factors influencing the load-bearing capacity of the rope, e.g. rust, wear, indentations caused by pressure, breakage of internal wires, crystalline condition of the wires, magnetic condition of the ropes, etc., by ensuring that electro-magnetic inspection takes in these factors and provides a means of distinguishing between them.

The High Authority has declared its readiness, in accordance with the proposal of the Commission, to finance these practical tests.

For the purposes of these investigations samples from some 30 discarded ropes - from Belgium, Germany, Great Britain and France - which had already been electro-magnetically inspected in the country from which they came, would be sent to the Rope-Testing Station of the Westfälische Berggewerkschaftskasse in Bochum.

These samples would then be tested again using the Bochum electro-magnetic apparatus. After the ropes had been opened up to determine which conclusions drawn from the electro-magnetic inspection diagrams were correct.

The experimental programme was drawn up as follows :

1. 30 winding ropes to be made available in the Community Countries and in Great Britain over a period of some 6-8 months;
2. electro-magnetic inspection to be carried out shortly before the ropes are removed;
3. the sample pieces (roughly 3 pieces per 12 m. length) to be taken on the basis of the recorded inspection diagram;
4. the selected sample pieces to be marked by coloured rings and by removing one or two outer wires at each end of the piece;
5. fresh electro-magnetic inspection of the rope, especially of the sample pieces, to determine the sections of the diagrams corresponding to the sample pieces;
6. the sample pieces to be cut out after the rope has been discarded, the points

where the rope is cut being located so that the coloured rings and the artificial breakages of wires are about 0.5 m. away, bringing the total length of the sample pieces to roughly 13 metres. The ends should be whipped very firmly or welded together, so that the relative position of the elements of the rope does not change during transport, by loosening up. The beginning of each sample piece should be specially marked, e.g. with a flag or tag;

7. the 3 samples pieces of discarded rope to be sent to Bochum with a piece, as far as possible, of the same length, of the same rope in new condition (as a check piece);
8. each sample piece to be electro-magnetically inspected using the Bochum apparatus in the Rope-Testing Station at Bochum;
9. a piece of rope approximately 60 cm. long to be removed from each test piece to allow inspection of the individual wires (for tension, bending and twisting);
10. a further section of rope approximately 4 m. long to be removed from each sample piece, to allow of submitting the whole strand to a tearing test;
11. the remainder of each sample piece to be opened up and the individual wires inspected.

This series of tests has begun and is continuing according to plan.

B. - Recording accelerometer for testing shaft-guides

The Recommendation of the Conference :

"The development of devices for testing shaft guides should be aimed at producing apparatus which can be easily handled by the personnel examining the shafts"

(Resolution 32 - M, page 148 of the Conference Report)

was also studied by the Working Party, which has not yet completed its investigations into the problem.

The experts agree that defects in the lines of cage guides (e.g. misalignment of individual guides, imperfect butting of the ends of guides, wear, etc.) give rise to horizontal oscillations of the cages and skips (designated by the term "conveyances" hereafter). These oscillations produce dynamic forces which in time cause not only deterioration of the complete installation of shaft guides, but also favour the occurrence of hair-cracks or fatigue breaks in the weight-carrying parts of the conveyences and may, in some cases, lead to damage to the winding rope. The horizontal oscillations may produce vertical oscillations which can also lead to rope damage.

There are already several devices, based on the accelerometer principle, to measure the horizontal oscillations; these devices are mounted on the conveyance. According to the experts, the two devices already subjected to practical tests are the "Cambridge Double Accelerometer" and the "Two-Component Recording Accelerometer" developed by the Rope-Testing Stations in the Saar and at Bochum.

The Cambridge Double Accelerometer consists essentially of two mass-spring systems set at 90° to each other and electro-magnetically damped, an electro-magnetic time marker - controlled by an additional Cambridge contact clock - and a celluloid film which is driven by a clockwork mechanism.

The rate of advance depends on the "winding-on" diameter, i.e. it is not constant, so that equal times do not correspond to equal lengths of recorded diagram, nor, in consequence of this, to equal lengths of travel of the conveyance. To record the length of the conveyance, an ancillary electrical apparatus is used in the winding-engine house to record a travel/time diagram. These records of travel have to be transferred to the acceleration/measuring run diagram proper. The celluloid record is then examined and assessed by means of a microscope or with a special viewer-enlarger or by a photograph magnified 10 times. (This device is not flameproof).

The Two-Component Recording Accelerometer of the Rope-Testing Station at Bochum is a purely mechanical measuring device. Two spring-mass systems, fitted with a liquid damper (silicone) are fitted 90° to each other. The accelerations are recorded on a band of paraffin-waxed paper which advances at a constant rate, thus making it unnecessary to add time marks, because equal times correspond to equal lengths of recordings and to equal lengths of travel of the conveyance. The recording of the length of travel is made directly on the waxed-paper band of the Two-Component Recording Accelerometer. A flexible shaft, which connects the accelerometer with the device (known as the depth indicator) which is also attached to the conveyor, transmits the rotations of a wheel running along the lines of shaft guides to the accelerometer. A "length-travelled" mark is made on the acceleration diagram for each 10 metres of length of travel. The recordings made by the Two-Component Recording Accelerometer can be assessed directly with regard to the magnitude of the acceleration and the length of travel (depth).

The horizontal oscillatory accelerations of the conveyance do not in general permit of any conclusions being drawn as to the magnitude of the dynamic forces. They are neverthless an index of the disturbance of the smoothness of travel of a conveyance and serve in particular for the comparison of diagrams recorded successively at intervals of time. Suitable treatment of the line of shaft guides on the basis of the acceleration measurements obtained can considerably improve the smoothness of movement of the conveyances. In the first place this undoubtedly increases the reliability of operation of the installation and in addition reduces the outlay on repair and maintenance required in the future for both the shaft guides and the conveyances themselves.

A prerequisite for, and at the same time a useful supplement to, the acceleration measurements is the measurement of the static state of the guides by means of purely mechanical guide-testing devices. The diagrams produced by these devices give indications of the degree of wear on the guides, of changes in the distance between the guides, and of faulty butting at the joints.

The investigations carried out hitherto using recording accelerometers and guide-testing apparatus have given good results and proved the value of such equipment for inspecting winding installations.

The experts on the Working Party suggest, as their first conclusion, that it is advisable to recommend these devices, in the light of the operating conditions, especially in cases where external signs indicate that the smoothness of travel of the conveyances is deteriorating.

The study of this problem is to be continued.

V

HIGH AUTHORITY COMPETITION FOR THE IMPROVEMENT OF SAFETY EQUIPMENT IN COALMINES

As was noted in the Commission's First Report, the prototypes were required to be in the hands of the panel of judges appointed by the High Authority by not later than September 1, 1959.

The appliances entered were, in accordance with the rules of the competition, of the following types:

1. portable methanometers,
2. portable firedamp-limit warning devices,
3. portable oxygen-limit warning devices,
4. carbon-monoxide recorders,
5. self-rescue apparatus affording complete protection against noxious gases and oxygen deficiency for at least one hour.

The panel were supplied with four specimens of each prototype, which were to be subjected, in two separate Community countries, to six months' continuous laboratory tests and to six months' practical tests below ground.

Test procedures and directives were drawn up by the panel to ensure that the results would be properly intercomparable.

The laboratory tests were completed towards the end of June 1960, and the appliances thereupon short-listed are now undergoing their practical trials below ground.

The panel hopes to announce its awards by about the middle of 1961.

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SECTION TWO

HUMAN FACTORS

After considering various possible methods of tackling these problems, the Commission set up a restricted working party to define and circumscribe the points to be concentrated upon (see First Report, end of p. 52).

The Working Party, which was composed of representatives of the Governments and of the employers' and workers' associations, proposed that four sets of questions be studied, namely :

a. "effects of working hours on safety"

b. "medical problems of safety policy"

c. "psychological and sociological factors affecting safety"

d. "effects of methods of payment on safety.

It further proposed that a separate working party be set up for each item. The Commission agreed; it was subsequently found, however, that with the time and facilities available it was possible to organize only the first three of the working parties suggested.

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So far, the Commission has adopted three recommendations concerning medical aspects.

The remaining problems on the agendas of all three working parties are still under examination, and the Commission has therefore not yet been called upon to state its views on them.

It feels, however, that it should record the subjects discussed, pending the working parties' ultimate submission of their findings.

This information as to the work in progress is not, of course, intended in any way to anticipate the findings.

I

WORKING PARTY " ON MEDICAL PROBLEMS "

The working Party's objectives are as follows:

1°) Organization and operation of colliery medical services.

2°) Arrangements in the member countries regarding specialization by doctors practising or intending to practise occupational medicine at collieries.

3°) a. Functional rehabilitation of workers who, after a spell of disability can be re-absorbed into their former occupation or into similar work, i.e. who do not require to undergo a fresh apprenticeship.

b. Occupational retraining of workers who for medical reasons have become unfit for their former occupation and therefore require, to be taught a new skill.

c. Re-employment, preferably in the same colliery or otherwise, in another colliery, of

- workers who have undergone occupational retraining (those who have undergone functional rehabilitation are presumed to be suitable for employment in the same occupation, and in the same colliery, as before),
- workers found on medical examination to be unfit for their current occupation.

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So far, the Working Party has been engaged in the examination of item (1): as the subject is of great importance to the improvement of safety, and raises a considerable number of practical problems, the Working Party has explored it in considerable detail.

1) As the Working Party feels that an efficient contribution by the medical services to the improvement of safety depends to a very great extent on the practical details of their operation, it has drawn up a detailed description of these.

The description covers:

- Laws, regulations and contractual provisions concerning medical services and medical examination and supervision;
- duties and responsabilities of colliery medical services;
- nature, scope and object of examinations effected;
- miners required to undergo examination;
- number of doctors employed;
- material means provided for doctors;

- measures taken to ensure good relations between medical and other services of the collieries and between the medical services and the workers and workers' representatives;
- status and terms of employment of the medical officer and other members of the colliery medical services, arrangements ensuring their professional independance.

The description will be found in Annex C.

2) In compiling this description and making the relevant country by country comparisons, the Working Party came to the conclusion that it was both feasible and desirable to draw up a general summary bringing out certain "minimum principles",, the comprehensive application of which throughout the Community it considers would make still more effective the contribution of the medical services to the improvement of safety.

3) It was decided to go in particular detail into a number of points, including the following :

- the requirement that all collieries should have medical services;
- the duties and responsabilities of these services, in particular with regard to preventive medicine (pre-entry examinations, periodic check-ups for all workers, and special examinations of workers whom it is planned to assign to particular jobs);
- minimum requirements as to what these examinations should consist of;
- qualifications (degrees, diplomas and practical experience) expected of colliery medical officers;
- procedure for appointment of colliery medical officers and role of workers' representatives in this connection;
- status and terms of employment of medical officers and arrangements ensuring their professional independance;
- association of workers' representatives with the running of medical services and institutes of mining medicine.

Recommendations submitted to date

So far the Commission has endorsed three recommendations, together with a report containing supplementary details. The recommendations relate specifically to

- pre-entry medical examinations,
- special medical examinations for particular workers,
- routine medical check-ups (periodic examinations, examinations in connection with a change of job or following an absence).

The first recommendation lays it down as a general principle that all applicants for employment in a colliery should be required to undergo a pre-entry medical examination, adds some notes as to the form which the examination should take and the points it should be designed to establish, and emphasizes that particular attention should be paid to the state of the lungs in the case of workers whom it is planned to employ below ground or in a job where they will be exposed to dust.

The second defines the object of special medical examinations and the cases in which these should be effected.

The third defines the object of periodic check-ups and indicates at what intervals they should be carried out: distinction is made according as the subject is an adult or a juvenile, while with regard to changes of job it recommends that an additional examination should be made where the new job entails a hazard to which the subject has not previously been exposed. It further suggest that a worker returning after an absence should, if necessary, undergo a special medical examination where his return to work represents a danger to his own safety or to that of others.

The Commission at its meeting on December 20, 1960, adopted these recommendations, together with the introductory report accompanying them. The full text follows:

REPORT

ON PRE-ENTRY, SPECIAL AND ROUTINE MEDICAL EXAMINATIONS

AND

RECOMMENDATIONS

PRE-ENTRY EXAMINATIONS FOR ALL PERSONNEL

I BASIC PRINCIPLE

1. There were three schools of thought on this subject.

a) Some members consider that the pre-entry examination should be conducted with a view to assessing the applicant's fitness for employment as a hewer, this being the underground occupation involving the widest range of physical aptitudes.

They further argue that, for the pre-entry examination to be adapted to the particular requirements of each applicant's prospective job, it would need to be possible to decide beforehand what job was to be assigned him, whereas in fact this is not always possible, nor indeed desirable. After all, the turnover of underground personnel is very substantial, and whatever the management's original plans may have been the worker may always have later on to be put on to a different job from that for which he was recruited. Moreover, the less physically demanding jobs below ground should be allotted to those men who are no longer able to perform the heavier types of work, so that the latter can be given to new entrants, at any rate as soon as they have received the requisite training and, in the case of juveniles, developed the necessary physique.

The members taking this view do, however, make an exception with regard to specialized craftmen, who are obviously not likely to be transferred to other work. In their case, therefore, the pre-entry examination can and should be adapted to the specific requirements of the job concerned.

b) Other members of the Working Party maintain that it is by no means impossible to organize the pre-entry examination with an eye to the subject's fitness for the particular work to be assigned him. They consider this a more efficient way of going about it; in addition, they feel that it would be extremely difficult to define the "craftsman" category to be excepted, and that in any case, in view of the increasing diversification below ground as a result of mechanization, men are more and more having to be recruited for particular duties.

c) The suggestions was also made that the medical officer might certify applicants as "fit for all types of work" or "fit for all but a few types of work." Naturally, he could not be expected to specify the exceptions by name, as this would mean he would have to be familiar with the special features of all the different types of underground work: he could, however, quite well note that the man should not be employed, say, in very hot or humid workings, or on jobs requiring keen eyesight or hearing.

2. a) If the pre-entry examination is conducted with a view to assigning the subject to a particular job, certain criteria might be adapted to the special features of that job, as for instance regarding eyesight, hearing or physical strength. Even so, however, all applicants without exception should be required to satisfy certain health standards.

b) Also, all necessary measures would need to be taken to ensure that a man initially examined with reference to a particular assignment could not subsequently be given a different one involving different hazards, until he had first undergone another examination.

II. PRACTICAL DETAILS

The Working Party would emphasize that the pre-entry examination must include a general examination and all such special examinations as may be necessary to ascertain whether the applicant is suffering from any physical condition making him unsuitable for employment.

It is, of course, essential that more precise indications should be given as to the tests, procedure and criteria to be employed. The Working Party strongly urges the need for such indications, and also holds that these should not be given case by case, but should be fixed beforehand by general directives. It feels, however, that this is a strictly medical matter in which it is not itself qualified to advise, and which should be entrusted to medical experts. Nor is it prepared to recommend whether the indications should be drawn up at Community or at national level, since it is felt that insistence on one or the other might result in undesirable delays. In any case, indications drawn up at national level could always be compared, with a view to standardizing them in so far as might be deemed advisable.

III. LUNG EXAMINATIONS

A. Particular importance of these

In view of the silicosis hazard, special attention must be devoted to the examination of the cardio-respiratory system in the case of all workers who have been or will be exposed to this.

B. Method to be employed for X-ray' examinations of the cardio-respiratory system;

1. The Working Party is unanimous in considering mere radioscopy, without an exposure, to be insufficient; its debates turned on the relative merits of radiography, giving a 1:1 plate or film, and radiophotography, giving a reduced-format film.

a) It should be noted that the two methods are based on quite different principles: radiography is effected by interposing the part of the body to be photographed between the X-ray tube and the plate or film, while radiophotography consists in photographing a fluorescent radioscopic image. Their respective advantages are thus not simply a matter of the size of the plate or film produced; much careful study is needed to establish the best format for radiophotography.

b) The two methods are not interchangeable. The supporters of radiophotography claim that it is a more effective means of detection than radiography, in that certain small opaque patches can be seen more clearly thanks to the use of an "intensifying screen". On the other hand, once lesions or anomalies have been so detected, their closer study is best effected by standard-format radiography, supplemented where necessary by special radiological or other examinations.

c) It is agreed that where radiophotography is used the format should be not smaller than 70x70 mm., and that special care should be taken in the processing of the films.

d) Otherwise, some members are for one and some for the other. It was emphasized that the conclusions to be drawn from an X-ray plate or film, or a series of plates concerning the same subject, depend to a great extent on the interpretation of the investigator. This underscores the importance of the experience accumulated in the individual coalfield with the one method or the other.

2. In conclusion, the Working Party is agreed:

- 1°) That the examination of the cardio-respiratory system can be effected either by radiography or by radiophotography;

- 2°) that where radiophotography is used the format must be not smaller than 70x70 mm.;

- 3°) that where radiophotography is used it should always be possible to supplement this, if necessary, by standard-format (1:1) radiography.

The Working Party would very much like to go further into this question, on the basis of additional studies and of a more comprehensive exchange of information and experience, with the object of arriving at greater standardization of the methods of radiological examination in the different Community countries.

C. Requirements to be laid down as to state of entrants' cardio-respiratory system

1. In what cases should a normal chest image be required?

The Working Party considers that a normal chest image should be required in all cases where the job to which the man is to be assigned involves a dust hazard, i.e. all occupations below ground, and all surface occupations entailing exposure to dust.

2. What constitutes a "normal chest image"?

The term does not necessarily imply an image entirely free of any anomalous features: there is therefore a certain range of images which can be rated as normal by the examining doctor.

The Working Party feels, however, that precise definition of a normal chest image is a highly technical medical matter: it prefers, accordingly, not to attempt such a definition itself, but to leave it to the competent authorities in each country to do so by such methods as they consider most appropriate.

IV. PERSONS REQUIRED TO UNDERGO PRE-ENTRY MEDICAL EXAMINATION

The Working Party considers that all applicants for employment, whether at the surface or below ground, should be required to undergo pre-entry medical examination, and that this should in all cases include a radiographic or radiophotographic chest examination, even though not all surface workers need necessarily be certified as showing a normal chest image (see above).

As regard surface personnel in jobs not involving a dust hazard, it is emphasized that they do nevertheless run certain other risks (e.g. of tuberculosis), and that it is to the interest of both employer and employed that any lesions already existing at the time of entry should be detected beforehand.

V. RECOMMENDATIONS TO BE REGARDED AS MINIMUM STANDARDS SUBJECT TO REVISION

All recommendations by the Commission are to be regarded as basic minimum standards.

Moreover, rapid strides are being made in all fields connected with radiological examinations and the concept of the normal chest image: the Working Party's present findings must, therefore, be revised in the future as and where necessary.

N.B. The medical experts on the Working Party emphasize that, although pre-entry medical examinations are extremely valuable and indeed indispensable, only relatively limited conclusions can be drawn from them. Thus the doctor can report only as to whether certain symptoms are present:he can conclude that the subject shows no symptoms which could be a reason for not employing him, but he cannot predict with any certainty how the man's constitution will react to a dusty environment.

SPECIAL EXAMINATIONS

I. OBJECT OF SPECIAL EXAMINATIONS PART;PLAYED BY OTHER COLLIERY DEPARTMENTS

Some jobs demand special endowments on the part of the worker, or make it specially important that he should possess certain physical aptitudes: thus keen eyesight is more important for an engine-driver than for most other underground personnel, while a sudden loss of consciousness could have the most serious consequences where the victim is a winding engineman.

Hence an ordinary examination is not a sufficient basis for assessing a man's fitness for either of these jobs: a special examination, undertaken with their particular requirements in mind, is essential. Indeed, even this is not in itself enough: the vocational guidance and training departments, the psychological service and the technical departments all bear their share of responsability in the ultimate decision, whether their function is to determine the requirements which the man must satisfy or the extent to which he does satisfy them. The medical service's role is, however, a rather special one, inasmuch as the doctor has to maintain professional secrecy.

Accordingly, the Working Party's conclusion may be summed up as follows:

1) It finds that the object of special medical examinations is to ascertain the subject's fitness for certain specific duties.

2) While it acknowledges that other departments must play some part in the matter, it makes no reference to co-operation between them and the medical service.

3) It confines itself to laying down that the medical service must take their views into consideration.

II. CASES REQUIRING SPECIAL EXAMINATION

A. The Working Party considers special examinations to be called for:

1) when the job envisaged involves a particular hazard to the man concerned and or to others, in the form of either danger of accident or danger to health, resulting either from the normal performance of the job or from the special conditions under which it is carried on (as for instance in the case of duties which involve a particular hazard only if performed in a humid atmosphere or at a high temperature).

2) Where the job requires special physical endowments or qualities of character.

B. The Working Party is not, in its view, competent under its terms of reference to draw up an exhaustive list of the jobs falling under these two heads. It has preferred, therefore, simply to give a few general examples, and to leave it to the national authorities.

1) To list the jobs for which special medical examinations should be effected;

2) to lay down what the examination for each such job should consist of.

The Working Party would emphasize, however, that upon the national authorities' deciding that given jobs do call for special prior examination, it should be compulsory for the collieries, to have the examinations made.

In the case of rescue workers, the Working Party is agreed that special examinations should always be made, but considers it to be a matter for the Working Party on Co-ordination of Rescue Arrangements to decide whether it wishes to lay down details as to the nature of these.

ROUTINE MEDICAL EXAMINATIONS

I. PERIODIC HEALTH CHECKS

1. Objects

These are three in number:

1°) To check whether the man's standard of fitness for his work is still what it was when he was signed on, or alternatively what his standard of fitness is, in order that he may be assigned to duties appropriate to that standard;

2°) to detect any signs of occupational disease at as early a stage as possible;

3°) to help supervise the workers' state of health.

2. Miners required to undergo health checks

The Working Party considers that all workers, both underground and surface, should be subjected to periodic check-ups, for two reasons. Firstly, silicosis is not the colliery worker's only occupational hazard: some surface workers, such as those required to handle pitch or hydrocarbons, are exposed to other risks. Secondly,the periodic check-ups are not confined solely to detecting occupational diseases: they are also designed to aid in supervising the men's state of health and to establish how far the latter are still fit for their jobs (for example, after a certain age has been reached, some jobs are likely to be too heavy).

3. Frequency

a) The Working Party makes a distinction in this respect between juveniles (under 21) and adult workers.

1°) In the case of adult workers, it was unanimously agreed that examination should be effected every two years. The Italian representatives mentioned that in Italy the interval was fixed at one year, and urged that the same arrangement should be made in the other countries.

2°) In the case of workers under 21, it was also unanimously agreed that the interval should be shorter than two years. Opinion differed, however, as to the exact frequency desirable, the Netherlands representatives maintaining, on practical grounds, that it was not possible to reduce the period below 16-17 months, while the other countries' representatives accepted one year as reasonable. (16-17 months is already the regular period in the Netherlands, and one year in Italy, for both adults and juveniles).

b) The various figures mentioned are of course the maximum intervals.

c) The Working Party is also agreed that in some cases examination should take place more frequently, where warranted by certain health symptoms in the worker himself, by the nature of his duties, or by the type of working where he is employed.

II. EXAMINATIONS ON SPECIFIC OCCASIONS

1. Prior to reassignment within the colliery

Workers should be medically re-examined whenever it is proposed to assign them to different duties involving hazards not taken into account in previous examinations undergone. This is particularly important where the pre-entry examination was conducted mainly in the light of the special requirements of the man's first job.

2. Following absence from work

This is especially desirable following absence on account of illness or accident, but can also be so in other connections.

Where the man was absent for reasons other than illness or accident, the question arises whether he can simply be judged fit to resume work on the strength of his pre-entry or last periodic examination, or whether he should be specially re-examined first.

Where the man was off sick or injured, he cannot in any case report for duty until his doctor passes him as fit to resume work. The problem is then whether his own doctor's opinion is sufficient with regard to his fitness for his own particular occupation at the colliery, or whether the colliery medical service should be consulted on the more specific aspects. While the man's doctor may be a member of the colliery medical staff, he may equally well be an outside practitioner quite unconnected with the colliery or even with the coalmining industry.

It is felt that this question does not really admit of one comprehensive answer. While the colliery medical service's opinion is definitely to be regarded as necessary following a prolonged absence, it may also be needed after a short one, for instance, where due to illness, according to the nature of the illness concerned. Similarly, the nature of such examinations as the colliery medical service may carry out may vary according to the circumstances.

The Working Party therefore prefers simply to recommend that the colliery medical service be notified of all absences, their duration and causes, and of course, where the absence is the result of illness or accident, of the nature of the illness or accident in question. The medical service should then make its own assessment as to whether the absentee should undergo examination before returning to work, and if so, what form the examination should take.

R E C O M M E N D A T I O N S

I. PRE-ENTRY MEDICAL EXAMINATIONS

All applicants for employment at collieries should undergo a pre-entry medical examination. This must establish that the applicant shows no symptoms rendering him unfit for such employment; it must include a general examination and all such special examinations as may be deemed necessary for the purpose.

The examinations effected must include, as regards the chest, a radiography or radiophotography of format not smaller than 70x70mm ; the latter to be supplemented if need be by a standard-format (1:1) radiography.

The nature and practical details of these examinations, together with the criteria on which the doctor should base his findings, should be defined by medical experts. In the case of recruitment for work, whether below or above ground, where the worker will be exposed to a dust hazard, the examination must show a normal pulmonary image, such image likewise to be defined by medical experts.

These are to be regarded as minimum recommendations.The points concerning the number and type of examinations to be carried out, the effecting of radiological examinations and the definition of the normal pulmonary image are subject to review in each country whenever this is felt to be appropriate in the light of progress in medical and radiological knowledge, working conditions and preventive measures.

II. SPECIAL EXAMINATIONS

1. The object of special medical examinations should be to establish (taking into account, according to circumstances, the opinions of the training, vocational-guidance, applied-psychology and other services concerned) a worker's fitness for certain specific occupations.

2. Such examinations are essential in the case of jobs

   a) which either in themselves or owing to the conditions under which they are performed involve a special hazard to the worker himself or to others as regards health and/or safety;

   b) or which demand particular physical aptitudes or characterological qualities.

3. No attempt has been made to list in full the cases in which special examinations are necessary, this being left to the competent authorities in each country. Examples include:

   a) winding enginemen;

   b) staple-pit enginemen;

   c) motormen (drivers of locomotives, mobile haulers and surface vehicules);

   d) workers assigned to hot workings;

   e) all those employed on cage handling.

III. ROUTINE EXAMINATIONS

A. Periodic health checks

The object here is to establish whether the subject is still fit for duty, to detect any symptoms of occupational disease at the earliest possible stage, and where appropriate to help supervise the subject's health generally.

All personnel should undergo such check-ups at intervals of not more than two years, or less in the case of workers under 21; check-ups may also be more frequent if the individual worker's state of health, the nature of his job or the type of working in which he is employed makes this desirable.

B. Examinations on specific occasions

1. Prior to reassignment

   Workers whom it is proposed to assign to jobs involving hazards not previously taken into account for the man concerned should be re-examined.

2. Following absence from work

   Where a man's return to work after an illness or accident involves risk to the safety of himself or others, he may be subjected to a special examination in accordance with the details of his particular case.

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II.

WORKING PARTY ON "PSYCHOLOGICAL AND SOCIOLOGICAL FACTORS"

Outstanding problems not yet dealt with by the Commission

1. The Working Party has before it three main subjects:
   a) Measures to enable personnel to recognize dangers and work in such a way - as to avoid them;
   b) training of safety supervisors;
   c) measures to promote co-operation by all concerned in securing the highest possible safety standards.

Up to now the Working Party has discussed only (a) and (b), which have been taken as including the possible contribution of properly-conducted psychological examinations to better safety. It has so far been able only to rough out some ideas, which have still to be gone over by it before being submitted to the full Commission. These are as follows.

A.- Measures to enable personnel to recognize dangers and work in such a way as to avoid them

2. The aim must be:
   a) to work out in advance the risks entailed by operations in given circumstances;
   b) to explain these to all who are exposed to them by taking part in the operations concerned;
   c) to explain how the work is to be so performed as to obviate the risks;
   d) to see to it that this is in fact done.

   Taken as a whole these measures will ordinarily help to establish a general atmosphere of safety-mindedness, and convince all concerned that emphasis on output is perfectly reconcilable with emphasis on safety.

3. With regard to detection of danger, the Working Party has made a start on the examination of the following arrangements:
   a) Advance study of the broad group of general safety measures forming in practice part of the operational regulations, and of individual safety measures, prior to any opening-up of new workings or notable changes in operating conditions (this to be effected as a regular addition to the advance study of the technical and economic aspects of the projected operation);
   b) submission of regular returns to the colliery management of all accidents, incidents and dangerous situations (even those not culminating in actual accidents) which have occurred during operations. This would enable the safety record for the working in question to be drawn up on completion of the

operations there alongside the profit-and-loss record.

4) The Working Party has further discussed arrangements to familiarize personnel with prospective dangers, viz.

   a) Examination by all concerned, or by their representatives, of the dangers liable to arise in the commencement of operations in a new working.

      This would enable everyone to be made familiar with the situation and the risks to be expected, and also with the precise details of the work to be done;

   b) Thereupon, explanation to all workers concerned regarding the methods to be employed, such explanation to be restated and supplemented as often as required.

5) Arrangements to explain to the men how a job should be performed in such a way as to eliminate risk come, of course, under the head of occupational training. In this connection, attention may be drawn to the recommendations adopted on training by the Conference on Safety in Coalmines, and to the valuable effects which their implementation may be expected to have on safety.

   The Working Party's discussions mainly concerned the following points:

   a) Specialization of occupational training

      The Working Party debated the question whether general training for work below ground was sufficient, or whether this should be supplemented by special training in line with the particular features of each man's proposed occupation and the particular conditions under which he is to work (including the place at which he is to do so).

   b) Importance of a stable labour force

      If the latter thesis is accepted, then quite obviously training cannot achieve its proper object unless the men can be counted upon to be there for a sufficiently long time. Moreover, it is not really enough that they should simply continue at the same colliery: they should continue in the same job in the same type of working unless and until given the requisite additional training for reassignment to different duties or a different locality.

   c) Instruction on safety measures

      This should be given automatically as part of vocational training as such. It should bring home to the worker that there is no clash between safety-mindedness and keenness on a good output.

d) Working conditions for instructors

There should be a sufficient number of instructors, who should be allowed all the time and facilities they require to do their job properly.

6) As regards checking to ensure that the work is performed in accordance with safety regulations, it was emphasized that this must be the responsability of supervisory officials and under-officials.

Other ways of helping to ensure this (without prejudice to the responsibility referred to) will be discussed in connection with "measures to promote co-operation by all concerned in securing the highest possible safety standards." The Working Party has not yet begun its consideration of this item.

B.- Safety training supervisory officials and under-officials

7) Before seeking to state any principles on the subject, it is necessary to define the personnel categories to which they should apply.

"Supervisory officials and under-officials" is here taken as meaning those not themselves engaged in production work, but employed specifically to keep an eye on the actions and reactions of others, and to discipline any breach of regulations. As regards the training of such personnel, the Working Party's conclusions to date have been as follows.

8) The point made in A,5,b above concerning the need for a man to continue some considerable time in the same job if his training is to be of value applies equally in the case of the special training of supervisory officials and under-officials.

9) Given the above principles concerning occupational training for personnel in general, it follows that supervisory officials and under-officials must:

a) be sufficiently conversant with the instructions relating specifically to the jobs and trades they are required to supervise, and with the instructions concerning the particular workings under their charge;

b) acquire the necessary knowledge to be able to draw the attention of the men they are supervising to the hazards of their jobs and show them how these can best be avoided. They should also receive instruction in leadership;

c) be given properly-diffenrentiated training according to the manner in which they are appointed to their supervisory duties. Obviously, the same training should not be given to a rank-and-file worker, to a man who has gone on after a brief period of practical work to attend courses at a specialized centre, and to a graduate of a technical college or university. In the case of rank-and-file workers, the accent should be on theory and general training; with men having already received more advanced technical education, on the practical aspects;

d) be trained with special reference to the particular requirements of the supervisory grade to which they are to be appointed, and be required to show before promotion to a higher grade in the scale of supervisory personnel that they do in fact possess the requisite qualifications for their new duties;

e) have every facility for refresher and follow-up training, to enable them to keep abreast of developments in safety requirements resulting from the sweeping changes in techniques and working methods.

10) In addition to being thus tailored to the special demands of their particular duties, the training of supervisory officials and under-officials should concentrate on the inculcation of safety rules. In particular, they must be able to submit full and accurate reports on accidents and any other occurrences connected with safety in the workings they supervise.

Their training should therefore cover:

- correct drafting of accident reports;
- extraction of instructive points suggested by these;
- investigation of causes of accidents;
- indication of possible corrective measures.

Accident reports should contain all relevant details as to the causes, circumstances and consequences of the accident, the character of the man or men thought likely to be responsible, and any suggested future precautions against its recurrence.

Accordingly, the wording and layout of the report form should make it perfectly clear what information is required from each person concerned in its drawing-up. All the items of information requested should be obtainable in answer to a straight, unambiguous question, and those answering the questions should be able to feel sure that the sole object of the report is to assist accident prevention.

At the same time, the supervisory personnel should also have explained to them the exact purport of the various questions on the form and the way to answer them correctly; in particular, they should be enabled to classify the causes of accidents according to the rating adopted for the form, and set practical exercices to make clear to them the effects of an incomplete, vague or inaccurate answer.

These accident reports would serve as the basis for the safety record to be drawn up periodically for each working, and also for the study of ways and means of preventing other accidents of the same kind and of encouraging general keenness and co-operation to ensure higher standards of safety.

11) The importance to safety of maintaining an adequate staff of qualified foremen and supervisors alive to their responsabilities regarding both the safety and the technical side raises the problem of an appropriate selection procedure.

Requirements can of course be laid down in theory with regard to the conditions and qualifications for appointment to such posts and promotion from one supervisory or foremanship grade to another, but in practice allowance must be made in each case for all the circumstances involved. Hence it is necessary to fix the procedure for these appointments and promotions.

In some countries, all proposed supervisory appointments and promotions have to be notified in advance to the mining authorities, with details of the powers the nominee is to be given and the sphere within which they will be exercised, the appointment or promotion cannot become effective until the authorities have given their consent, which they may do subject to certain provisos. In one Community country it becomes effective unless the authorities actively object within a given time-limit.

While there exist such individual national arrangements, the procedure to be adopted in respect of the selection of supervisory personnel remains a matter for some attention.

C.- Psychotechnical examinations

12) The Working Party's discussions under this head were mainly on the need:

- To study how such examinations can be most effectively conducted;
- to establish how they, along with the medical examinations and job fitness tests, can aid the management in deciding on a more informed basis regarding the subject's recruitment, assignment to certain duties or promotion to a supervisory post.

13) Psychotechnical examinations for colliery personnel could be of two kinds. First, a fairly summary pre-entry examination, designed simply to ascertain the applicant's general intelligence, in order to weed out those falling below a given minimum standard: it is a fact that quite a number of accidents are caused by the employment below ground of men of unduly limited understanding.

Again, a man whom it is proposed to assign to certain duties involving a particular risk of group accidents or calling for special intelligence or qualities of charachter could be required to undergo a more detailed psychotechnical examination to establish his suitability for the job. It is felt that this would be useful in particular in the case of:

- loco-drivers;
- signalmen;
- winding enginemen;
- shotfirers;
- haulage foremen;
- shaker-conveyor foremen;
- face deputies,
- and other workmen carrying out supervisory duties.

14) The pre-entry psychotechnical examination would be in the nature of a selection test, i.e. designed solely to check whether the applicant possesses the right qualities for underground employment generally, or for employment, forthwith or later, in a specific capacity: in view of the increasing diversification of the miner's work, the latter would be preferable.

    Subsequent psychotechnical examinations, on the other hand, should as far as possible be more for the purpose of vocational guidance: they should be aimed at ascertaining not merely whether the subject is suited for a particular job, but for what range of jobs he is suited.

15) The management should be responsible for laying down the requirements to be satisfied by applicants for employment and candidates for particular assignments or promotions.

    In the case of some occupations, it might be useful to have the psychologist determine these requirements experimentally, by examining men who have been on the jobs in question for some time and given satisfaction.

16) The psychologist should be reasonably familiar with the nature of the man's prospective duties and the conditions under which they will be performed. Also, his conclusions would apply for a fixed period only.

17) A practice could usefully be made of having marks awarded at regular intervals by their superiors on men who had undergone psychotechnical examination, and comparing these with the psychologist's findings.

    It should be noted, however, that such marking systems ordinarily cover all aspects of the worker's occupational conduct, while the psychologist deals only with some of these. The marks could not, therefore, be simply condensed into an overall assessment for comparison with the psychologist's rating : they would need to be awarded on the basis of a set of standard questions framed to elicit the required data. The marking system would need to be very carefully worked out to ensure that it was properly objective and comparable with the psychologist's report.

III.

EFFECTS OF WORKING HOURS ON SAFETY WITH SPECIAL REFERENCE TO DIFFICULT AND UNHEALTHY WORKINGS

Outstanding problems not yet dealt with by the Commission

1) In accordance with its programme, the Working Party first discussed which types of working it would consider (wet workings, thin seams, hot workings), and then went on to examine, with regard to hot workings, what method could best be used for measuring the effective heat, and beyond what temperatures special precautions were needed or operations must cease and perhaps even the continued presence of any person in such workings must be prohibited.

2) After a general discussion of all three types of difficult working referred to, attention was concentrated on hot workings.

3) The Working Party first reviewed the regulations in force in the different coal-producing countries of the Community.

a) GERMANY

The Mines Act provides for reduced working hours above a dry temperature of 28°C.

The normal shift as fixed by collective-bargaining agreement is eight hours, but the maximum time which may be spent, at work or otherwise, in a hot working is six hours. A "hot working" is any point at which the temperature exceeds 28°C. The six hours include only such minutes of travelling time as are spent passing through temperatures over 28°C. The total duration of the shift thus amounts to the six hours spent working in and passing through hot atmospheres plus the rest of the travelling time at lower temperatures; it may accordingly vary from one worker to another.

As the calculation is based on the dry temperature, the other atmospheric factors - humidity,air velocity and radiation - are not taken into account.

Continued study is being given to the regulation of work at high temperatures, in order to take account of improved knowledge of conditions in hot workings, and also because it is now felt to be a deficiency that no maximum temperature has been fixed above which personnel should not be present in a working at all.

b) BELGIUM

No provision is made in the regulations as to the length of time to be worked at particular temperatures, but the Regional Inspectors of Mines have power to fix maximum temperatures beyond which work must cease. For the Campine coalfield the maximum is 30°C. by the Belgian formula of 0.9 wet temperature plus 0.1 dry, and for the Borinage 31°C.; in the other Belgian coalfields the question does not arise.

A proposed new regulation on ventilation further provides that at all points in the mine the temperature must be kept within limits involving no risk to health, due allowance being made for the velocity and moisture content of the air and the type of work to be done. This general provision ought to be supplemented by more specific detailed directives.

c) FRANCE

The overall regulations make only general reference to hot workings: except in special cases, the air velocity in workings must be such that the dry and wet temperatures are appropriate to the work to be done.

An implementing order provides that, where it is absolutely vital that a particular activity should be carried on in an overheated atmosphere, it should be limited to short periods with appropriate breaks in less uncomfortable surroundings. This applies in particular to rescue work or action to avert imminent danger.

By the Decree of 1936 the Government is empowered to fix shorter hours for workings where the atmospheric conditions make the work exceptionally arduous: this has, however, never been done.

d) NETHERLANDS

The relevant portions of the mines regulations are in process of revision.

Under the old regulations:

- No persons under 20 were allowed to be employed in underground workings where the temperature was over 30°C.;
- except by special authorization of the Inspector-General of Mines, no persons were allowed to spend any time in temperatures of over 35 °C. unless in cases of emergency or imminent danger;
- the shift for personnel employed at points below ground where the temperature was over 30°C. must not exceed six hours;

- the Inspector-General was empowered to require shifts to be reduced down to but not below six hours in the case of certain workings where the temperature was over 28°C. and the atmospheric conditions exceptionally unfavourable.

The new draft regulations provide, inter alia, that:

- the term "effective temperature" shall be officially defined as "the atmosphere computed, by reference to a given nomogram, from the dry and wet temperatures and the air velocity";
- the effective temperature beyond which persons under 21 may not be present in underground workings shall be 28°C. instead of 30°C. as heretofore;
- the effective temperature beyond which personnel may work only in the case of imminent danger shall be 32°C., the Inspector-General to have power to authorize exceptions;
- the effective temperature beyond which the length of the shift is reduced shall be 28°C., the six-hour limit to apply not to the time spent actually working but to the whole time spent below ground.

e) ITALY

Where the dry temperature exceeds 32°C. the shift is limited to five hours; where it exceeds 35°C. operations must cease.

These limits apply to all mines: the competent authorities may fix lower temperatures in accordance with the degree of humidity. In point of fact, the temperature in the coalmines is appreciably below 32°C.

f) UNITED KINGDOM

There are no specific regulations on this point, merely a general requirement that appropriate conditions must be maintained regarding temperature and humidity.

So far, no difficulties have arisen.

The matter is, however, receiving attention: the research establishments are at work on air-conditioning and air-cooling systems, while hygrometers installed in underground workings are read daily so that the precise humidity figures are regularly available.

4) The Working Party also noted the arrangements at various Belgian and German

collieries for cooling the air in workings. These are of two kinds.

At some collieries a powerful refrigerating plant at the surface cools the whole ventilation air. Part of the improvement is lost in circulation: the loss is very slight in the cross-cuts, as the surrounding strata are cooled and act as insulators, but is more considerable in the gate-roads, where virgin rock is constantly being laid bare.

At one colliery in Southern Belgium where this method is used, wet temperatures of 26-27°C. have been obtained with very high dry temperatures, although the strata temperature is about 52°C. and the uncooled dry temperature might be as much as 38-39°C. in the return airways.

In other cases, it is considered useless to pre-cool the ventilation air at the top of the downcast shaft, and systems have therefore been installed whereby fresh water and brine are passed through circuits to heat-exchangers at the bottom gate. Just beyond the air-conditioners (usually placed some 50 metres from the bottom gate) the temperature may be brought down to a mere 14°C.

5) a) - Following this initial exchange of information, the Working Party went on to discuss possible measures for ensuring greater safety in hot workings in the different Community countries.

It was agreed that the Working Party should debate not the member countries regulations as such, but points of substance and medical considerations applying to all Community countries. This is did in considerable detail, producing a number of highly pertinent observations; it is felt, however, that these should be further gone over in consultation with medical experts before they are offered in the form of definite conclusions to the full Commission.

The following is a brief progress report on the Working Party's discussions to date.

b) - The great problem of work at high temperatures is for the worker to keep his thermal equilibrium. Beyond a certain effective temperature he is liable to fail, to collapse on the job and suffer serious injury to his health: with such temperature conditions prevailing, it is useless simply to allow breaks in the work, as they do little to help restore the man's thermal equilibrium. Below this maximum, the equilibrium can be maintained, provided special precautions are taken and the worker can get rid of the additional heat and if necessary exert himself less: here breaks can be helpful.

c) - The Working Party preferred to base its discussions on the concept of atmosphere rather than on that of temperature, the latter ordinarily relating to dry temperature, while the former also covers humidity, air velocity and (in theory though often not in practice) radiation efects.

d) - The Working Party declines to offer any opinion on the relative scientific merits of the various methods so far devised for measuring atmospheric conditions; no recommendation will be made in this connection.

e) - It has sought to view the problems purely from the practical angle. These have been the object of detailed research in various countries and industries: while the results are not yet final, they provide sufficient basis for a number of conclusions suitable for practical implementation, though subject to later revision.

Experience latterly, more especially as coal-winning is having to be conducted deeper and deeper below ground, has clearly demonstrated that certain precautions are desirable and should be introduced without waiting for the final research findings.

6) The Working Party discussed the desirability of establishing two maximum temperatures beyond which, respectively:
- Personnel should, for health and safety reasons, not be allowed to work or even to be present at all;
- operations should be allowed only subject to special precautionary arrangements.

a) Urging the fixing of (1), the German delegates emphazided, in addition to the medical considerations just cited, their own experience under the regulations in force in Germany: despite the reduced hours workable above a dry temperature of 28°C., the absence of an absolute maximum was felt to be infortunate.

b) Limit (1) might vary considerably according as it was based practical experience or on purely scientific calculations. Scientifically speaking, it is possible to work at compartively high temperatures, but regulations based on these criteria alone would be of little practical value to the collieries: the conditions under which work would have to be carried on at the highest temperatures would be barely reconcilable with operational requirements, and any such regulations would moreover have a bad effect psychologically.

The Working Party intends to base itself on these points in determining in due course the temperature limit it will propose to the Commission.

c) Beyond this limit, personnel would be allowed into the workings only in exceptional circumstances or in the case of imminent danger, on the following conditions:

Prior permission to be obtained from the Inspectorate of Mines, such permission to be provisional only; the work to be performed under medical supervision, and for limited periods, not exceeding one hour without a break; assignments of this kind to be given only to men passed as perfectly fit, and not over a certain age.

In the event of imminent danger work could of course be undertaken without advance notification of the Inspectorate of Mines and the medical service and without special medical examination of the personnel concerned; such notification should, however, be given without delay in order that any action necessary on the part of the authorities could be taken as quickly as possible.

7) For the reasons given under 5, b above, special precautions should be taken to maintain the thermal equilibrium of personnel working at temperatures between the absolute maximum referred to under 6 and a lower ceiling level.

a) The first precaution would be the institution of special medical checks in connection with conditions in hot workings, to test the subjects' ability to withstand heat. As individual reactions to heat vary widely, it is not enough for the men assigned to such duties to be simply in good health and suited to underground duties in general. Failing very careful selection based on heat tolerance, the accent would need to be on the other precautionary measures mentioned below, beyond a fairly low temperature ceiling, so as to allow for the poorest individual resistances.

The selection should comprise a medical examination specifically for the purpose just before the man's assignment to a hot working, followed up fairly soon afterwards by a check-up on his inurement, and subsequently by further checks at regular intervals.

As well as effecting these selection tests for work at high temperatures, the medical service should be entitled to propose any other precautions for taking into account all the circumstances in any particular working.

b) The important question arises whether men employed in hot workings should be required to work shorter hours or to expend less energy.

c) In theory reduced expenditure of energy would certainly be the better alternative; in practice, however, it is extremely difficult to gauge expenditure of effort, either in hot workings or elsewhere, besides which the amount of effort required to perform a particular job may vary appreciably from one worker to another. Shorter working hours may therefore be regarded as an indirect but helpful means of avoiding overstrain at high temperatures and the consequent dangers.

They do not, however, in themselves constitute a full solution. A man has only a limited amount of energy to expend, and certain jobs can demand too much, thereby involving danger to health after very short exertions. Moreover, workers may step up their expenditure of energy in line with the reduction in working hours, and so be as tired after a reduced shift as after a normal one.

It is therefore desirable to have recourse to both types of arrangement, i.e. shorter working hours and precautions to limit expenditure of energy.

8) Although the constitution may be differently affected by regular and by occasional work at high temperatures, it would appear better to shorten the daily shift than to reduce the weekly total by granting off-days, as the latter would tend to lessen the advantages of heat inurement.

The question then arises whether the reduction should be in the statutory length of the shift (which usually includes winding and travelling time) or in the amount of time actually to be spent in a hot atmosphere. The latter appears more to the point, as the purpose is to limit the effects of heat on the human frame. So understood, the maximum fixed would apply to the whole period spent working, any breaks taken also in a hot atmosphere, and time taken travelling through such atmospheres, but not to time taken travelling through normal atmospheres. The total length of the shift might thus vary from worker to worker; obviously, however, each man must be able to return to the surface immediately his shift is over.

As the time actually spent at work in normal workings very often comes to about six hours out of the regular eight-hour shift, it has been queried whether, to afford real protection, the maximum period to be spent in hot atmospheres should not be fixed at less than six hours. The setting of a special limit for hot workings does of course ensure that the six hours cannot be exceeded even where the travelling distance is exceptionally short; in addition, it implies a ban on overtime in hot workings. However, to make for really effective protection, two possibilities were suggested.

It was felt by some that, over and above the time limitation, measures should be introduced to limit the expenditure of effort over a period, in such a way that the men in a hot working would not be required to expend more energy than those elsewhere. In view of the difficulty of calculating the energy needed to perform any given job, it was proposed to take the completion of a normal shift in a normal atmosphere as representing a reasonable burden of fatigue for a normal worker, and in determining the length of the shift to multiply the time spent in a hot atmosphere by a factor allowing for the extra fatigue involved: thus an hour spent in a hot atmosphere would be taken as equalling an agreed longer period in a normal atmosphere.

It is of course a fact that, even where everything is done to eliminate danger, work in hot atmospheres is liable to be more arduous than work at normal temperatures. This is, however, not properly speaking a safety problem, and the question of higher pay for additional fatigue involving no risk either to safety or to health would be a matter for collective bargaining.

9) There could be various possible ways of restricting the amount of effort required of men employed in hot workings.

a) Thus, piece work could be barred, either in all workings rated as "hot" or beyond an intermediate temperature between the lower ceiling (necessitating special precautions) and the absolute ceiling (necessitating discontinuance of operations); the prohibition could apply to piece work of all kinds or simply to individual work at piece rates.

b) Piece work could, while not barred altogether, be made subject to special rules applying only in the case of hot workings. Thus, the piece rates payable for work there could be increased to enable the worker to earn the same amounts as his opposite numbers in normal workings for less effort: this would however, involve some risk, inasmuch as the extra pay might tempt the men to intensify their exertions.

Alternative possibilities would be to restrict the amount of work actually to be done (e.g. by giving instructions that the tonnage to be extracted during the shift in a hot working must not exceed a specified amount), or to fix a ceiling to the total wages per day a man can earn at piece rates in a hot working; the example was quoted of rules in the German iron and steel industry whereby earnings at piece rates may not exceed a standard sum by more than 10%.

In coalfields where there are committees of workers' and employers' representatives whose terms of reference cover piece work, these could see to it that the piece-work arrangements, especially in hot workings, are such as not to make for overstrain, and in fact where possible to prevent it.

The Working Party also noted the potential value of scientific work organization methods in this connection. These do provide for breaks proportionate to the difficulty of the job and the environmental conditions, and properly applied should therefore serve to prevent overstrain.

10) It should be added that these measures to limit working hours and/or expenditure of energy need not all be instituted as from the same temperature. Obviously, appropriate medical tests should be carried out before the atmospheric conditions start to affect a constitution reacting normally to heat, so that all workers having poor reactions in this respect can be weeded out beforehand. The precautionary measures could thereafter become stricter and stricter up to the ceiling temperature beyond which localities would be barred to human occupation.

11) Two special problems were also brought up in the course of the discussions.

a) An effective temperature may represent any number of different dry temperatures, according to the degree of humidity of the atmosphere. It may therefore be asked whether, in addition to the ceiling effective temperature beyond which workings must be evacuated, a ceiling dry temperature ought not also to be fixed above which the same would apply, irrespective of the effective temperature. In a high dry temperature the worker's thermal equilibrium can be preserved by free perspiration, but this necessitates drinking large amounts, which involves an additional strain on the heart.

Experience elsewhere, however, more particularly in the potassium mines, suggests that work is possible at dry temperatures seldom found in coalmines.

b) The question was also raised whether special precautions ought not to be taken with regard to juveniles and middle-aged workers.

In the case of juveniles, the danger is not so much that the work will be too much for them as that it will stunt their growth. However, it was pointed out that all the Community countries already have a whole series of safeguards for juvenile workers - in many cases not only laws and regulations concerning their working conditions, but also contractual provisions prohibiting the employment of persons under a specified age on piece work. It was further noted that to require juveniles to be actually barred from employment in hot workings might mean that they could not go up for their hewer's examination until they were older, and indeed might substantially restrict the possibility of employing them at all. In any case, the special medical checks for all workers to be assigned to hot workings would enable the appropriate action to be taken in each individual case.

Similarly, while after middle age workers are undoubtedly likely to be less suited for work at high temperatures, it is felt best that the colliery medical service should be responsible for deciding case by case which men should be excluded.

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PART TWO

DEVELOPMENTS IN THE FIELD OF MINE SAFETY IN THE COMMUNITY COUNTRIES

POSITION REGARDING IMPLEMENTATION OF THE CONFERENCE'S RECOMMENDATIONS

PART TWO

DEVELOPMENTS IN THE FIELD OF MINE SAFETY IN THE COMMUNITY COUNTRIES; POSITION REGARDING IMPLEMENTATION OF THE CONFERENCE'S RECOMMENDATIONS

On pp. 117 ff. of its First Report, the Commission set forth the provisional position as to the steps taken by the different Governments up to November 1, 1958, to implement the recommendations of the Conference.

The tables on pp. 146-170 of this Report enable a comparison to be made between the situation as at November 1, 1958, and that reached by December 31, 1960.

The indications in the column headed "31.12.60" represent action taken since November 1, 1958, in respect both of technical aspects and of human factors. Those in the column headed "1.11.58" which have remained unchanged have not been transferred to the 1960 column.

By comparing the position as at November 1, 1958, and December 31, 1960, respectively, we are able to see what progress has been made during the period under review; it must be borne in mind, of course, that in adapting and remodelling mine safety regulations experience has shown it to be necessary to dispose of numerous problems and in many cases to overcome special difficulties.

x

x x

The abbreviations used in the tables are as follows.

C = National regulations already in conformity with the Conference's Resolution.

NRC = New regulations in conformity with the Conference's Resolution have been drawn up and promulgated.

NRP = New regulations in conformity with the Conference's Resolution are in preparation.

E = Question as to whether new regulations should be drawn up is under examination.

RB = Conference's Resolution has been referred back to the Commission for reconsideration.

N = Competent authorities in the country concerned have decided not to bring their regulations into line with the Conference's Resolution.

? = Final decision still uncertain.

C' = Recommendation not embodied in regulations but already in force in practice. (This abbreviation is used for the first time)

As will be recalled, the Governments, meeting in the Special Council of Ministers on March 15 and April 15, 1957, divided the Conference's recommendations into four categories, viz.

1. Propcsals which the Governments will take immediate steps to have put into effect in full;
2. Proposals which the Governments will take immediate steps to have put into effect with minor amendments or with an intervening period of grace;
3. Proposals which the Governments will adopt in substance;
4. Proposals which the Governments consider to require closer examination.

A recapitulation of the Conference recommendations now ratified by the laws or regulations of the member countries must thus include

- those already shown as such in the column giving the position as at November 1, 1958,
- those indicated in the column for December 31, 1960,

together with those given under the latter date as being applied in practice though not figuring specifically in regulations.

Action therefore remains to be taken only in respect of those recommendations regarding which either new regulations are in preparation, examination is still in progress or no decision can as yet be announced.

Finally, in a very small number of cases, the competent national authorities have decided against implementing the recommendations in question. These cases are duly shown in the tables.

In order to give a definitive picture of the present position, so that in future it will be necessary only to list changes taking place in relation to it, we have felt it best to summarize the content of those recommendations which at December 31, 1960, had not, in one or more member countries, been embodied either in laws, in regulations or in mining practice.

All recommendations not included in the following summary are therefore to be regarded as having been implemented de jure or de facto in all the member countries.

I.- FEDERAL REPUBLIC OF GERMANY, LAND NORTH RHINE/WESTPHALIA

A.- RECOMMENDATIONS ON TECHNICAL ASPECTS

In 5 cases the question as to whether new regulations should be drawn up is still under examination (E); in 7 cases the present arrangements are in part already in line with the Conference's recommendations while as regards the remainder the recommendations are still under examination (CE).

In 3 cases the competent authorities have decided not to alter their existing regulations (N), and in 2 cases they are prepared to alter them in part (CN).

In 1 case only is the outcome still in doubt (?).

Recommendations rated E

1) IV, A, 4 (Conference Report p. 31)

Compressed-air ejectors

- Compressed-air ejectors in use underground to be placed in appropriate ducts; minimum length of duct between ejector and discharge point to be fixed; whole apparatus to be properly earthed.

2) IV, B, 6 (Conference Report p. 39)

Minimum air quantity per independent ventilating district

- To be based not only on the number of workers in attendance, but also allowing for other factors such as the tonnage worked, amount of firedamp emitted, and atmospheric conditions.

3) VII, B, 3, 2, a (Conference Report p. 54)

Prevention of fires in shafts

- In all shafts, and particularly in downcast shafts, all wood linings and other wooden equipment, especially in ladderway partitions, portal headpieces over landings, etc., to be replaced without delay by fire-resisting material.

4) IX, A, 17-M (Conference Report p. 74)

Locomotive haulage (improvement of visibility and protection of driver)

- New locomotives to have fixed covered cabs; locomotives already in use to be converted to conform with this requirement; the competent authorities to have the right to exempt certain types of locomotive. (See also p. 20 of the Commission's First Report.)

5) IX, B, 30-M (Conference Report p. 81)

Restriction of use of flammable oils

- Use of flammable oils below ground for mechanical transmission purposes to be avoided.

Recommendations rated N

1) IV, A, 5 (Conference Report p. 32)

Clearing-out of compressed-air mains

- Compressed-air valve to be opened very gradually; air jet not to be directed towards those points where firedamp is most likely to be present; care to be taken to make sure that there is no accumulation of firedamp in the area immediately in front of the end of the air pipe.

2) V, B, 5, b (Conference Report p. 47)

General neutralization

- Minimum percentage of incombustible matter in dust to be fixed in proportion to amount of firedamp present.

3) VIII, A, 7-E, last two words of first sentence (Conference Report p. 63)

Restriction of use of flammable oils

- "Should it be necessary for technical reasons to use flammable oil, the amount should be kept to a minimum, and effective precautions taken to prevent any risk of fire from "oil leakages".

Recommendation rated ?

- IX, A, 20-M, second paragraph (Conference Report p. 76)

Locomotive haulage

- New locomotives and other vehicles to be fitted with devices which will ensure that they can be set and kept in motion only when the driver is at his post.

B.- RECOMMENDATIONS CONCERNING SAFETY REGULATIONS, SAFETY SUPERVISION AND THE WORKER'S PART IN SAFETY

In 3 cases the competent authorities have decided not to alter their existing regulations (N)

1) I, G, first paragraph (Conference Report p. 84)

Safety departments in enterprises

- Specialist staff, administratively independent of the safety department, to be assigned to inquire into certain matters of particular importance in connection with safety; their activities to be conducted in close co-operation with the safety department.

2) II, A, 2, third sentence (Conference Report p. 92)

Position of Mines Inspectorate personnel

- Such personnel to be required to work in the Mines Inspectorate for a stated minimum period, and to engage full-time on their inspection duties.

3) IV, 3, B (Conference Report p. 97)

Disciplinary action in the event of breaches of safety regulations

- Indispensable, but, in the Conference's view, not the most effective method of improving safety. Improvement possible by means of careful study of working methods, proper training of personnel and full co-operation by all concerned in creating safety-mindedness. Also useful: system of bonuses for personnel in sections with a largely accident-free record.

One recommendation is under examination (E).

Recommendation rated ?

II, D, 1 (Conference Report p. 90)

Councils and Committees assisting the Minister responsible for the mines

- Desirable that these should include employer's and workers' representatives.

C.- RECOMMENDATIONS CONCERNING HUMAN FACTORS

In 6 cases the competent authorities have decided not to bring their regulations into line with the Conference's recommendations, and in 1 case to do so only in part (N). In only 1 case is the question of drawing up fresh regulations still partly under examination (CE).

The recommendations regarding medical and psychological examination and supervision have so far been studied only from the medical angle; changes with regard to the psychological side will be considered only when the Working Party on Psychological and Sociological Factors has completed its assignment. This is also the position in most of the other member countries.

Recommendations rated N

1) III, 9 (Conference Report p. 103)

Practical reception methods: organization

- "Assembly centres" to be established where large-scale recruitment is being carried on in countries having a manpower surplus, such centres to be responsible for giving material and moral assistance, medical fitness tests and a certain amount of guidance as to the job and general living and working conditions awaiting the men on reaching their destination.

2) V, 2 (Conference Report p. 110)

Methods of observing and assessing individual miners at work

- All those concerned with safety (managerial and supervisory staff, medical officers, psychologists, safety engineers, etc.) to be associated with employment of special work-study methods (time and motion study, job analysis, job evaluation, etc.).

3) VI, 12, last sentence (Conference Report p.115)

Intensified training of adults: specialization of instructors

- Instructors to be full-time specialists and to have nothing to do with the production side.

4) - 5) VIII, 10, c/d (Conference Report p. 123)

Problems in connection with foreign workers

- So far as possible, instructors training foreign workers to have an adequate knowledge of the latter's language as well as of the language of the country of employment; every team to include at least one worker with an adequate knowledge of both languages.

6) IX, 5 (Conference Report p. 125)

Method of payment of supervisory staff

- Pay of supervisory staff to be so fixed as to enable them to bear their full share of responsibility regarding safety without suffering any disadvantage in regard to their wages.

II.- FEDERAL REPUBLIC OF GERMANY, SAAR

A.- RECOMMENDATIONS ON TECHNICAL ASPECTS

17 recommendations are still under study, 2 of them in part only.

In 2 cases it has been decided not to accept part of the change recommended.

Recommendations rated E

1) II,2-S,b, second sentence (Conf. Rep. p. 14)

Use of millisecond detonators in gassy or dusty workings

- Period of delay between two shots liable to affect one another not to exceed three intervals of delay.

2) II,6-S,a, third sentence (Conf. Rep. p. 15)

Shotfirers

- On completion of training, shotfirers to be issued with a certificate valid for a defined period only.

3) IV,A,3, third, fifth and sixth paragraphs (Conf. Rep. p. 29)

Abandoned workings in gassy mines

- All stoppings to be fitted with piping to enable gases behind the stoppings to be sampled; the construction of any stopping to be notified to the competent authority and its position marked on the mine plan; stoppings to be opened only with the consent of the competent authority.

4) IV,B,6 (Conf. Rep. p. 39)

Minimum air quantity

- Minimum air quantity per ventilating district to be based not only on the number of workers in attendance, but also allowing for other factors such as the tonnage worked, amount of firedamp emitted, and atmospheric conditions.

5) V,5,b, (Conf. Rep. p. 48)

General neutralization

- Minimum percentage of incombustible matter in dust to be fixed in proportion to amount of firedamp present.

6) VI,2 (Conf. Rep. p. 50)

Construction of flame safety lamps

- Flame safety lamps to be fitted with devices to prevent opening by unauthorized persons; if equipped with a relighting device, this to be of a perfectly safe type.

7) VII,4 (Conf. Rep. p. 55)

Prevention of fires in the neighbourhood of shafts

- Fireproofing to be effected of all landings of shafts, all roadways leading up to them over a distance of at least 75 metres from centre of shaft, and connecting roads between two shafts and doors in these roads.

8) - 9) VII,5,a/e (Conf. Rep. p. 56)

Prevention of fires in workings

- Fireproof supports to be introduced during the drivage, overhaul and repair of main stonedrifts used for ventilating purposes, and particularly in the main intake airways; brakes to be fitted with flameproof wide-rimmed brake-drums, fireproof brake-bands and fireproof brake-linings.

10) VIII, 7-E (Conf. Rep. pag. 63)

Restriction of use of flammable oils

- Amounts of flammable oil employed to be kept to a minimum; effective precautions to be taken to prevent any risk of fire from oil leakages; roof linings, support and lagging to be fireproof; automatic indicators to be provided showing temperature of oil and emission of decomposed gases; catch-drains, collecting sumps and fire-extinguishing devices to be provided.

11) IX,17-M (Conf. Rep. p. 74)

Locomotive haulage (improvement of visibility and protection of driver)

- New locomotives to have fixed covered cabs; locomotives already in use to be converted to conform with this requirement; the competent authorities to have the right to exempt certain types of locomotive.

12) - 15) IX,20-M, second paragraph, 21-M, 22-M, a/b (Conf. Rep. pp. 76-77)

Locomotive haulage

- New locomotives and other vehicles to be fitted with devices which will ensure that they can be set and kept in motion only when the driver is at his post; points and ventilation doors to be operable from the locomotive; and ventilation doors to be fitted with a contrivance which will give warning of the approach of the locomotive before they open; single-track haulage roads, roadway crossings and roadway junctions, and approaches to stations, to be provided with visual signals; reflector-type markers to be used to draw attention to obstructions or to work in progress along the track.

16) IX,28-M (Conf. Rep. p. 80)

Man-winding in staple-pits

- All staple-pits to be provided with man-winding apparatus, and man-winding in such pits to be subject to prior authorization.

17) IX,30-M (Conf. Rep. p. 81)

Restriction of use of flammable oils

- Use of flammable oils below ground for mechanical transmission purposes to be avoided.
  (See also p. 116 above).

B. - RECOMMENDATIONS CONCERNING SAFETY REGULATIONS, SAFETY SUPERVISION AND WORKERS' PART

5 recommendations under this head are still under examination, 2 are partly so, 1 is not to be adopted, and 3 remain in doubt.

Recommendations rated E

1) - 2) I,B,1/2 (Conf. Rep. p. 82)

Safety departments in enterprises

- An Act or Regulation to exist making it compulsory for every enterprise to have at least one safety department; minimum requirements to be laid down as to that department's duties and functions, its general organization, and the qualifications and abilities needed by its staff.

3) I,F, second paragraph (Conf. Rep. p. 84)

Powers of safety department

- Safety department to have the right to decide on the action to be taken in the event of imminent danger, provided it notifies the management later

4) II,A,1 (Conf. Rep. p. 91)

Number of inspection officials

- If necessary, number of inspection appointments to be increased, in order to enable more inspections to be carried out.

5) III,C (Conf. Rep. p. 95)

Participation by foreign workers in safety inspection

- Foreign workers to be allowed to participate in safety inspection on the same terms as nationals of the country concerned.

Recommendation rated N

II,A,2, third sentence (Conf. Rep. p. 92)

Position of Mines Inspectorate personnel

- Such personnel to be required to work in the Mines Inspectorate for a specified minimum period, and to engage full-time on their inspection duties.

Recommendations rated ?

1) II,D,1 (Conf. Rep. p. 90)

Councils and Committees assisting the Minister responsible for the mines

- Desirable that these should include employers' and workers' representatives.

2) - 3) III,B,1/2 (Conf. Rep. pp. 94-95)

Effective participation by workers in safety inspection

- Workers' delegates engaged on safety inspection to be available in sufficient numbers, to possess adequate knowledge of mining conditions and regulations, and to have the full confidence of their fellow-workers.
- Such delegates, moreover, to work solely and wholly on safety inspection, to be independent vis-à-vis the enterprise inspected, to be given thorough training and regular refresher courses, and to be paid the same rates as operational underground workers with the same qualifications; the Mines Inspectorate to see to it that these conditions are fulfilled.

C.- RECOMMENDATIONS CONCERNING HUMAN FACTORS

18 recommendations are still under examination (7 of these in part only); 1 has been decided against in part; in 2 cases the position is in doubt.

Recommendations rated E

1) III,8 (Conf. Rep. p. 103)

Reception of new entrants

- Reception services to be organized, on the employers' responsibility and in co-operation with the trade unions; every enterprise to have a reception department; this deparment to work in co-operation with the welfare services and with the training department.

2) - 3) III,10/11 (Conf. Rep. pp. 103-104)

Practical reception methods: organization

- Reception centres in country of employment; reception departments in enterprise.

4) - 5) III,12/13 (Conf. Rep. pp. 104-105)

Practical reception methods: facilities

- Newcomers to be enabled to acquaint themselves with the set-up and working of the enterprise; action to be taken to dispose of language difficulties and to facilitate adjustment of the men to their new living and working conditions and environment.
- Newcomers to be given every assistance in adapting themselves to work at the colliery (by the reception department, the welfare services and their own superiors and fellow-workers).

6) IV,1, first paragraph (Conf. Rep. p. 106)

Medical and psychological examination and supervizion: General Recommendation

- Measures concerning medical and psychological examination and supervision of workers to be introduced generally.

7) IV,1 fifth paragraph, first few words (Conf. Rep. p. 106)

- Workers to be given medical and psychological check-ups at regular intervals.

8) IV,8 (Conf. Rep. p. 108)

Aims and objects of medical and psychological supervision

- To be conducted throughout the worker's career, in order to make sure that he is at all times fit for his job from the safety point of view.

9) IV,10, first two sentences (Conf. Rep. p. 108)

Practical methods of medical and psychological supervision

- Periodic re-examination of all adult personnel; especially frequent and systematic checks on those employed on strenuous, dangerous or unhealthy work and on any men of weakly constitution; also re-examination prior to any transfer or promotion.

10) VI,24 (Conf. Rep. p. 118)

Training of instructors

- Instructor training centre to be established.

11) VI,25 (Conf. Rep. p. 118)

Participation by workers' organization in training

- The trade unions to be associated with the organization of vocational training.

Recommendations rated ?

1) III,7 (Conf. Rep. p. 102)

Reception arrangements: responsibility

- In the case of collective recruitment, responsibility for the reception organizations set up in the country of recruitment to be shared between the local or national authorities and the employers; workers preferably also to be associated.

2) III,9 (Conf. Rep. p. 103)

Practical reception methods: organization

- "Assembly centres" to be established where large-scale recruitment is being carried on in countries having a manpower surplus, such centres to be responsible for giving material and moral assistance, medical fitness tests and a certain amount of guidance as to guidance as to the job and general living and working conditions awaiting the men on reaching their destination.

III.- BELGIUM

A.- RECOMMANDATIONS ON TECHNICAL ASPECTS

39 recommendations are still under examination (E). In 1 case the existing regulations are already partly in line with the corresponding recommendation (CE). In 1 case the competent authority is not prepared to amend its present regulations on the subject (N). In 3 cases the issue is still in doubt (?).

Recommendations rated E

1) II,4-S (Conf. Rep. p. 15)

Protection of personnel during shotfiring

Times for shotfiring to be chosen so that as few persons as possible are exposed to the danger of an explosion.

2) VI,1 (Conf. Rep. p. 50)

Use of flame safety lamps

Flame safety lamps to be issued only to men instructed in their use and employing them to detect the presence of firedamp or deficiency in oxygen.

3) VII,3,3,c (Conf. Rep. p. 54)

Prevention of fires in shafts

Electric cables with fireproof sheathing to be used in new shafts and in shafts being overhauled.

4) VII,6, first paragraph (Conf. Rep. p. 57)

Places where combustible or flammable materials accumulate

Places where transformers or circuit-breakers immersed in flammable oil are housed to be included under the above head within the meaning of Regulation 54,4 of the I.L.O. Model Code.

5) - 12) IX,1-M,a/b/c/d/e,2-M, both paragraphs (Conf. Rep. pp. 67-69)

Man-winding : signalling systems in shafts

Electric signalling devices to be installed in all main shafts and in all staple-pits where man-winding is carried on regularly on a considerable scale, and also, as far as possible, in shafts where this is not the case; the signalling system to be so designed that it is impossible to give the "O.K." signal at the same time from two or more landings; new electric signalling systems in shafts to be provided with a continuously-operating recording or indicating instrument for the testing of insulation; electric signalling systems connected with intermediate landings to be provided with an emergency alarm device; existing electric and mechanical signalling systems to be supplemented as far as possible by telephone installations.

- Where two or more floors at a single landing are used simultaneously in man-winding, the signalling devices at the main loading point to be automatically locked; this requirement not, however, to apply regarding departure signals, in which case the signalling devices for each floor must be included in the general signalling system

13) - 14) IX, 6-M, 7-M (Conf. Rep. p. 70)

Winding ropes

- Ropes with galvanized wires to be used in staple-pits and upcast shafts with a high relative moisture content, and in wet shafts.
- Fixed working platforms in shafts to be assessed for maximum load plus an adequate safety margin before they are installed; the material employed, especially timber, to be examined periodically for quality and safety.

15) - 16) IX, 8-M, 9-M (Conf. Rep. p. 71)

Conveyors

- Man-riding on armoured or similar conveyors to be prohibited.
- Contrivances to be developed enabling conveyors to be stopped from any point alongside; conveyors not yet fitted with these to be at any rate so installed that they can be stopped at any time by a signal.

17) - 19) IX, 11-M, 12-M, 14-M, a (Conf. Rep. pp. 71-72)

Internal-combustion engines below ground

- Fixed internal-combustion engines to be prohibited in underground workings; movable engines to be Diesel only.
- Where Diesel fuel is used in locomotives and vehicles not running on rails, precautions to be taken to ensure that no fuel is spilled during filling; in the case of larger quantities of fuel, filling to be carried out only on special fireproof premises.
- Exhaust gases to be checked regularly to keep them below the danger level.

20) - 21) IX, 15-M, 16-M (Conf. Rep. pp. 73-74)

Travelling below ground

- Loading-points and crossings, and points where mine-cars are constantly being moved about during coaling operations to be bridged over to ensure safe crossing.
- Every effort to be made to ensure that a travelling road is at all times left along the face.

22) - 23) IX, 17-M, 18-M, b/c, 19-M, 20-M, 21-M, 22-M, a/b, 23-M, a/c, 24-M, a/b (Conf. Rep. pp. 74-79)

Locomotive haulage

New locomotives to have fixed covered cabs; locomotives already in use to be converted to conform with this requirement; the competent authorities to have the right to exempt certain types of locomotive. (See also p. 20 of the Commission's First Report).

- Maximum load haulable by any one locomotive to be so fixed that the braking distance with a mean coefficient of friction of 0.17 does not exceed a given length.
- Locomotives to be equipped for travel in either direction with electric headlights which can be dipped.
- All locomotives to be fitted with sandboxes which will operate when travelling in either direction.
- All locomotives to be fitted with devices ensuring that they cannot be set in motion, by any unauthorized person; new locomotives to be fitted with devices ensuring that they can be set and kept in motion only when the driver is at his post.
- Points and ventilation doors to be operable from the locomotive; ventilation doors to be fitted with a contrivance which will give warning of the approach of the locomotive before they open.
- Single-track haulage roads, crossings and roadway junctions, and approaches to stations, to be provided with visual signals.
- Reflector-type markers to be used to draw attention to obstructions or to work in progress along the track.
- Minimum height of trolley wire in new levels to be fixed at 2.50 metres above the top of the rails in the case of installations of over 280 V, and 2.20 metres in that of installations under 280 V.
- In gassy mines, no coal-winning to be performed within a specified protective zone (fixed in accordance with local conditions) on either side of

the trolley-locomotive track.

- Regular man-riding to be by means of minecars specially fitted out for the purpose; in trolley installations, man-riding cars to be covered over.
- Minecars used exclusively for man-riding to be constructed to prevent leaning out.

34) IX, 25-M (Conf. Rep. p. 79)

Authorization of man-riding

Man-riding on continuous conveyors in level or inclined roads to be permitted only subject to special rules laid down by the competent authority.

35) IX, 26-M (Conf. Rep. p. 80)

Haulage of materials on continuous conveyors

To be subject to special rules.

36) IX, 27-M (Conf. Rep. p. 80)

Precautions at loading-points and landings

Care to be taken in planning and construction to ensure that the men working at these points are not endangered by the loading, haulage and winding operations.

37) IX, 28-M (Conf. Rep. p. 80)

Man-winding in staple-pits

All staple-pits to be provided with man-winding apparatus, and man-winding in such pits to be subject to prior authorization.

38) IX, 29-M (Conf. Rep. p. 80)

Testing of guides in main shafts

Guides to be examined at regular intervals with appropriate testing apparatus.

39) IX, 30-M (Conf. Rep. p. 81)

Restriction of use of flammable oils

Use of flammable oils below ground for mechanical transmission purposes to be avoided.

Recommandation rated N

VII, 1, 3 (Conf. Rep. p. 52)

Prevention of underground combustion

Retreating working to be employed, for preference, in pits or districts subject to spontaneous combustion.

Recommendations rated?

1) II, 9-S (Conf. Rep. p. 17)

Method of payment of shotfirers

To be fixed with due regard for their position of responsibility.

2) V, 6, b, (Conf. Rep. p. 49)

Stone-dust barriers

The competent authority to fix the maximum number of men to be employed in any one "isolated section".

3) IX, 3-M (Conf. Rep. p. 69)

Man-winding installations in shafts

Shafts equipped with electric signalling systems and used regularly for man-winding purposes to be provided with a device serving to lock the winding-engine brake so long as any one of the shaft gates is open.

B. RECOMMENDATIONS CONCERNING SAFETY REGULATIONS, SAFETY SUPERVISION AND WORKERS' PART IN SAFETY

In 9 cases examination continues; in 6 it has been decided not to issue revised regulations.

Recommendations rated E

1) - 2) I, 1-D, 1/2 (Conf. Rep. p. 83)

Safety departments in enterprises

Adequate number of safety personnel, to be employed full time on safety duties; rank and pay of safety personnel.

3) I, 2, A, 2, (Conf. Rep. p. 87)

Organization of safety supervision in enterprises

Every member of the managerial and supervisory staff employed on safety duties to possess the appropriate qualifications as recognized by the competent authority.

4) - 5) II, B, third and fourth paragraphs (Conf. Rep. p. 89)

Exemptions from safety regulations

The employers to be consulted regarding any exemptions; workers' representatives within the enterprise to be notified of exemptions granted.

6) II, A, 1 (Conf. Rep. p. 91)

Number of inspection officials

If necessary, number of inspection appointments to be increased, in order to enable more inspections to be carried out.

7) - 8) II, A, 2 (Conf. Rep. p. 91)

Position of Mines Inspectorate personnel

Mines Inspectorate personnel to have a proper standing, and to be required to work in the Inspectorate for a specified minimum period and to engage full-time on their inspection duties.

9) II, A, 3 (Conf. Rep. p. 92)

Refresher training for inspectors'assistants and workers' safety delegates

Regular refresher courses to be organized by the Mines Inspectorate.

Recommendations rated N

1) I, C, second paragraph (Conf. Rep. p. 83)

Safety departments in enterprises

The colliery manager to consult the workers' representatives in connection with the appointment of the officers and personnel of the safety department.

2) I, G (Conf. Rep. p. 84)

Specialist safety supervisors

Specialist staff from outside the safety department to be appointed to deal with certain aspects of safety; their activities to be conducted in close co-operation with the safety department.

3) - 4) II, A, 1, second and third paragraphs (Conf. Rep. p. 88)

Organization of inspection arrangements

Safety, health and technical inspection to be carried out by one and the same inspection service, whose members must have all the qualifications required for this purpose; the departments responsible for studying the inspection reports and taking the necessary action to be answerable only to the Minister responsible for the mines.

5) II, A, 2 (Conf. Rep. p. 89)

Delegation of authority

Any delegation of authority concerning safety in mines by the Minister to be to the Mines Inspectorate only; the Inspectorate to inform the national, regional or local authorities of action taken in virtue thereof.

6) IV, 3, A, 1, (Conf. Rep. p. 97)

Disciplinary action in the event of breaches of safety regulations

Appropriate penalties to be imposed in the case of prosecutions requested by the Mines Inspectorate following particularly flagrant and clearly proven offences definitely affecting general safety.

C. RECOMMENDATIONS CONCERNING HUMAN FACTORS

In 12 cases the Conference's recommendations are still under examination (E), in 5 the existing regulations are already partially in line with the corresponding recommendations (CE); in 2 it is not yet known what the decision will be (?).

The great majority of the recommendations under this head are rated C', i.e. while not specifically embodied in regulations they are already observed in practice.

Recommendations rated E

1) IV, 3 (Conf. Rep. p. 107)

Aims and objects of medical and psychological examination

Pre-entry examination to include the use of applied psychology with the object of ascertaining the character and mental abilities of the subject.

2) - 3) IV, 6-7 (Conf. Rep. pp. 107-108)

Medical and psychological services

Medical examinations to be carried out by qualified medical practitioners experienced in industrial medicine in collieries; psychological examination to be carried out by experienced psychologists with adequate knowlegde of the structure of the enterprise, the environment and the working conditions.

The medical practitioners and psychologists concerned to have full professional independence and full responsibility in the performance of their duties; specialists to be called in doubtful cases; the employer to retain full responsibility as to whether or not he engages an applicant on the basis of the fitness grading given.

4) - 6) IV, 9; IV,10, first and second sentences; IV,10, third sentence (Conf. Rep. pp. 108-109)

Practical methods of medical and psychological supervision

Juvenile workers to undergo examination at least once a year, the object being to watch their physical development and assess their adaptability to working conditions in the pit.

Periodic re-examination of all adult personnel; especially frequent and systematic checks on those employed on strenuous, dangerous or unhealthy work and on any men of weakly constitution; re-examination prior to any transfer or promotion.

Should any contra-indications be found, the worker to be given more suitable work at the same colliery.

7) - 8) V, 2-3 (Conf. Rep. p. 110)

Methods of observing and assessing individual miners at work

All those concerned with safety (managerial and supervisory staff, medical officers, psychologists, safety engineers, etc.) to be associated with the employment of special work-study methods (time and motion study, job analysis, job evaluation, etc.)

Attention of managerial and supervisory staff to be drawn to their responsibility for keeping a check on whether the men are properly placed in and adapted to their jobs; these officials to be accordingly permitted to make suggestions for the transfer of a particular man to a particular job, or for his being given further training.

9) X, 7 (Conf. Rep. p. 129)

Amount of work done

Reductions in working hours not to involve intensification of effort during the hours so reduced; methods of payment to be properly applied so as to allow of short rest periods.

10) X, 8 (Conf. Rep. p. 130)

Difficult and unhealthy working conditions

Allowance to be made in the fixing of working hours for extra fatigue due to the difficult or unhealthy character of certain workings, particularly those where the temperature is unusually high.

11) - 12) XI, 5-6 (Conf. Rep. pp. 131-132)

Special living and working conditions

- Efforts to be made to discourage heavy drinking; enterprise to make non-injurious beverages available for their personnel.
- Housing conditions for all miners to conform to certain standards as regards distance from the colliery, social amenities, allocation, etc; hostels to be provided for unmarried workers.

Recommendations rated?

1) IV, 1, first paragraph (Conf. Rep. p. 106)

Medical and psychological examination and supervision : General Recommendation

Measures concerning medical and psychological examination and supervision of workers to be introduced generally.

2) IV, 1, last part of fifth paragraph (Conf. Rep. p. 106)

Reassignment within the enterprise

Workers found unfit to perform their duties in a normal manner to be assigned to more suitable jobs at the same colliery.

IV. FRANCE

A. RECOMMENDATIONS ON TECHNICAL ASPECTS

In 7 cases recommendations are still under examination (E); in 14 the existing regulations were already partially in line with the corresponding recommandations (CE); in 2 the competent authority has decided not to make any changes in the regulations in force (N).

Recommendations rated E

1) I (Conf. Rep. p. 8)

General working plans

General long-term and short-term plans of operations to be drawn up, incorporating all details having a bearing on safety, and forwarded in advance to the competent authority; any amendments of importance to be similarly notified in good time.

2) II, 2-S, b (Conf. Rep. p. 13)

Use of instantaneous or millisecond detonators in coal and adjacent strata

Where used in gassy or dusty workings, number of stages to be kept to a minimum; period of delay between two shots liable to affect one another not to exceed three intervals of delay.

3) IV, B, 2 (Conf. Rep. p. 34)

Permissible number of men per separate ventilating district

The competent authority to specify a limit to the number of men working on the main shift in each separate ventilating district.

4) - 5) IX, 2-M, both paragraphs (Conf. Rep. pp. 68-69)

Man-winding

Where two or more floors at a single landing are used simultaneously in man-winding, the signalling devices at the main loading point to be automatically locked; this requirement not, however, to apply regarding synchronized signalling systems, in which case the signalling devices at each floor must be included in the system.

6) IX, 17-M (Conf. Rep. p. 74)

Locomotive haulage

New locomotives to have fixed covered cabs; locomotives already in use to be converted to conform with this requirement; the competent authority to have the right to exempt certain types of locomotive.

(See also p. 20 of the Commission's First Report.)

7) IX, 30-M (Conf. Rep. p. 81)

Restriction of use of flammable oils

Use of flammable oils below ground for mechanical transmission purposes to be avoided.

Recommendations rated N

1) IX, 23-M, a (Conf. Rep. p. 77)

Locomotive haulage

Minimum height of trolley wires in new levels to be fixed at 2.50 metres above the top of the rails in the case of installations of over 280 V, and 2.20 metres in that of installations under 280 V.

2) IX, 28-M (Conf. Rep. p. 80)

Man-winding in staple-pits

All staple-pits to be provided with man-winding apparatus, and man-winding in such pits to be subject to prior authorization.

B. RECOMMENDATIONS CONCERNING SAFETY REGULATIONS, SAFETY SUPERVISION AND WORKERS' PART IN SAFETY

7 recommendations are under examination (E), 14 are under examination but at the same time are in part already observed in practice (C'E).

Recommendations rated C'E

include :

I, A/B/C, third paragraph D/E/F/G/H/I, first paragraph Conf. Rep. pp. 82-85)

Safety departments in enterprises

- Enterprises to be obliged to organize safety departments; every colliery to have a member of the staff or a special department responsible for safety.
- Minimum requirements to be laid down concerning the duties and functions of the safety department.
- Colliery managers to ascertain from workers' representatives whether the safety personnel proposed are acceptable to the men.
- Numbers, rank and pay of safety personnel.
- Jurisdiction of safety department.
- Powers of safety department.
- Co-operation with specialist safety supervisors appointed from outside the department.
- Administrative position of safety department; powers of management.
- Exchanges of information among officials of safety departments of different collieries.

Recommendations rated E

1) - 3) I, C, first and second paragraphs/I, second paragraph (Conf. Rep. pp. 82-83/85)

Safety departments in enterprises

- Appointment of officers and personnel of safety departments; consultation of workers' representatives.

- Exchange of information at Community level.

4) A - 2, Conf. Rep. p. 87

Organization of safety supervision in enterprises

- Every member of the managerial or supervisory staff employed on safety duties to possess the appropriate qualifications as recognized by the competent authority.

5) B - Third paragraph Conf. Rep. p. 89

Exemptions from safety regulations

- The employers to be consulted regarding any exemptions.

6) - 7) A - 2 and C Conf. Rep. pp. 93/95

Participation by workers in safety inspection

- Study to be made whether it is desirable to arrange for workers to be associated with safety inspection through an appropriate representative body, or, where this is already the case, whether the arrangements in question conform with the principles laid down by the Conference.
- Foreign workers to be allowed to participate in safety inspection on the same terms as nationals of the country concerned.

C. - RECOMMENDATIONS CONCERNING HUMAN FACTORS

The competent authority has decided in a large number of cases not to embody the Conference's recommendations in specific regulations, but to see to it that they are applied in practice (C').

30 recommendations are still partially under examination (CE or C'E).

V.- ITALY

The President of the Italian Republic on April 9, 1959, promulgated Decree n° 128 (published in n° 87 of the Gazetta Ufficiale, April 11, 1959), providing for the coming into force on January 1,1960, of the new mines inspection regulations.

As was noted in the Commission's First Report (p. 115), these regulations, 693 in number, apply to all mining activities.

In most cases the Italian Governement has duly taken account of the Conference's recommendations, particularly as regards technical aspects and safety : these cases are denoted in the tables following by the abbreviation NRC.

Otherwise, the position is as follows :

A.- RECOMMENDATIONS ON TECHNICAL ASPECTS

2 recommendations are still under examination (E); 6 are not to be implemented (N); 5 are in doubt (?).

Recommendations rated E

1) VIII,8-E, first paragraph (Conf. Rep. p. 64)

Restriction of use of flammable oils

- Oil-filled electrical equipment not to be used either in coal-winning workings or in their immediate vicinity; where used in roadways, such equipement always to be fixed.

  (See also pp. 4-8 of the Commission's First Report.)

2) IX,16-M (Conf. Rep. p. 74)

Traveling below ground

- Every effort to be made to ensure that a travelling road is at all times left along the face.

Recommendations rated N

1) IV,A,4 (Conf. Rep. p. 31)

Compressed-air ejectors

- Compressed-air ejectors in use underground to be placed in appropriate ducts, minimum length of duct between ejector and discharge point to be fixed; whole apparatus to be properly earthed.

2) IV,B,4 (Conf. Rep. p. 36)

Firedamp drainage

- Systematic drainage of firedamp from adjacent strata to be carried out in in all mines where firedamp content exceeds the permitted maximum with normal methods of ventilation; this to be done by means of a network of special piping.

3) VII,1,3 (Conf. Rep. p. 52)

Prevention of underground combustion

- Retreating working to be employed, for preference, in pits or districts subject to spontaneous combustion.

4/5) VII,3,3,d/e (Conf. Rep. p. 54)

Prevention of fires in shafts

- In new shafts, and where possible in those being overhauled, gas-drainage pipes preferably to be sited in the upcast shafts, and care to be taken to see that electric cables are laid well away from compressed-air mains and gas-drainage pipes.

Recommendations rated ?

1) II,9-S (Conf. Rep. p. 17)

Method of payment of shotfirers

- To be fixed with due regard for their position of responsibility

2) III, 4-SC, second paragraph (Conf. Rep. p. 19)

Face supports

- Increasing use to be made in future of steel props of permanently uniform load bearing capacity.

3) III,14-SC (Conf. Rep. p. 22)

Gate-roads (Yielding supports)

- Supports in gate-roads to resist the general lowering of the rocks only to the point where it is still possible for the whole of the strata to lower together with the surrounding rocks, without bed separation.

4) LX,2-M, second paragraph (Conf. Rep. 69)

Signalling systems in shafts

- Signalling devices at different floors of a single landing to be included in general signalling system.

5) IX,21-M (Conf. Rep. p. 76)

Locomotive haulage

- Points and ventilation doors to be operable from the locomotive; ventilation doors to be fitted with a contrivance which will give warning of the approach of the locomotive before they open.

6) IX,30-M (Conf. Rep. 81)

Restriction of use of flammable oils

- Use of flammable oils below ground for mechanical transmission purposes to be avoided.

B.- RECOMMENDATIONS CONCERNING SAFETY REGULATIONS, SAFETY SUPERVISION AND WORKERS' PART IN SAFETY

In 2 cases the desirability of framing fresh regulations is still under exa- examination (E); in 9 it has been decided not to do so (N); in 2 the outcome is still in doubt (?).

Recommendations rated E

1) II,A,1 third paragraph (Conf. Rep. p. 88)

Organization of inspection arrangements

- Departments responsible for studying and acting on inspection reports to be answerable only to the Minister.

2) III,B,2 (Conf. Rep. p. 95)

Effective participation by workers in safety inspection

- Workers' delegates engaged on safety inspection to do this and nothing else, to be independent vis-à-vis the enterprise inspected, to be given thorough training and regular refresher courses, and to be paid the same rates as operational underground workers with the same qualifications; the Mines Inspectorate to see to it that these conditions are fulfilled.

Recommendations rated N

1/2) I,C, second and third paragraphs (Conf. Rep. p. 83)

Safety departments in enterprises

- The colliery manager to consult the workers' representatives in connection with the appointment of the officers and personnel of the safety department, and to ascertain from them whether the safety personnel proposed are acceptable to the men.

3) I,F second paragraph (Conf. Rep. p. 84)

Powers of the safety department

- Safety department to have the right to decide on the action to be taken in the event of imminent danger, provided it notifies the management later.

4) I,G (Conf. Rep. p. 84)

Specialist safety supervisors

- Specialist staff from outside the safety department to be appointed to deal with certain aspects of safety; their activities to be conducted in close co-operation with the safety department.

5) I,I,1, first paragraph (Conf. Rep. p. 85)

Exchanges of information

- To be organized among officials of safety departments of different collieries, the Mines Inspectorate to take part in such exchanges.

6) II,8, fourth paragraph (Conf. Rep. p. 89)

Exemptions from safety regulations

- Workers' representatives within the enterprise to be at any rate notified of any exemptions granted.

7) II,C, third paragraph (Conf. Rep. p. 90)

Consultation of workers

- Where an enterprise draws up special safety instructions of its own, the management must consult the safety committee on which the workers are represented.

8) III,C (Conf. Rep. p. 95)

Participation by foreign workers in safety inspection

- Foreign workers to be allowed to participate in safety inspection on the same terms as nationals of the country concerned.

9) IV,3,b (Conf. Rep. p. 97)

Disciplinary action in the event of breaches of safety regulations

- Indispensable, but, in the Conference's view, not the most effective method of improving safety. Improvement possible by means of careful study of working methods, proper training of personnel and full co-operation by all concerned in creating safety-mindedness. Also useful : system of bonuses forpersonnel in districts with a low accident rate.

Recommendations rated ?

1) - 2) I,D,2; I,I, second paragraph (Conf. Rep. pp. 83/85)

Safety departments in enterprises

- Rank and pay of safety personnel; Community-level exchanges of information among safety departments.

3) II,A,3 (Conf. Rep. p. 92)

Refrescher training for inspectors' assistants and workers' safety delegates

- Regular refresher courses to be organized by the Mines Inspectorate.

C.- RECOMMENDATIONS CONCERNING HUMAN FACTORS

Since the Italian authorities had first of all to concentrate on the Conference's technical and safety recommendations, in connection with the remodelling of the mines inspection regulations, they have not yet completed their examination of 40 of the recommendations on human factors (E); in 8 further cases a negative decision has been taken (N); in 1 the position is not yet clear (?).

Recommendations rated E

1)-2) III,10/11 (Conf. Rep. pp. 103-104)

Practical reception methods : organization

- Reception centres in country of employment; reception departments in enterprises.

3)-6) IV,1, first paragraph, second, third and fourth paragraphs / first part of fifth paragraph / second part of fifth paragraph (Conf. Rep. p. 106)

Medical and psycological examination and supervision

- Measures concerning medical and psychological examination and supervision to be introduced generally.
- Medical examination of mineworkers prior to their engagement and to any important change of job to be made compulsory, such examination to be supplemented if necessary by a psychotechnical examination before appointment to certain special jobs; the medical examination to be carried out by a specially-appointed doctor possessing the requisite qualifications and working entirely on his own responsibility and in complete independence; the Governments to encourage the establishment and extension of colliery medical services.
- Medical, and if necessary psychotechnical, supervision to be carried out regularly and systematically.
- Workers found unfit to perform their duties in a normal manner to be assigned to more suitable jobs at the same colliery.

7)-8) V,2/3 (Conf. Rep. p. 110)

Methods of observing and assessing individual miners at work

- All those concerned with safety (managerial and supervisory staff, medical officers, psychologists, safety engineers, etc.) to be associated with the employment of special work-study methods (time and motion study, job analysis, job evaluation, etc.).
- Attention of managerial and supervisory staff to be drawn to their responsibility for keeping a check on whether the men are properly placed in and adapted to their jobs; these officials to be accordingly permitted to make suggestions for the transfer of a particular man to a particular job, or for his being given further training.

9)-10) VI,1; VI,2, second paragraph (Conf. Rep. p. 112)

Aims and objects of vocational training

- Each individual worker to be given training appropriate to the job assigned him; all vocational-training schemes to take due account of safety requirements.

11)-14) VI,4 (Conf. Rep. p. 113)

Training requirements

- Training to be systematic and carefully planned; instructors to be specially-trained men paid to teach and only to teach, and having no connection with the production side; instructional facilities and equipment to be such as will make it possible to provide instruction in progressive stages; systems and methods of vocational training to be based, in particular, on the general principles set forth in Resolutions Nos. 13 and 46 adopted by the Coal Mines Committee of the International Labour Organization at its Second and Sixth Sessions.

15)-16) VI,8/9 (Conf. Rep. p. 114)

Full systematic training of juveniles (apprenticeship)

- Systematic training to be provided in specialized apprenticeship centres for a minimum period; every colliery to have an apprenticeship centre giving approximately three years' training and issuing a proficiency certificate on completion of this; boys having completed their apprenticeship to be formed into groups from time to time to undergo further training.

17) VI,10 (Conf. Rep. p. 114)

Shortened training for juveniles

- Boys who for any reason connot be sent to an apprenticeship centre to be given systematic training, including theoretical instruction at the surface and practical instruction at reserved training faces; a proficiency certificate to be issued on completion of this.

18)-23) VI,12, second sentence; VI,13/14/15/16 (Conf. Rep. pp. 115-116)

Intensified training of adults - specialist instructors

- Training to be given by instructors who are full-time specialists and not connected with the production side; every adult entrant to be given systematic training in accordance with a detailed three-stage programme drawn up in advance; a certificate of competency to be issued on completion of stage 2; where these arrangements have not yet been introduced, "worker-and-mate" system (with a senior worker initiating newcomers) to be used as a temporaty measure only; under this system, the skilled worker employed on the instruction of the newcomer not to be connected with the production side as regards his wages.

24)-25) VI,17, first paragraph/second and third paragraphs (Conf. Rep. p. 116)

Training of specialists

- "Workers-and-mate" training to be prohibited in the case of electricians, locomotif-drivers and all other personnel doing particularly responsible work.
- Shotfirers to be given systematic training carrying a certificate valid for a specified period only, the training having thereafter to be repeated at regular intervals; training and retraining ih shotfiring to be also provided for the supervisory staff immediately concerned.

26)-29) VI,18/19/20/21 (Conf. Rep. p. 117)

Training of supervisory staff

- A considerable proportion of the training ofsupervisory personnel to be aimed at ensuring that they are thoroughly familiar with the safety regulations and accident-prevention arrangements.
- Training and further training of supervisory personnel to aim at preparing them to take their full share of responsibility for leadership and safety.
- Appointments to the supervisory staff to be made only on completion of a special training course and receipt of a certificate of competency.
- Promotion to the higher grades of the supervisory staff to be preceded by special advanced training, given at training centres established for this purpose.

30)-32) VI,22/23/24 (Conf. Rep. p. 118)

Training of instructors

- Trainig to be provided only by staff trained in use of instructional methods suitable for teaching coalmining subjects.
- These staff to be given special training by highly-qualified teachers.
- Instructor training centre to be established.

33) VI,25 (Conf. Rep. p. 118)

Participation by workers' organizations

- The trade unions to be associated with the organization of vocational training.

34) VII,4 (Conf. Rep. p. 119)

Occupational diseases

- Complaints attributable to the effects of physical factors inherent in the environment to rank as occupational diseases.

35) IX,5 (Conf. Rep. p. 125)

Method of payment of supervisory staff

- Pay of supervisory staff to be so fixed as to enable them to bear their full share of responsibility regarding safety without suffering any disadvantage in regard to their wages.

36)-38) IX,9,a, first and second sentences; IX,9,d, second paragraph; IX,10; IX,11 (Conf. Rep. pp. 126-127)

Piece work

- Piece rates to be fixed allowing for the time taken up by the proper performance of safety duties.
- Where many foreign workers are employed on piece work, care to be taken that they are appropriately represented at any management/union discussions concerning piece rates.
- Training and rates of pay of supervisory staff to be specially fixed to allow for proper performance of safety duties; where one of the men is given special responsibilities for a team in regard to safety, the piece rates paid him to be adjusted so as to allow for the time spent by him on safety duties.
- Only fully trained men to be put on piece work.

39)-40) XI,5/6 (Conf. Rep. pp. 131-132)

Special living and working conditions

- Efforts to be made to discourage heavy drinking; enterprises to make non-injurious beverages available for their perssonnel.
- Housing conditions for all miners to conform to certain standards as regards distance from the colliery, social amenities, allocation, etc.; hostels to be provided for unmarried workers.

Recommendations rated N

1) III,12 (Conf. Rep. p. 104)

Practical reception methods : facilities

- Newcomers to be enabled to acquaint themselves with the workings of the enterprise; action to be taken to dispose of language difficulties and to facilitate adjustment to the new environment.

2)-8) VIII,9/10,a/b/c/d/f, (Conf. Rep. p. 123)

- Foreign workers to acquire an adequate knowledge of the language of the country of employment.
- Foreign workers to be given instruction in the language of the country of employment; an interpreter to be available on every shift on which foreign workers are employed; instructors training foreign workers to have an adequate knowledge of the latter's language; every team to include at least one worker with an adequate knowledge of both languages; enterprises to provide foreign workers with translations of the safety and operational rules and regulations; enterprises to provide foreign workers with translations of any other technical matter of value in connection with their further training.

Recommendation rated ?

III,7 (Conf. Rep. p. 102)

Reception arrangements : responsibility

- In collective recruitement, responsibility for the reception organizations set up in the country of recruitment to be shared between the local or national authorities and the employers; workers preferably also to be associated.

VI.- NETHERLANDS

As was noted in the Commission's First Report, a Committee has been working in the Netherlands since the end of 1955 on the remodelling of the mines inspection regulations. The Committee's instructions are to base itself on the classification adopted by the Netherlands Government, and to take due account of the recommendations of the Conference.

As the Committee is about to complete its work, the competent authorities feel that there is no particular point for the present in issuing or changing regulations piecemeal. In the meantime they have requested the enterprises to apply certain of the Conference's recommendations in practice forthwith, without waiting for the new regulations to come into force.

A.- RECOMMENDATIONS ON TECHNICAL ASPECTS

1 recommendation is still under examination in its entirety (E), and another in part (CE).

Recommendation rated E

IX,30-M (Conf. Rep. p. 81)

Restriction of use of flammable oils

- Use of flammable oils below ground for mechanical transmission purposes to be avoided.

B.- RECOMMENDATIONS CONCERNING SAFETY REGULATIONS, SAFETY SUPERVISION AND WORKERS' PART IN SAFETY

1 recommendation is still under examination (E); 1 is under examination in part (CE).

Recommendation rated E

II,A,2, third sentence (Conf. Rep. p. 92)

Position of Mines Inspectorate personnel

- Such personnel to be required to work in the Mines Inspectorate for a stated minimum period, and to engage full-time on their inspection duties.

C.- RECOMMENDATIONS CONCERNING HUMAN FACTORS

The recommendations with regard to psychological examination and supervision, and to psychological services, are still under examination.

VII.- INTERIM POSITION REGARDING IMPLEMENTATION OF THE CONFERENCE'S RECOMMENDATIONS

I

TECHNICAL ASPECTS

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
I - General working plans p. 8	C		C		C		E		E	NRC	C		C	
II- Shotfiring														
Shotfiring in workings where coal is present or there is danger from firedamp														
A - 1 - S a p. 12	C		C		C		E	NRP	E	NRC	-		C	-x)
b p. 12	C		C		C		C		E	NRC	-		E	
c p. 12	C		C		C		C		E	NRC	-		E	C
Use of instantaneous and millisecond detonators														
A - 2 - S a p. 13	C		C		C		E	NRP	E	NRC	C		C	
b p. 13	C		C E+		C		E		E	NRC	C		C	
Shotfiring circuit														
A - 3 - S a p. 14	C		C		C		NRP		E	NRC	C		C	
b p. 14	C		C		C		C		E	NRC	C		C	
c p. 14	C		E	NRC	C		NRP		E	NRC	C		C	

E^+ = 2-S,b, second sentence

-x)= none

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
Protection of personnel during shotfiring														
A - 4 - S p. 15	C		C		E		NRP		C	NRC	C		C	-x)
A - 5 - S p. 15	C		C		C		NRP		E	NRC	C		E	
Shotfirers and supervisory officials														
A - 6 - S a p. 15	C		C		NRP	NRC	C		E	NRC	C		C	
(third sentence)	N+	C+	E+											
b p. 15	C		C		C		C		E	NRC	C		C	
c p. 16	C		C		C		C		E	NRC	C		C	
Storage of explosives below ground														
B - 7 - S p. 16	C		C		C		C		E	NRC	C		C	
Safety explosives														
B - 8 - S p. 17	C		C		C		C		C	NRC	–		E	C
Payment of shotfirers														
B - 9 - S p. 17	C		C		?		E	C' + NRC	?		C		C	
III-Strata control														
Support: general														
A - 1 - SC p. 18	C		C		C		NRP		E	NRC	C		C	
Face support														
A - 2 - SC p. 19	C		C		C		C		E	NRC	C		C	

-x) = none

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
A - 3 - SC 1st para p. 19	C		C		NRP		NRP		E	NRC	C		C	
2nd para p. 19	C		C		NRP		NRP	NRC	E	NRC	C		C	
A - 4 - SC p. 19	RB		RB		RB		RB		?		C		C	
A - 5 - SC p. 20	NRP		C	CE	NRP		NRP	C	E	NRC	-		C	
A - 6 - SC p. 20	C		C		NRP		E	C'	E	NRC	-		C	
A - 7 - SC p. 20	C		C		NRP		NRP		E	NRC	-		C	
Coal-winning														
A - 8 - SC p. 20	C		C		NRP		C		E	NRC	C		C	
A - 9 - SC p. 21	C		C		NRP		NRP	NRC	E	NRC	-		C	
A -10 - SC p. 21	C		C		NRP		NRP		E	NRC	C		C	
A -11 - SC p. 21	C		C		NRP		C		E	NRC	C		C	
A -12 - SC p. 22	C		C		NRP		C		E	NRC	C		C	
Gate-roads														
A -13 - SC p. 22	C		C		NRP		C		E	NRC	C		C	
A -14 - SC p. 22	C		C		NRP		C		?		C		C	
A -15 - SC p. 23	C		C		NRP		C		E	NRC	C		C	
A -16 - SC p. 24	E	CN	E	NRC	NRP		C		E	NRC	-		NRP	C
IV- Ventilation and firedamp														
Main fans														
A - 1 p. 26	C		C		NRP		C		E	NRC	-		C	
(2nd para)	E	NRC NRP												

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
Auxiliary fans A - 2 p. 27 (3rd para)	C		C E	NRC	NRP		NRP		E	NRC	-		C	
Abandoned workings in gassy mines A - 3 p. 29	C E+)	C'	C E++)		NRP		NRP	NRC	E	NRC	-		C	
Compressed-air ejectors A - 4 p. 31	E		E	NRC	NRP		NRP		?	N	-		C	
Clearing-out of compressed-air mains A - 5 p. 32	E	A	E	NRC	NRP		NRP	NRC	E	NRC	-		C	
Ventilation inspection A - 6 p. 32	C		C		-	NRP	C		E	NRC	-		C	
Coal measures liable to sudden outbursts of firedamp B - 1 p. 33	N		C		C/NRP		C		E	NRC	-		C	
Permissible number of men per separate ventilating district B - 2 p. 34	C		C		NRP		E		E	NRC	-		C	
Classification B - 3 p. 35	C		C		NRP		C		E	NRC	-		C	
Firedamp drainage B - 4 p. 36	C		C		NRP		NRP	NRC	?	N	-		C	

E+) = A-3, 3rd, 4th, 5th and 6th paras
E++) = A-3, 3rd, 5th and 6th paras

Conference Resolutions		N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
		1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
Permissible firedamp content															
B - 5	p. 37	C		C		NRP		C		E	NRC	-		C	
Minimum air quantity															
B - 6	p. 39	RB	E	RB	E	NRP		C		E	NRC	-		NRP	C
General principles in regard to coal-winning															
B - 7	p. 40	C		C		NRP		C		E	NRC	-		C	
V - Combustible dust															
Classification															
B - 3 a	p. 44	C		C		NRP		C		?	NRC	-		C	
B - 3 b	p. 44	E+)	C	C		NRP		C		E	NRC	-		C	
c	p. 45	C		C		NRP		C		E	NRC	-		C	
d	p. 45	C		C		NRP		C		E	NRC	-		C	
e	p. 45	E++)	C	C		NRP		C		E	NRC	-		C	
f	p. 46	C		C		NRP		C		E	NRC	-		C	
Prevention															
B - 4 a	p. 47	C	C'	C		NRP		C		C	NRC	-		C	
B - 4 b	p. 47	E		C		NRP		NRP		E	NRC	-		C	
General neutralization															
B - 5 a	p. 47	C		C		NRP		C		C	NRC	-		C	
b	p. 48	E	N	E		NRP		C		E	NRC	-		C	
c	p. 48	C		NRP		NRP		C		E	NRC	-		C	

E+) - Re amount of firedamp present E++) - Re regular inspection

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	13.12 60	1.11 58	31.12 60	1.11 58	31.12 60
Stone-dust barriers														
B - 6 a p. 48	C		C		NRP		C		E	NRC	-		C	
b p. 49	RB		RB		?		C		E	NRC	-		C	
c p. 49	C	C	C		NRP		C		E	NRC	-		C	
d p. 49	C		C		NRP		C		E	NRC	-		C	
VI - Portable lighting														
Use of flame safety lamps														
A - 2 p. 50	C		C		E		C		E	NRC	-		C	
Construction of flame safety lamps														
A - 2 p. 50	C		E		C		C		E	NRC	-		C	
VII- Fires and underground combustion														
Prevention of underground combustion														
B - 1 - 1 a p. 51	C		C		NRC		NRP		E	NRC	-		C	
- 1 b p. 51	C		C		NRC		NRP		E	NRC	-		C	
- 2 p. 51	C		C		NRC		NRP	NRC	E	NRC	-		C	
B - 1 - 3 p. 52	C		C		N		NRP	NRC	?	N	-		C	
- 4 p. 52	E	C	E	C	NRC		NRP		E	NRC	-		C	
Detection of underground combustion														
B - 2 - a p. 52	E	C	E	CN	NRC		NRP		E	NRC	-		C	

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 50
- b p. 53	E	C	E	CN	NRC		NRP		E	NRC	-		C	
Prevention of fires in shafts														
B - 3 - 1 p. 54	C		C		NRC		NRP		E	NRC	-		C	
- 2 a p. 54	RB	E	RB	NRC	NRC		NRC		E	NRC	-		C	
- 2 b p. 54	RB	C	RB	NRC	NRC		NRC		E	NRC	-		C	
- 2 c p. 54	RB	CE	RB	NRC	NRC		C		E	NRC	-		C	
- 2 d p. 54	RB	C	RB		NRC		NRC		E	NRC				
- 3 a p. 54	RB		RB	NRC	NRC		NRP		E	NRC	-		C	
- 3 b p. 54	RB		RB		NRC		NRP		E	NRC	-		C	
- 3 c p. 54	RB	C	RB	C	E		C		E	NRC	-		C	
- 3 d p. 54	RB	C'	RB	NRC	NRC		NRP		?	N	-		C	
- 3 e p. 54	RB	C'	RB	NRC	NRC		NRP		?	N	-		C	
Prevention of fires in the neighbourhood of shafts														
B - 4 p. 55	E	C'	E		NRC		NRP		E	NRC	-		C	
Prevention of fires in workings														
B - 5 - a p. 56	E	C'	E		NRC		NRP		E	NRC	-		C	
-bb p. 56	C		C		NRC		NRP	C'E+	E	NRC	-		C	
- c p. 56	E	C'	NRP		NRC		E	NRP	E	NRC	-		C	
- d p. 56	E	C' NRP	E	CE	NRC		NRP		E	NRC	-		RB	C
- e p. 56	E		E		NRC		E	C'E	E	NRC	-		C	
- f p. 56	C		C		NRC		NRP		E	NRC	-		C	

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 660	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
Places where flammable materials accumulate														
B - 6 - a 1st para p. 57	C		C		RB		C		E	NRC	C		C	
2nd para p. 58 (last sentence)	RB		RB		RB		RB		E	NRC	E		RB	C
Fire fighting														
B - 7 - a p. 58	C		C		NRC		C		E	NRC	-		C	
- b p. 59	C		C		NRC		C		E	NRC	-		C	
- c p. 59	C		C		NRC		C		E	NRC	-		C	
- d p. 59	C		C		NRC		C NRP 2nd para		E	NRC	C		C	
General fire-prevention and firefighting measures														
B - 8 - 1st para p. 59	C		C		NRC		NRP		E	NRC	-		C	
- 2nd para p. 60	C		C		NRC		C		E	NRC	-		C	
Telephone connections														
B - 9 p. 60	C		C		NRC		C		C	NRC	-		C	
VIII- Electrification														
Rated voltage														
A - 1 - E p. 61	C		C		E	NRP	C	C'E NRP	E	NRC	C		C	
Earth faults														
A - 2 - E p. 61	C		C		E	NRP	C	NRP+)	E	NRC	E		C	
Circuit-breakers and fuses								C+)						
A - 3 - E - a p. 62	C		C		E	NRP	E	CE C'E	?	NRC	C		C	

+) 2-E, 3rd para

++) 2-E, 1st and 2nd paras.

Conference Resolutions		N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
		1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
A - 3 - E - b	p. 62	C		C		E	NRP	E	CE C'E	?	NRC	C		C	
- c	p. 62	C		C		E	NRP	E	CE C'E	E	NRC	C		C	
Protective screens															
A - 4 - E	p. 63	C		C		E	NRP	C		E	NRC	E		C	
Armoured cables															
A - 5 - E	p. 63	C		C		E	NRP	E	C	E	NRC	C		C	
Outer sheating of armoured cables															
A - 6 - E	p. 63	C		C		E	NRP	E	C 1) EC'E 2)	E	NRC	E		C	
Use of flammable oil															
A - 7 - E	p. 63	C		E		E	NRP	C		E	NRC	E		C	
Restrictions of use of flammable oil		?	N+)												
A - 8 - E 1st para	p. 64	C		C		E	NRP	E	EC'	E		E		C	
2nd para	p. 64	RB	CC'	RB	NRC	RB		RB		E	NRC	E		RB	C
Cable laying															
A - 9 - E	p. 64	C		C		E	NRP	C		E	NRC	C		C	
Electricians															
A - 10 - E	p. 65	C		C		E	NRP	C		E	NRC	C		C	
Specifications for cables															
B - 11 - E	p. 65	C		C		E	NRP	C		E	NRC	E		C	
IX - Mechanization															
Man-winding in shafts															
A-1-M-a, 1st sentence	p. 67	C		C		E		NRP		E	NRC	-		C	

1) Armoured cables
2) Flexible cables

+) 2-E, 3rd para
++) 2-E, 1st and 2nd paras.

Conference Resolutions		N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
		1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
2nd sentence	p. 67	C		C		E		E	C'	E	NRC	-		C	
-b	p. 67	C		C		E		C	'	E	NRC	-		C	
-c	p. 67	C		C		E		C		E	NRC	-		C	
-d	p. 67	C		C		E		C		E	NRC	-		C	
-e	p. 67	C		C		E		C		E	NRC	-		C	
A-2-M 1st para	p. 68	C		C		E		C	E	E	NRC	-		C	
2nd para	p. 69	C		C		E		C	E	?		-		CC	
A - 3 - M	p. 69	C +)		RB		?		RB		RB	NRC	-		C	
A - 4 - M	p. 69	C		C		C		NRP		?	NRC	-		C	
Shaft sinking															
A - 5 - M	p. 70	C		C		EC		E	C 1) C 2)	E	NRC	-		C	
Cables															
A - 6 - M	p. 70	C		C		E		C		E	NRC	-		C	
A - 7 - M	p. 70	C		C		E		C		E	NRC	-		C	
Conveyors															
A - 8 - M	p. 71	C		C		E		C		E	NRC	C		C	
A - 9 - M	p. 71	E	C'E	C		E		C		E	NRC	E		C	
A -10 - M	p. 71	C		C		C		C		E	NRC	E		C	
Internal-combustion engines below ground															
A - 11 - M	p. 71	C		C		E		E	CE 1) C 2)	E	NRC	C		C	
A - 12 - M	p. 72	C		C		E		C		E	NRC	C		C	
A - 13 - M	p. 72	C		C		C		C		E	NRC	C		CE	C

C+) = only remain winding shafts with signalling devices at landings

1) = 1st para

2) = 2nd para

Conference Resolutions		N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
		1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
A - 14 - M - a	p. 72	C		C		E		C		E	NRC	E		C	
- b	p. 73	RB		RB		RB		RB		RB		-		E	
Travelling below ground															
A - 15 - M	p. 73	E	CE	E	NRC	E		E	C'E/E	?	RB	E		C	
A - 16 - M	p. 74	E	C'	E	NRC	E		C		E		-		C	
Locomotive haulage															
A - 17 - M	p. 74	RB	E	RB	E	RB	E	E		?	RB	C		NPP	C
A - 18 - M - a	p. 75	C		C		C		E	C'E NRP	?	RB	C		C	
A - - b	p. 75	C		C		E		E	C'E NRP	?	RB	C		CC	
- c	p. 75	C		C		E		E	C'	?	RB	C		C	
A - 19 - M	p. 76	C		C		E		E	C'	?	RB	C		C	
A - 20 - M	p. 76	C		C		E		E	C'	?	RB	C		C/B	
		?+)		E+)											
A - 21 - M	p. 76	E	CE	E		E		E	C'E/E	?		E		C	
A - 22 - M - a	p. 77	E	C'E	E		E		E	C'E NRP	E	NRC	C		C	
- b	p. 77	E	C'E	E		E		E	C'E NRP	E	NRC	E		C	
A - 23 - M - a	p. 77	C		C		E		C	N	E	NRC	NRP		C	
- b	p. 78	C		C		C		C		E	NRC	-		C	
- c	p. 78	C		C		E		C		E	NRC	-		C	
- d	p. 78	C		C		C		C		E	NRC	-		C	
A - 24 - M - a	p. 79	E	C	E	NRC	E		E	C'E/E	E	NRC	C		C	
- b	p. 79	E	C	E	NRC	E		E	C'E/E	E	NRC	C		C	

+) = 20 - M, 2nd para

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
Man-riding B - 25 - M p. 79	C		C		E		C		E	NRC	-		C	
Haulage of materials on conveyors B - 26 - M p. 80	E	CN	E	NRC	E		C		E	NRC	C		C	
Precautions at loading points and landings B - 27 - M p. 80	E	C'	E	NRC	E		C		E	NRC	C		C	
Man-winding in staple-pits B - 28 - M p. 80	C		E		E		C	N	E	NRC	-		NRP	C
Testing of shafts guides B - 29 - M p. 80	C		C		E		NRP		E	NRC	-		C	
Use of flammable oils for mechanical transmission purposes B - 30 - M p. 81	E		E		E		E		?	N	E		RB	E

Conference Resolutions		N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
		1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
I - Safety departements and organisation of supervision within the enterprises															
1) Safety departments in enterprises															
A - 1	p. 82	C		E	C'	C		E	C'E/E	E	NRC	C		C	
2	p. 82	C		E	C	C		E	C'E/E	E	NRC	C		C	
B - 1	p. 82	C		E		C		E	C'E/E	E	NRC	E		C	
2	p. 82	C		E		C		E	C'E/E	?	NRC	E		C	
C - 1st para	p. 82	C		E	C'	C		E		E	NRC	C		C	
2nd para	p. 83	-		E	-	N		E		?	N	E		C	
3rd para	p. 83	C		E	C	C		E	C'E/E	?	N	-		C	
D - 1	p. 83	C		E	C'	E		E	C'E/E	?	NRC	E		C	
2	p. 83	?	C'	?	C	E		E	C'E/E	?		E		C	
E	p. 83	C		E	C'	C		E	C'E/E	?	NRC	E		C	
F - 1st para	p. 84	C		E	C'	C		E	C'E/E	?	NRC	E		C	
2nd para	p. 84	C		N	E	C		E	C'E/E	?	N	E		C	
G	p. 84	N 1) C 2)		E	C 1) C 2)	N		E	C'E/E	?	N	C		C	
H	p. 84	C		E	C	C		E	C'E/E	E	NRC	C		C	
I- 1st para	p. 85	C		E	C'E	NRC		E	C'E/E	?	N	E		C	
2nd para	p. 95	RB		RB		-		E		?	?	E		RB	C

1)G, 1st para. 2)G, 2nd para.

Conference Resolutions		N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
		1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
2) Organization of supervision of safety arrangements in enterprises															
A - 1	P. 86	C		C		C		E	C	?	NRC	C		C	
2	p. 87	C		C		E		E		?	NRC	C		C	
II- Framing of regulations and inspection for compliance with them															
1) Organization of inspection arrangements															
A - 1-1st para	p. 88	C		C		C		C		E	NRC	C		C	
2nd para	p. 88	C		C		N		C		E	NRC	C		N	C
3rd para	p. 88	C		C		N		C		E		C		N	C
2) Delegation of powers															
A - 2	p. 89	C		C		N		C		C		C		N	C
3) Exemptions															
B - 1st para	p. 89	C		C		C		C		E	NRC	-		C	
2nd para	p. 89	C		C		C		C		E	NRC	-		C	
3rd para	p. 89	C		E	C	E		RB	E	?	NRC	-		E	C
4th para	p. 89	C		E	C	E		C		?	N	-		E	C
5th para	p. 89	C		C		C		E	NRC	?	NRC	-		C	

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
4) Enterprises' own instructions														
C – 1st para p. 90	C		C		C		C		E	NRC	C		C	
2nd para p. 90	C		C		C		C		E	NRC	C		C	
3rd para p. 90	C		C		C		E		?	N	C		C	C
4th para p. 90	C		C		C		C		E	NRC	C		C	C
5) Councils and Committees assisting the Minister														
D – 1 p. 90	?		?		C		E	E/C'E	C		C		C	
2 p. 90	C		C		C		C		C		C		C	
3 p. 90	C		E		C		C		C		C		C	
6) Number of inspection appointment														
A – 1 p. 91	C		?	E	E		C		C		E C)		C	
2 p. 91	C		C		C		C		C		E C)		C	
7) Experience required of inspection personnel														
A – 1 p. 91	C		C		C		C		C		C		C/E	
8) Position of Mines Inspectorate personnel														
A – 2 – 1st and 2nd sentences p. 91	?	C'	?	C	E		C		?	NRC	E		E	C
3rd sentence p. 92	N		N		E		C		?		E		E	

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
9) Refresher training for inspectors' assistants and workers' delegates														
A - 3 p. 92	E	C'E	E	C'E	E		C		?		C		C	
III- Workers' part in satefy														
A - 1st para p. 93	C		C		C		C		E	NRC	C		C	
2nd para p. 93	C		C		C		C		E	NRC	C		C	
A - a/b p. 93	C		C		C		E		E	NRC	E		C	
B - 1 p. 94	C		?		C		C		?	NRC	C		C	
2 p. 94	C		?		C		C	CE	?	E	C		C	
C p. 95	E	C'	?	E	C		E		?	N	E		NRP	
IV - Disciplinary action in the event of breaches of safety regulations														
1) p. 96	C		C		C		C		E	NRC	C		C	
2) p. 96	C		C		C		C		C	NRC	C		C	
3) A - 1 p. 97	C		C		N		E	C/E	C	NRC	C		C	
3 - A - 2 p. 97	C		C		C		C	C'	E	NRC	C		C	
3 - B p. 97	?	N	C		C		C		E	N	E		E	

HUMAN FACTORS

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
I - Reception of new entrants														
1) Responsibility for reception														
Par. 7 p. 102	?	C'	?		?orE	C'	C	C'	?				C	
Par. 8 p. 103	E	C'N	?	E	E	C'	C	C'	C		none at present		C	
2) Practical reception methods : organization														
Par. 9 p. 103	?	N	?		E	C'	C	C'	C				C	
Par. 10 p. 103	C		E		E	C'	C	C'	E				C	
Par. 11 p. 104	C		E		E	C'	C	C'	E				C	
3) Practical reception methods : facilities														
Par. 12 p. 104	C		E		E	C'	C	C'	C	N			C	
Par. 13 p. 104	C		E		E	C'	C	C'	C				C	
II-Medical and psychological examination and supervision														
1) General recommendation														
Par.1 - 1st para p. 106	E	C+)	?	E	?		CE	C'E	E		E		C	C+)
2nd, 3rd and 4th paras p. 106	C+)		C+)		C+)E		CE		E		E		C	C+)
1st part of 5th para p. 106	E	C+)	?	E	C+)E		CE	C'E	E		E		C	C+)

+)Excepting psychological examination.

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.12 58	31.12 60	1.11 58	31.12 60
Par. 1 - 2nd part of 5th para p. 106	E	C'	?	C'E	?		E	C'E	E		E		C	C+)
2) Aims and objects of medical and psychological examination														
Par. 3 p. 107	E	C+)	?	CE	E		CE		C	RB	E		C	C+)
3) Entrants undergoing examination														
Par. 4 p. 107	E	CE	?	C+	C+E		CE	C'E	C	RB	E		C	C+)
4) Medical and psychological service														
Par. 5 p. 107	C+)		?	C'E	C+E		CE	C'E	C	RB	E		C	C+)
Par. 6 p. 107	C+)		E	C'E	E		CE		C	RB	E		C	C+)
Par. 7 p. 108	C+)		C		E		CE		C	RB	E		C	C+)
5) Aims and objects of medical and psychological supervision														
Par. 8 p. 108	E	C+	?	E	C+E		CE	C'E	C		E		C	C+)
6) Practical methods of medical and psychological supervision														
Par. 9 p. 108	C		C		E		C		C		E		C	C+)
Par. 10 - 1st and 2nd sentences p. 108	E	C	?	E	E		CE	C'E	C		E		C	C+)
Par. 10 - 3rd and 4th sentences p. 109	E	C	?	C	E		E	C'E	C		E		C	C+)
Par. 11 p. 109	C		C		C		CE	C'E	C		E		C	C+)

+) Excepting psychological examination.

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
III-<u>Methods of observing and assessing individual miners at work</u>														
Par. 2 p. 110	?	N	C		E		CE	CE 1) C'E	?	E	E		C	
Par. 3 p. 110	?	C	C		E		C	C'	?	E	E		C	
IV- <u>Vocational training</u>														
1) <u>Aims and objects; general recommendations</u>														
Par. 1 p. 112	C		C		E	C'	C	C'	E		C		C	
Par. 2 - 2nd para p. 112	C		C		E	C'	C	C'	E		C		C	
2) <u>Training requirements</u>														
Par. 4 - 2nd para (schemes) p. 112	C		C		E	C'	C	C'E	E		C		C	
3rd para (instructors) p. 113	C		C		E	C'	C	C'	E		C		C	
4th para (facilities) p. 113	C		C		E	C'	C	C'	E		C		C	
Par. 5 p. 113	C		C		E	C'	C		E		C		C	
3) <u>Full systematic training of juveniles</u>														
Par. 8 p. 114	C		C		E	C'	C		E		-		C	
Par. 9 p. 114	C		C		E	C'	C	CE/ C'E	E		-		C	
4) <u>Shortened training for juveniles</u>														
Par. 10 p. 114	C		E	CE	E	C'	C	C'E	E		-		C	

+) Excepting psychological examination.

1) 1st para.

2) 2nd para.

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
5) Apprenticeship contract														
Par. 11 p. 114	C		C		E	C'	C		C		-		C	
6) Intensified training of adults														
Par. 12 - 1st and 2nd sentences p. 115	C		C		E	C'	C	C'	C	contingency plans exist	-		C	
3th sentence p. 115	N		C		E	C'	C	C'	E		-		C	
Par. 13 p. 115	C		C		E	C'	CE	C'E	E		-		C	
Par. 14 p. 115	C		E	CE	E	C'	CE	C'E	E		-		C	
Par. 15 p. 116	C		E	CE	E	C'	CE	C'E	E		-		-	
Par. 16 p. 116	C		E	CE	E	C'	CE	C'E	E		-		C	
7) Training of specialists														
Par. 17 - 1st para p. 116	C		E	C'	E	C'	CE	CE/C'	E		C		C	
2nd and 3th paras p. 116	E	C	E	CA	E	C'	C		E		C		C	
8) Training of managerial and supervisory personnel														
Par. 18 p. 117	C		C		E	C'	C	C'	E		C		C	
Par. 19 p. 117	C		C		E	C'	C	C'	E		C		C	
Par. 20 p. 117	C		C		E	C'	C	C'	E		C		C	
Par. 21 p. 117	C		E	C'E	E	C'	C	C'	E		C		C	
9) Training of instructors														
Par. 22 p. 118	C+)		C		E	C'	C	C'	E		C		C	
Par. 23 p. 118	C+)		E	C+)	E	C'	CE	C'E	E		C		C	
Par. 24 - 1st sentence p. 118	E	C	?	E	E	C'	CE	C'E	C		C		N	C
2nd sentence p. 118	-		-		E	C'	C	C'E	E		-		-	

+) Instructors working full-time

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
10) Participation by workers' organizations														
Par. 25 p. 118	E	C	?	E	E	C'	C		E		E		C	
V-Physical aspects of the environment														
Par. 4 p. 135	E	C	?	CE	E	C'	CE	C'E	E		E		C	
VI-Psychological and sociological factors														
Foreign workers														
Par. 9 p. 123	C		C		E	C'	CE	C'E	E	N	Supervisory personnel are required to have a knowledge of foreign languages		C	
Par.10 - a p. 123	C+)		C		E	C'	CE	C'E	E	N			C	
b p. 123	C		C		E	C'	C		E	N			C	
c p. 123	?	N	C		E	C'	C	C'	E	N			C	
d p. 123	?	N	C		E	C'	C	C'	E	N			C	
e p. 123	C		C		E	C'	C	C'	E	N			C	
f p. 123	?	C'	C		E	C'	CE	C'E	E	N			C	
VII-Methods of payment														
1) Payment of supervisory staff														
Par. 5 p. 125	?	N	C		E	C'	C	C'	E		C		C	
2) Payment of shotfirers														
Par. 7 p. 125	C		C		E	C'	C	C'	E		C		C	

C+ = excepting last ten words

1) Supervisory personnel are required to have a knowledge of foreign languages; the regulations and instructions are printed and issued in several languages.

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
3) Piece work														
Par. 9 - a 1st and 2nd sentences pp. 126	C		C		E	C'	C	C'	E		C		C	
Par. 9 - b p. 126	C		C		-		C	C'	C		C		C	
Par. 9 - c p. 126	C		C		C		C	C'	C		C		C	
Par. 9 - d 1st para p. 126	C		?	C	C		C	C'	C		C		C	
Par. 9 - e p. 126	C		C		C		C		E		C		C	
Par. 10 p. 127	C		C		E	C'	C	C'	E		C		C	
Par. 11 p. 127	C		C		E	C'	C	C'	E		C		C	
VII-Working hours														
1) Normal working hours														
Par. 4 p. 128	C		C		E	C'	C	C'	E	NRC	C		C	
Par. 5 p. 128	C		C		E	C'	C	C'	E	NRC	C		C	
2) Hours actually worked														
Par. 6 p. 129	C		C		C or E	C'	C		E	NRC	C		C	
3) Amount of work done														
Par. 7 p. 129	?	C'	C		E		C	C'	C		C		C	
4) Difficult and unhealthy working conditions														
Par. 8 p. 130	C		E	CE	E		C	C'	C	RB	C		C	

Conference Resolutions	N.R./Wph.		Saar		Belgium		France		Italy		Luxembourg		Netherlands	
	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60	1.11 58	31.12 60
IX-Special living and working conditions														
1) Temperance measures														
Par. 5 p. 131	C		C		E		C	C'	E		C		C	
2) Housing														
Par. 6 p. 132	?	C'	E	C'	E		C	C'	E		C		C	

PART THREE

- SAFETY STATISTICS

- COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

PART THREE

SAFETY STATISTICS

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

The Conference on Safety in Coalmines went in some detail into the subject of comparable accident statistics. While admitting the difficulty of arriving at these, the Conference emphasized that they were absolutely necessary, for various study purposes.

To this end the Conference recommended the following procedure :

"Until the statistics in the different countries have been lined up, it would be best for a simplified table to be introduced, to serve as a basis for a uniform statistical system for the whole Community.

"In order that as little additional work as possible may be involved, these statistics should be such as can readily be extracted from the more detailed figures currently compiled in the different countries,and should consist only of a summarized breakdown of accidents by technical causes and degree of seriousness" (Conference Report, pp. 159.160).

The Commission in its First Report stated that it considered this matter could usefully be examined, with reference in the first instance to underground accidents only. It has now worked out a uniform classification of accidents by seriousness and cause.

A. SERIOUSNESS

For the purposes of the classification, recordable accidents are those either :

1) resulting in death within eight weeks;
2) preventing return to duty below ground for eight weeks or longer

Three points may be noted in this connection;

a) The criterion for accidents of type (2) is not the length of time before the man can resume his original work, but the length of time before he can be passed fit for underground duties generally : it is common practice for casualties on recovery to be assigned for a time to other jobs than those they were performing when the accident occurred.
b) Accidents not coming under either of the heads mentioned are not included in the Community statistics.
c) The Community statistics do not indicate whether or not accidents have culminated in permanent disability, as the presence, and in particular the degree, of such disability takes so long to establish that the compilation of the statistics would be unduly retarded.

B. CAUSE

The classification proposed by the Commission recognizes twelve categories of causes.

1) Falls of ground

This covers falls of stone or coal from their natural position; it does not include falls of ground due to causes coming under other heads, e.g. use of explosives, firedamp or dust explosions, sudden outbursts of firedamp or underground combustion or fires, which should be recorded under the head concerned. Accidents caused by stowing material are shown under head 5, "Falling objects".

2) Haulage and transport

Accidents caused by any haulage or transport installation, stationary or in motion, for the carriage of personnel or of material, in coal-winning or other workings, roadways, shafts, staple-pits, etc., including those caused by the driving motors of such installations. Accidents under this head include, for instance, those caused by lumps of coal falling from the conveyor belt,timber falling from a mine-car carrying them, or lumps of coal flying out from a fixed chute; also accidents caused by the transmission gear or motor of a transport vehicule.

A distinction is made between those coal-getting machines which are primarily means of transport, such as the scraper-box, and those which are primarily used for the actual extraction, such as the plough : accidents caused by the first type are shown under head 2, "Haulage and Tranport", and by the second under head 4,"Machinery, handling of tools and supports".

Electrocution by contact with trolley wires falls under head 11,"Electricity".

3) Movement of personnel

Falls by men in shafts or staple-pits, stumbling, tripping, slipping, bumping, spraining, etc., where not caused by haulage or transport installations or other items of the classification.

4) Machinery, handling of tools and supports

Accidents caused by the operation of machines other than those mentioned under head 2, "Haulage and transport", or by the setting, withdrawal or resetting of supports. Accidents due to the slipping or falling over of machines in moving or shifting are to be shown under head 5, "Falling objects"; those due to the slipping or falling of supports or support elements in transport or shifting under head 2, "Haulage and transport", or under head 5, "Falling objects".

5) Falling objects

Accidents caused by the falling or slipping of blocks from loose piles of debris or in loading, falling or slipping of shaft supports, timber, tools, props, piping, etc.

6) Explosives

Accidents resulting from conveyance of explosives, charging of shotholes, untimely or premature detonation, insufficient protection of personnel, striking of drills or cutter picks on undetonated explosive, misfires, retarded detonation, residues of explosives, or shotfiring fumes. Where the use of explosives set off a firedamp or dust explosion or caused underground combustion or a fire, such accident is shown under the head concerned.

Unexpected detonations of explosives by electric current fall under the present head.

7) Explosions of firedamp or coal dust

This category includes poisoning or asphyxiation by the gases released. It also covers firedamp and dust explosions caused by electric current. Where an accident was due to several factors one of which is the ignition or explosion of firedamp or coal dust, it is ordinarily recorded under this head.

8) Sudden outbursts of firedamp, suffocation by natural gases (CO_2, CH_4, H_2S) and oxygen deficiency

This includes accidents caused by flying objects or falls of ground due to sudden outbursts of firedamp. For the purposes of this head, suffocation is only that resulting from the gas given off in sudden outbursts or from other natural gases; suffocation by fumes due to shotfiring, to firedamp or dust explosions or to underground combustion or fire is to be entered under the corresponding heads.

As just noted, where the sudden outburst was followed by an explosion any accident resulting is to be classified under head 7, "Explosions of firedamp or coal dust".

9) Underground combustion and fires

Includes poisoning or asphyxiation by gases or fumes so released. Burns, injuries by falls of ground or falling objects following the outbreak of combustion or fire. Fires caused by electric current come under this head; those caused by firedamp or dust explosions, however, come under head 7, "Explosions of firedamp or coal dust".

In general, where an accident was due to several factors one of which is underground combustion or fire, it is shown under the present head, except where another factor was the ignition or explosion of firedamp or coal dust, in which case it is shown under head 7.

10) Inrushes of water

Inrushes due to penetration of old workings or proximity of overburden, resulting in casualties through falls of ground, falling objects, drowning, etc.

11) Electricity

Accidents caused by electricity, such as burns, electric shock, electrocution by contact with trolley wires.

Firedamp and dust explosions, underground combustion and fires and unexpected detonations of explosives caused by electricity are shown under the respective heads concerned.

12) Other causes

All accidents not classifiable under heads 1-11, e.g. those caused by compressed air, and those to which no precise cause can be assigned.

C. COVERAGE

Strictly, the statistics relate to casualties, not to the actual incidents. This means including in the returns all casualties occurring below ground, irrespective of the grade or function of the person concerned, and of whether he is regularly employed on underground duties or not.

D. GROUP ACCIDENTS

Separate mention is made of group accidents, viz. incidents resulting in the death or disablement as defined above of five or more persons : the number of such incidents is given, together with the number of fatal and serious casualties caused. The latter figures of course also appear in the general statistics.

E. COMPARATIVE TABULATION

By means of these figures it should be possible to work out the comparative casualty rate for the different coalfields in each country and for the different Community countries. The casualty rate in each case is the ratio of casualties to total hours worked (in million man-hours),calculated to the third decimal place.

F. STATISTICS ACCORDING TO THIS CLASSIFICATION

The present Report contains the first statistical summary compiled in accordance with this common classification of underground accidents in 1958 and 1959, with separate figures for each country and comparative tables showing

a) the number per million man-hours of disablements leading to eight weeks or more off work below ground;

b) the number per million man-hours of deaths ensuing within eight weeks of the accident;

c) the number of group accidents involving five or more such deaths and/or disablements in the Community countries in the two years covered.

I. COMMON STATISTICAL SUMMARY

OF

UNDERGROUND ACCIDENTS

AT MINES

IN 1958

Year: 1958
Country: Nordrhein-Westfalen
Coalfield: Ruhr

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	2,794	165		4.780	0.282	-	-	-
2) Haulage and transport	1,549	107		2.650	0.183	1	7	-
3) Movement of personnel	1,538	63		2.632	0.108	-	-	-
4) Machinery, handling of tools and supports	480	6		0.821	0.010	-	-	-
5) Falling objects	1,525	40		2.609	0.068	1	-	5
6) Explosives	6	4		0.010	0.007	-	-	-
7) Explosions of firedamp or coal dust	8	8		0.014	0.014	1	7	8
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.003	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	3	-		0.005	-	-	-	-
11) Electricity	6	15		0.010	0.026	-	-	-
12) Other causes	322	14		0.551	0.024	1	-	5
TOTAL	8,231	424	584,511,733	14.082	0.725	4	14	18

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1958
Country: Germany, Land North Rhine/Wesphalia,
Coalfield: Aachen

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place)	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	193	9		3.781	0.176	-	-	-
2) Haulage and transport	112	13		2.194	0.255	-	-	-
3) Movement of personnel	80	3		1.567	0.059	-	-	-
4) Machinery, handling of tools and supports	6	1		0.118	0.020	-	-	-
5) Falling objects	65	1		1.274	0.020	-	-	-
6) Explosives	-	-		-	-	-	-	-
7) Explosions of firedamp or coal dust	-	-		-	-	-	-	-
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.039	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	1	1		0.020	0.020	-	-	-
12) Other causes	1	4		0.020	0.078	-	-	-
TOTAL	458	34	51,040,329	8.973	0.666			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1958
Country: Germany, Land North Rhine/Westphalia
Coalfield: Ibbenbüren

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	61	-		5.451	-	-	-	-
2) Haulage and transport	19	1		1.698	0.089	-	-	-
3) Movement of personnel	15	-		1.341	-	-	-	-
4) Machinery, handling of tools and supports	9	-		0.804	-	-	-	-
5) Falling objects	14	-		1.251	-	-	-	-
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	-	-		-	-	-	-	-
12) Other causes	14	-		1.251	-	-	-	-
TOTAL	132	1	11,189,880	11.796	0.089			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Germany, Land North Rhine/Westphalia,

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

All coalfields

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	3,048	174		4.713	0.269	-	-	-
2) Haulage and transport	1,680	121		2.598	0.187	1	7	-
3) Movement of personnel	1,633	66		2.525	0.102	-	-	-
4) Machinery, handling of tools and supports	495	7		0.765	0.011	-	-	-
5) Falling objects	1,604	41		2.480	0.063	1	-	5
6) Explosives	6	4		0.009	0.006	-	-	-
7) Explosions of firedamp or coal dust	8	8		0.012	0.012	1	7	8
8) Sudden outbursts of firedamp, suffocation by natural gases	-	4		-	0.006	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	3	-		0.005	-	-	-	-
11) Electricity	7	16		0.011	0.025	-	-	-
12) Other causes	337	18		0.520	0.028	1	-	-
TOTAL	8,821	459	646,741,942	13.639	0.709	4	14	18

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Saar

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Coalfield: Saar

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	462	20	78,042,903	5.920	0.256	-	-	-
2) Haulage and transport	168	9	"	2.153	0.115	-	-	-
3) Movement of personnel	175	2	"	2.242	0.026	-	-	-
4) Machinery, handling of tools and supports	61	-	"	0.782	-	-	-	-
5) Falling objects	235	6	"	3.011	0.077	-	-	-
6) Explosives	5	2	"	0.064	0.026	-	-	-
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	-	-		-	-	-	-	-
12) Other causes	16	-	"	0.205	-	-	-	-
TOTAL	1, 122	39	78,042,903	14.377	0.500			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Germany, Land North Rhine/Westphalia plus Saar
All coalfields

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	3,510	194		4.843	0.268	-	-	-
2) Haulage and transport	1,848	130		2.550	0.179	1	7	-
3) Movement of personnel	1,810	68		2.497	0.094	-	-	-
4) Machinery, handling of tools and supports	556	7		0.767	0.010	-	-	-
5) Falling objects	1,839	47		2.537	0.065	1	-	5
6) Explosives	11	6		0.015	0.009	-	-	-
7) Explosions of firedamp or coal dust	8	8		0.011	0.011	1	7	8
8) Sudden outbursts of firedamp, suffocation by natural gases	-	4		-	0.005	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	3	-		0.004	-	-	-	-
11) Electricity	7	16		0.010	0.022	-	-	-
12) Other causes	353	18		0.487	0.025	1	-	5
TOTAL	9,945	498	724,784,845	13.721	0.687	4	14	18

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Belgium

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Coalfield: Charleroi/Namur

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	558	18	Including lowering and raising time	12.187	0.393			
2) Haulage and transport	377	4		8.234	0.087			
3) Movement of personnel	116	-		2.533	-			
4) Machinery, handling of tools and supports	265	-		5.788	-			
5) Falling objects	9	-		0.197	-			
6) Explosives	2	-		0.044	-			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	1	-		0.022	-			
9) Underground combustion and fires	-	-		-	-			
10) Inrushes of water	-	-		-	-			
11) Electricity	-	-		-	-			
12) Other causes	11	1		0.240	0.022			
TOTAL	1,339	23	45,778,648	29.245	0.502			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Belgium
Coalfield: Liège

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	162	10	Including lowering and raising time	4.606	0.284			
2) Haulage and transport	118	2		3.355	0.57			
3) Movement of personnel	46	-		1.308	-			
4) Machinery, handling of tools and supports	64	-		1.820	-			
5) Falling objects	22	-		0.625	-			
6) Explosives	3	1		0.085	0.028			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	1	1		0.028	0.028			
9) Underground combustion and fires	-	-		-	-			
10) Inrushes of water	-	-		-	-			
11) Electricity	-	1		-	0.028			
12) Other causes	5	-		0.142	-			
TOTAL	421	15	35,173,800	11.969	0.425			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Belgium
Coalfield: Borinage

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	195	3	Including lowering and raising time	7.070	0.109			
2) Haulage and transport	138	3		5.003	0.109			
3) Movement of personnel	28	-		1.015	-			
4) Machinery, handling of tools and supports	102	-		3.698	-			
5) Falling objects	19	-		0.689	-			
6) Explosives	-	-		-	-			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.073			
9) Underground combustion and fires	-	-		-	-			
10) Inrushes of water	-	2		-	0.073			
11) Electricity	2	3		0.073	0.109			
12) Other causes	12	-		0.435	-			
TOTAL	496	13	27,580,896	17.983	0.473			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Belgium

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

Coalfield: Centre

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	93	3	Including lowering and raising time	4.208	0.136			
2) Haulage and transport	82	1		3.711	0.045			
3) Movement of personnel	40	1		1.810	0.045			
4) Machinery, handling of tools and supports	46	-		2.082	-			
5) Falling objects	18	3		0.815	0.136			
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	-	-		-	-			
12) Other causes	8	-		0.362	-			
TOTAL	287	8	22,097,792	12.988	0.362			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Belgium
Coalfield: South

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	1,008	34	Including lowering and raising time	7.711	0.260			
2) Haulage and transport	715	10		5.470	0.076			
3) Movement of personnel	230	1		1.759	0.008			
4) Machinery, handling of tools and supports	477	-		3.649	-			
5) Falling objects	68	3		0.520	0.023			
6) Explosives	5	1		0.038	0.008			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	2	3		0.015	0.023			
9) Underground combustion and fires	-	-		-	-			
10) Inrushes of water	-	2		-	0.015			
11) Electricity	2	4		0.015	0.031			
12) Other causes	36	1		0.275	0.008			
TOTAL	2,543	59	130,631,136	19.454	0.452			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Belgium
Coalfield: Campine

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties: Disablements as under (a) below	Number of casualties: Fatalities as under (b) below	Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below: Number of accidents	Group accidents as under (c) below: Number of disablements as under (a)	Group accidents as under (c) below: Number of fatalities as under (b)
1) Falls of ground	105	8	Including lowering and raising time	1.821	0.139			
2) Haulage and transport	63	9		1.092	0.156			
3) Movement of personnel	25	1		0.434	0.017			
4) Machinery, handling of tools and supports	51	1		0.884	0.017			
5) Falling objects	10	-		0.173	-			
6) Explosives	-	1		-	0.017			
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	-	-		-	-			
12) Other causes	13	-		0.226	-			
TOTAL	267	20	57,654,104	4.630	0.346			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Belgium

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

All coalfields

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	1,113	42	Including lowering and raising time	5.911	0.223			
2) Haulage and transport	778	19		4.132	0.101			
3) Movement of personnel	255	2		1.354	0.011			
4) Machinery, handling of tools and supports	528	1		2.804	0.005			
5) Falling objects	78	3		0.414	0.016			
6) Explosives	5	2		0.027	0.011			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	2	3		0.011	0.016			
9) Underground combustion and fires	-	-		-	-			
10) Inrushes of water	-	2		-	0.011			
11) Electricity	2	4		0.011	0.021			
12) Other causes	49	1		0.260	0.005			
TOTAL	2,810	79	188,285,240	14.924	0.420			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: France

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Coalfield: Nord/Pas-de-Calais

CAUSE	Number of casualties: Disablements as under (a) below	Number of casualties: Fatalities as under (b) below	Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below: Number of accidents	Group accidents as under (c) below: Number of disablements as under (a)	Group accidents as under (c) below: Number of fatalities as under (b)
1) Falls of ground	776	33		4.889	0.208	-	-	-
2) Haulage and transport	269	25		1.695	0.157	1	-	11
3) Movement of personnel	188	-		1.184	-	-	-	-
4) Machinery, handling of tools and supports	120	2		0.756	0.013	-	-	-
5) Falling objects	279	5		1.758	0.031	-	-	-
6) Explosives	2	-		0.012	-	-	-	-
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	-	-		-	-	-	-	-
12) Other causes	428	6		2.696	0.038	-	-	-
TOTAL	2,062	71	158,732,198	12.990	0.447	1	-	11

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1958
Country: France

Coalfield: Centre/Midi (less Provence)

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	393	17		6.078	0.263	-	-	-
2) Haulage and transport	206	6		3.186	0.093	-	-	-
3) Movement of personnel	160	-		2.474	-	-	-	-
4) Machinery, handling of tools and supports	77	1		1.191	0.015	-	-	-
5) Falling objects	162	-		2.505	-	-	-	-
6) Explosives	7	-		0.108	-	-	-	-
7) Explosions of firedamp or coal dust	8	20		0.124	0.309	1	8	20
8) Sudden outbursts of firedamp, suffocation by natural gases	1	12		0.015	0.186	1	-	9
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	3	-		0.046	-	-	-	-
12) Other causes	330	1		5.103	0.015	-	-	-
TOTAL	1,347	57	64,662,785	20.830	0.881	2	8	29

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1958
Country: France
Coalfield: Lorraine

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	227	15		4.195	0.277	-	-	-
2) Haulage and transport	75	2		1.386	0.037	-	-	-
3) Movement of personnel	70	2		1.294	0.037	-	-	-
4) Machinery, handling of tools and supports	57	2		1.053	0.037	-	-	-
5) Falling objects	84	2		1.552	0.037	-	-	-
6) Explosives	3	-		0.055	-	-	-	-
7) Explosions of firedamp or coal dust	5	12		0.092	0.222	1	5	12
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-		-	-	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	1	-		0.019	-	-	-	-
12) Other causes	63	3		1.164	0.055	-	-	-
TOTAL	585	38	54,105,896	10.812	0.702	1	5	12

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1958
Country: France

All coalfields
(less Provence)

C A U S E	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	1,396	65		5.027	0.235	-	-	-
2) Haulage and transport	550	32		1.980	0.115	1	-	11
3) Movement of personnel	418	2		1.505	0.007	-	-	-
4) Machinery, handling of tools and supports	254	5		0.914	0.018	-	-	-
5) Falling objects	525	7		1.890	0.025	-	-	-
6) Explosives	12	-		0.043	-	-	-	-
7) Explosions of firedamp or coal dust	13	32		0.047	0.115	2	13	32
8) Sudden outbursts of firedamp, suffocation by natural gases	1	12		0.004	0.043	1	-	9
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	4	-		0.014	-	-	-	-
12) Other causes	821	10		2.956	0.036	-	-	-
TOTAL	3,994	165	277,500,879	14.380	0.594	4	13	52

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1958
Country: Italy
Coalfield: Sulcis

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	8	1		1.335	0.167			
2) Haulage and transport	8	-		1.335	-			
3) Movement of personnel	4	-		0.668	-			
4) Machinery, handling of tools and supports	7	-		1.169	-			
5) Falling objects	7	-		1.169	-			
6) Explosives	1	3		0.167	0.501			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	-	1		-	0.167			
9) Underground combustion and fires	-	-		-	-			
10) Inrushes of water	-	-		-	-			
11) Electricity	-	-		-	-			
12) Other causes	2	-		0.334	-			
TOTAL	37	5	5,989,868	6.177	0.835			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1958
Country: Netherlands

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

Coalfield: Limburg

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	86	17		1.326	0.262	1	-	7
2) Haulage and transport	98	5		1.511	0.077	-	-	-
3) Movement of personnel	21	-		0.324	-	-	-	-
4) Machinery, handling of tools and supports	40	1		0.617	0.015	-	-	-
5) Falling objects	26	-		0.401	-	-	-	-
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	-	-		-	-	-	-	-
12) Other causes	17	-		0.262	-	-	-	-
TOTAL	288	23	64,851,784	4.441	0.355	1	-	7

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

II. COMMON STATISTICAL SUMMARY

OF

UNDERGROUND ACCIDENTS

AT MINES

IN 1959

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1959
Country: Germany, Land North Rhine/Westphalia
Coalfield: Ruhr

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	2,437	145		4.768	0.284	1	-	7
2) Haulage and transport	1,306	88		2.555	0.172	-	-	-
3) Movement of personnel	1,307	59		2.557	0.115	-	-	-
4) Machinery, handling of tools and supports	488	15		0,955	0.029	-	-	-
5) Falling objects	1,374	26		2.689	0.051	-	-	-
6) Explosives	3	2		0.006	0.004	-	-	-
7) Explosions of firedamp or coal dust	-	-		-	-	-	-	-
8) Sudden outbursts of firedamp, suffocation by natural gases	-	1		-	0.002	-	-	-
9) Underground combustion and fires	-	2		-	0.004	-	-	-
10) Inrushes of water	-	2		-	0.004	-	-	-
11) Electricity	4	5		0,008	0.010	-	-	-
12) Other causes	293	15		0.573	0,029	-	-	-
TOTAL	7,212	360	511,102,335	14.111	0.704	1	-	7

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year:1959
Country:Germany, Land North Rhine/Westphalia
Coalfield:Aachen

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	170	17		4.088	0.409	-	-	-
2) Haulage and transport	114	10		2.741	0.240	1	8	-
3) Movement of personnel	78	3		1.876	0.072	-	-	-
4) Machinery, handling of tools and supports	20	2		0.481	0.048	-	-	-
5) Falling objects	81	-		1.948	-	-	-	-
6) Explosives	2	-		0.048	-	-	-	-
7) Explosions of firedamp or coal dust	-	6		-	0.144	1	-	6
8) Sudden outbursts of firedamp, suffocation by natural gases	-	1		-	0.024	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	1	-		0.024	-	-	-	-
12) Other causes	11	1		0.265	0.024	-	-	-
TOTAL	477	40	41,585,700	11.470	0.962	2	8	6

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: Germany, Land North Rhine/Westphalia
Coalfield: Ibbenbüren

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	23	6		2.238	0.584	-	-	-
2) Haulage and transport	16	2		1.557	0.194	-	-	-
3) Movement of personnel	14	-		1.362	-	-	-	-
4) Machinery, handling of tools and supports	5	-		0.487	-	-	-	-
5) Falling objects	14	-		1.362	-	-	-	-
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	1	-		0.098	-	-	-	-
12) Other causes	16	-		1.557	-	-	-	-
TOTAL	89	8	10,276,374	8.661	0.778	-	-	-

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: Germany, Land North Rhine/Westphalia
All coalfields

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	2,630	168		4.672	0.298	1	-	7
2) Haulage and transport	1,436	100		2.551	0.178	1	8	-
3) Movement of personnel	1,399	62		2.458	0.110	-	-	-
4) Machinery, handling of tools and supports	513	17		0.911	0.030	-	-	-
5) Falling objects	1,469	26		2.610	0.046	-	-	-
6) Explosives	5	2		0.009	0.003	-	-	-
7) Explosions of firedamp or coal dust	-	6		-	0.011	1	-	6
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.003	-	-	-
9) Underground combustion and fires	-	2		-	0.003	-	-	-
10) Inrushes of water	-	2		-	0.003	-	-	-
11) Electricity	6	5		0.011	0.009	-	-	-
12) Other causes	320	16		0.568	0.028	-	-	-
TOTAL	7,778	408	562,964,409	13.816	0.725	3	8	13

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: Saar

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS AT MINES IN THE E.C.S.C. COUNTRIES

Coalfield: Saar

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	418	17		5.591	0.227	-	-	--
2) Haulage and transport	202	7		2.702	0.094	-	-	-
3) Movement of personnel	172	-		2.300	-	-	-	-
4) Machinery, handling of tools and supports	70	-		0.936	-	-	-	-
5) Falling objects	265	-		3.544	-	-	-	-
6) Explosives	2	-		0.027	-	-	-	-
7) Explosions of firedamp or coal dust	10	2		0.134	0.027	1	5	2
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-		-	-	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	3	-		0.040	-	-	-	-
12) Other causes	13	-		0.174	-	-	-	-
TOTAL	1,155	26	74,769,582	15.447	0.384	1	5	2

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1959
Country: Germany, Land North Rhine/Westphalia plus Saar
All coalfields

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	3,048	185		4.779	0.290	1	-	7
2) Haulage and transport	1,638	107		2.569	0.169	1	8	-
3) Movement of personnel	1,571	62		2.463	0.097	-	-	-
4) Machinery, handling of tools and supports	583	17		0.914	0.027	-	-	-
5) Falling objects	1,734	26		2.719	0.041	-	-	-
6) Explosives	7	2		0.011	0.003	-	-	-
7) Explosions of firedamp or coal dust	10	8		0.016	0.012	2	5	8
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.003	-	-	-
9) Underground combustion and fires	-	2		-	0.003	-	-	-
10) Inrushes of water	-	2		-	0.003	-	-	-
11) Electricity	9	5		0.014	0.008	-	-	-
12) Other causes	333	16		0.522	0.025	-	-	-
TOTAL	8,933	434	637,733,991	14.007	0.680	4	13	15

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1959
Country: Belgium
Coalfield: Charleroi/Namur

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	225	14	Including lowering and raising time	6,508	0.405			
2) Haulage and transport	142	6		4.107	0.173			
3) Movement of personnel	48	1		1.388	0.029			
4) Machinery, handling of tools and supports	93	1		2.690	0.029			
5) Falling objects	13	-		0.376	-			
6) Explosives	1	-		0.029	-			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.058			
9) Underground combustion and fires	-	-		-	-			
10) Inrushes of water	-	-		-	-			
11) Electricity	-	-		-	-			
12) Other causes	10	-		0.289	-			
TOTAL	532	24	34,573,888	15.387	0.694			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: Belgium
Coalfield: Liège

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	136	5	Including lowering and raising time	4.470	0.164			
2) Haulage and transport	74	3		2.432	0.099			
3) Movement of personnel	32	1		1.052	0.033			
4) Machinery, handling of tools and supports	45	-		1.479	-			
5) Falling objects	12	-		0.394	-			
6) Explosives	-	-		-	-			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-		-	-			
9) Underground combustion and fires	-	1		-	0.033			
10) Inrushes of water	-	-		-	-			
11) Electricity	-	-		-	-			
12) Other causes	16	-		0.526	-			
TOTAL	315	10	30,424,312	10.353	0.329			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1959
Country: Belgium

Coalfield: Borinage

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	120	6	Including lowering and raising time	6.500	0.326			
2) Haulage and transport	87	3		4.712	0.162			
3) Movement of personnel	22	2		1.192	0.108			
4) Machinery, handling of tools and supports	80	-		4.333	-			
5) Falling objects	9	-		0.487	-			
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	-	-		-	-			
12) Other causes	4	-		0.217	-			
TOTAL	322	11	18,461,800	17.441	0.596			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1959
Country: Belgium
Coalfield: Centre

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	69	2	Including lowering and raising time	4.633	0.134			
2) Haulage and transport	61	2		4.096	0.134			
3) Movement of personnel	27	-		1.813	-			
4) Machinery, handling of tools and supports	37	-		2.485	-			
5) Falling objects	13	-		0.873	-			
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	-	-		-	-			
12) Other causes	2	-		0.134	-			
TOTAL	209	4	14,892,104	14.034	0.268			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: Belgium
Coalfield: South

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	550	27	Including lowering and raising time	5.592	0.275			
2) Haulage and transport	364	14		3.701	0.142			
3) Movement of personnel	129	4		1.312	0.041			
4) Machinery, handling of tools and supports	255	1		2.593	0.010			
5) Falling objects	47	-		0.478	-			
6) Explosives	1	-		0.010	-			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.020			
9) Underground combustion and fires	-	1		-	0.010			
10) Inrushes of water	-	-		-	-			
11) Electricity	-	-		-	-			
12) Other causes	32	-		0.325	-			
TOTAL	1,378	49	98,352,104	14.011	0.498			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: Belgium
Coalfield: Campine

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	74	4	Including lowering and raising time	1.575	0.085			
2) Haulage and transport	69	4		1.469	0.085			
3) Movement of personnel	16	-		0.340	-			
4) Machinery, handling of tools and supports	48	1		1.022	0.021			
5) Falling objects	7	-		0.149	-			
6) Explosives	-	2		-	0.043			
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	-	-		-	-			
12) Other causes	5	-		0.106	-			
TOTAL	219	11	46,981,440	4.661	0.234			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1959
Country: Belgium
Coalfield: All coalfields

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	624	31	Including lowering and raising time	4.294	0.213			
2) Haulage and transport	433	18		2.979	0.124			
3) Movement of personnel	145	4		0.398	0.027			
4) Machinery, handling of tools and supports	303	2		2.085	0.014			
5) Falling objects	54	-		0.371	-			
6) Explosives	1	2		0.007	0.014			
7) Explosions of firedamp or coal dust	-	-		-	-			
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.014			
9) Underground combustion and fires	-	1		-	0.007			
10) Inrushes of water	-	-		-	-			
11) Electricity	-	-		-	-			
12) Other causes	37	-		0.255	-			
TOTAL	1,597	60	145,333,544	10.989	0.413	0	0	0

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: France
Coalfield: Nord/Pas-de-Calais

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties: Disablements as under (a) below	Number of casualties: Fatalities as under (b) below	Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below: Number of accidents	Group accidents: Number of disablements as under (a)	Group accidents: Number of fatalities as under (b)
1) Falls of ground	802	27		5.021	0.169	-	-	-
2) Haulage and transport	272	13		1.703	0.082	-	-	-
3) Movement of personnel	130	1		0.814	0.006	-	-	-
4) Machinery, handling of tools and supports	133	9		0.833	0.057	-	-	-
5) Falling objects	360	--		2.254	-	-	-	-
6) Explosives	3	-		0.019	-	-	-	-
7) Explosions of firedamp or coal dust	-	-		-	-	-	-	-
8) Sudden outbursts of firedamp, suffocation by natural gases	-	4		-	0.025	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	-	1		-	0.006	-	-	-
12) Other causes	366	1		2.291	0.006	-	-	-
TOTAL	2,066	56	159,718,851	12.935	0.351	-	-	-

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1959
Country: France
Coalfield: Centre/Midi (less Provence)

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	286	11		4.724	0.183	-	-	-
2) Haulage and transport	132	3		2.180	0.050	-	-	-
3) Movement of personnel	118	-		1.949	-	-	-	-
4) Machinery, handling of tools and supports	94	1		1.553	0.016	-	-	-
5) Falling objects	152	-		2.511	-	-	-	-
6) Explosives	9	3		0.149	0.050	-	-	-
7) Explosions of firedamp or coal dust	1	2		0.017	0.033	-	-	-
8) Sudden outbursts of firedamp, suffocation by natural gases	-	1		-	0.016	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	-	1		-	0.016	-	-	-
12) Other causes	319	1		5.267	0.016	-	-	-
TOTAL	1,111	23	60,544,438	18.350	0.380	-	-	-

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: France

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS
AT MINES IN THE E.C.S.C. COUNTRIES

Coalfield: Lorraine

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	181	14		3.497	0.270	-	-	-
2) Haulage and transport	57	7		1.101	0.135	-	-	-
3) Movement of personnel	56	4		1.082	0.077	-	-	-
4) Machinery, handling of tools and supports	51	1		0.985	0.019	-	-	-
5) Falling objects	83	2		1.603	0.039	-	-	-
6) Explosives	2	4		0.039	0.077	-	-	-
7) Explosions of firedamp or coal dust	23	31		0.444	0.599	2	23	31
8) Sudden outbursts of firedamp, suffocation by natural gases	-	2		-	0.039	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	-	1		-	0.019	-	-	-
12) Other causes	68	6		1.314	0.116	-	-	-
TOTAL	521	72	51,765,240	10.065	1.390	2	23	31

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: France
All coalfields
(less Provence)

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	1,269	52		4.665	0.192	-	-	-
2) Haulage and transport	461	23		1.695	0.085	-	-	-
3) Movement of personnel	304	5		1.118	0.018	-	-	-
4) Machinery, handling of tools and supports	278	11		1.022	0.040	-	-	-
5) Falling objects	595	2		2.187	0.007	-	-	-
6) Explosives	14	7		0.051	0.026	-	-	-
7) Explosions of firedamp or coal dust	24	33		0.088	0.121	2	23	31
8) Sudden outbursts of firedamp, suffocation by natural gases	-	7		-	0.026	-	-	-
9) Underground combustion and fires	-	-		-	-	-	-	-
10) Inrushes of water	-	-		-	-	-	-	-
11) Electricity	-	3		-	0.011	-	-	-
12) Other causes	753	8		2.768	0.029	-	-	-
TOTAL	3,698	151	272,028,529	13.594	0.555	2	23	31

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

Year: 1959
Country: Italy
Coalfield: Sulcis

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS AT MINES IN THE E.C.S.C. COUNTRIES

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	7	-	Including lowering and raising time	1.378	-			
2) Haulage and transport	5	1		0.984	0.197			
3) Movement of personnel	2	-		0.394	-			
4) Machinery, handling of tools and supports	5	-		0.984	-			
5) Falling objects	10	1		1.968	0.197			
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	-	-		-	-			
12) Other causes	3	-		0.591	-			
TOTAL	32	2	5,079,802	6.299	0.394	0	0	0

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMMON STATISTICAL SUMMARY OF UNDERGROUND ACCIDENTS

AT MINES IN THE E.C.S.C. COUNTRIES

Year: 1959
Country: Netherlands

Coalfield: Limburg

CAUSE	Number of casualties		Man-hours worked	Number of disablements as under (a) per million man-hours (to third decimal place)	Number of fatalities as under (b) per million man-hours (to third decimal place	Group accidents as under (c) below		
	Disablements as under (a) below	Fatalities as under (b) below				Number of accidents	Number of disablements as under (a)	Number of fatalities as under (b)
1) Falls of ground	91	4		1.464	0.064			
2) Haulage and transport	97	9		1.562	0.145			
3) Movement of personnel	24	-		0.386	-			
4) Machinery, handling of tools and supports	25	1		0.402	0.016			
5) Falling objects	32	1		0.515	0.016			
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	-	-		-	-			
12) Other causes	10	-		0.161	-			
TOTAL	279	15	62,137,576	4.490	0.241			

(a) Casualties were unable to resume work below ground for a least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).

COMPARATIVE TABLE

OF COMMON STATISTICAL SUMMARIES

1958 and 1959

Comparative table

of numbers of persons incapacitated for eight weeks or longer,

1958 and 1959

per million man-hours

Cause	Germany (N.R./Wph. + Saar)		Belgium		France (less Provence)		Italy		Netherlands		Community	
	1958	1959	1958	1959	1958	1959	1958	1959	1958	1959	1958	1959
1) Falls of ground	4.843	4.779	5.911	4.294	5.027	4.665	1.335	1.378	1.326	1.464	4.846	4.490
2) Haulage and transport	2.550	2.569	4.132	2.979	1.980	1.695	1.335	0.984	1.511	1.562	2.602	2.347
3) Movement of personnel	2.497	2.463	1.354	0.998	1.505	1.118	0.668	0.394	0.324	0.386	2.003	1.823
4) Machinery, handling of tools and supports	0.767	0.914	2.804	2.085	0.914	1.022	1.169	0.984	0.617	0.402	1.098	1.064
5) Falling objects	2.537	2.719	0.414	0.371	1.890	2.187	1.169	1.968	0.401	0.515	1.962	2.161
6) Explosives	0.015	0.011	0.027	0.007	0.043	0.051	0.167	-	-	-	0.023	0.020
7) Explosions of firedamp	0.011	0.016	-	-	0.047	0.088	-	-	-	-	0.017	0.030
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-	0.011	-	0.004	-	-	-	-	-	0.002	-
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-	-	-	-
10) Inrushes of water	0.004	-	-	-	-	-	-	-	-	-	0.002	-
11) Electricity	0.010	0.014	0.011	-	0.014	-	-	-	-	-	0.010	0.008
12) Other causes	0.487	0.522	0.260	0.255	2.956	2.768	0.334	0.591	0.262	0.161	0.985	1.012
TOTAL	13.721	14.007	14.924	10.989	14.380	13.594	6.177	6.299	4.441	4.490	13.551	12.954

Comparative table

of accidents resulting in death within eight weeks

1958 and 1959

per million man-hours

CAUSE	Germany (N.R./Wph. + Saar)		Belgium		France (less Provence)		Italy		Netherlands		Community	
	1958	1959	1958	1959	1958	1959	1958	1959	1958	1959	1958	1959
1) Falls of ground	0.268	0.290	0.223	0.213	0.235	0.192	0.167	-	0.262	0.064	0.253	0.242
2) Haulage and transport	0.179	0.169	0.101	0.124	0.115	0.085	-	0.197	0.077	0.145	0.147	0.141
3) Movement of personnel	0.094	0.097	0.011	0.027	0.007	0.018	-	-	-	-	0.057	0.063
4) Machinery, handling of tools and supports	0.010	0.027	0.005	0.014	0.018	0.040	-	-	0.015	0.016	0.011	0.028
5) Falling objects	0.065	0.041	0.016	-	0.025	0.007	-	0.197	-	0.016	0.045	0.027
6) Explosives	0.009	0.003	0.011	0.014	-	0.026	0.501	-	-	-	0.009	0.010
7) Explosions of firedamp or coal dust	0.011	0.012	-	-	0.115	0.121	-	-	-	-	0.032	0.036
8) Sudden outbursts of firedamp, suffocation by natural gases	0.005	0.003	0.016	0.014	0.043	0.026	0.167	-	-	-	0.016	0.010
9) Underground combustion and fires	-	0.003	-	0.007	-	-	-	-	-	-	-	0.003
10) Inrushes of water	-	0.003	0.011	-	-	-	-	-	-	-	0.002	0.002
11) Electricity	0.022	0.008	0.021	-	-	0.011	-	-	-	-	0.016	0.007
12) Other causes	0.025	0.025	0.005	-	0.036	0.029	-	-	-	-	0.023	0.021
TOTAL	0.687	0.680	0.420	0.413	0.594	0.555	0.835	0.394	0.355	0.241	0.610	0.590

Comparative table of underground group accidents (see (c) below),

1958 and 1959

CAUSE	Germany (N.R./Wph. + Saar)						Belgium						France (less Provence)						Italy						Netherlands						Community					
	1958			1959			1958			1959			1958			1959			1958			1959			1958			1959			1958			1959		
	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	N	a	b	N	a	b
1) Falls of ground	-	-	-	1	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	7	-	-	-	1	-	7	1	-	7
2) Haulage and transport	1	7	-	1	8	-	-	-	-	-	-	-	1	-	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	7	11	1	8	-
3) Movement of personnel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4) Machinery, handling of tools and supports	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5) Falling objects	1	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	5	-	-	-
6) Explosives	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7) Explosions of firedamp or coal dust	1	7	8	2	5	8	-	-	-	-	-	-	2	13	32	2	23	31	-	-	-	-	-	-	-	-	-	-	-	-	3	20	40	4	28	39
8) Sudden outbursts of firedamp, suffocation by natural gases	-	-	-	-	-	-	-	-	-	-	-	-	1	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	9	-	-	-
9) Underground combustion and fires	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10) Inrushes of Water	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11) Electricity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12) Other causes	1	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	5	-	-	-
TOTAL	4	14	18	4	13	15	-	-	-	-	-	-	4	13	52	2	23	31	-	-	-	-	-	-	1	-	7	-	-	-	9	27	77	6	36	46

(a) Casualties were unable to resume work below ground for at least eight weeks.
(b) Casualties died within eight weeks.
(c) Accidents involving more than five casualties of types (a) and/or (b).
(N) Number of group accidents.

ANNEX A

INFORMATION REPORT

on the establishment of criteria for fire-resistant fluids used for power transmission (hydraulic fluids) and on the tests to be carried out for that purpose

CONTENTS

INFORMATION REPORT

on the establishment of criteria for fire-resistant fluids used for power transmission (hydraulic fluids) and on the tests to be carried out for that purpose.

In Recommendation 36 - M of the Conference on Safety in Coal Mines it is stated that :

"Research should be continued with the object of developing incombustible fluids to be used in place of inflammable oils for mechanical purposes, e.g. in hydraulic equipment, couplings, tub-decking plant, props, etc."

(Page 150 of the Conference Report).

The Working Party on Fires and Underground Combution, which was directed by the Mines Safety Commission to investigate this problem, set up at its Fourth Meeting on November 23, 1958, a Committee of Experts for this purpose and instructed this Committee to work out criteria for fire-resistant fluids of this kind and for appropriate tests.

In accordance with these instructions the types of fire-resistant hydraulic fluids suitable for use in the following devices and apparatus were studied:

1. Hydraulically-operated apparatus
   a) with mechanical pumps,
   b) without mechanical pumps.
2. Hydraulic couplings

Lubricants, e.g. for gears, compressors, diesel engines, ropes, guides, transformers, etc. were not dealt with.

In detail the folloving criteria and tests can be recommended :

1. CRITERIA FOR FIRE-RESISTANCE

The fire-resistant characteristics of the fluid were determined by tests a) to c) :

a) Spray ignition test over a flame

This test is used as a matter of routine in the aviation industry to determine non-flammability. The lubricant to be tested is atomized under a pressure of 70 kg/sq.cm.; the atomized jet is then directed on to an oxy-acetylene flame calibrated to correspond to a standard flame. Operating conditions are described in Appendix I.

b) Flame-propagation test in a mixture of the fluid with coal dust

By this test the propagation of a flame is measured on a mixture of 75% by vol. of coal dust and 25% by vol. of fluid, a test piece 250 mm. long, 20 mm. broad and 2 mm. thick being held in a Bunsen-burner flame of 1,000 °C. temperature to heat the extreme end of the test piece. When the latter flares up, the flame should not spread markedly beyond the zone of effect of the Bunsen-burner flame. Operating conditions are described in Annex II.

c) Auto-ignition test

Hydraulic couplings are protected against overloads by a fusible plug, which melts at approximately 140°C.. When the fusible plug melts, the pressure of the fluid generally produces a ragged outlet orifice, which favours oxidation of the jet accompanied by the formation of peroxides. If the fluid used is flammable, the peroxides undergo auto-ignition at 120°C. Hydraulic couplings can therefore constitute a potential source of fire. A device was developed which makes it possible to test whether the fluid used in the coupling can ignite under the conditions obtaining when a fusible plug melts. The test procedure, and the plan of the apparatus are described in Annex III.

2. HEALTH CRITERIA

The manufacturers of non-flammable fluids must provide a medical report certifying that their product is harmless. This requires the fulfilment of the following conditions:

a) Under the normal conditions of use and dilution, the product must not cause any harmful effects on the skin, mucous membranes of the eyes, nose or throat (it is well-known that e.g. parasubstituted aromatic compounds, hydrazine and chlorine derivatives can cause such effects);

b) the pH value must not be above 10, bearing in mind the tolerance of the skin to the product (the pH limit values in respect of metal corrosion are 6.5 and 10);

c) inhalation of vapours or aerosols must not cause either acute or chronic poisoning;

d) even in the event of any possible resorption via the skin or damaged tissues, no poisoning must occur;

e) toxicity tests with phosphate esters must be carried out principally on cats and chickens.

3. TECHNICAL CRITERIA

a) Determination of Flow Tempetature

The flow temperature at which the product again reaches a certain degree of fluidity, once it has passed from the solid state, must lie sufficiently below the lower operating temperature. The flow temperature is determined in accordance with the Franch Standard NFT 60 - 122 of June 1956. The device used and the method of operation are described in Annex IV.

b) Determination of viscosity

The non-flammable fluids must be capable of being pumped in the devices with hydraulic control at operating temperatures which vary, according to the place of use, between -20°C and + 20°C. Consequently, and bearing in mind the various types of pump used, the viscosity at 50° C must lie above some 25 to 30 centistokes and in some cases at about 80 centistoles. The viscosity must be measured at at least three temperatures, namely + 50°C, + 20 °C, ± 0° C and, if required, - 20°C. The viscosity is determined by the use of a viscosimeter and the appropriate thermostats, which are described in Annex V.

c) Determination of vapour pressure

The non-flammable fluids recommanded for use in hydraulic couplings must not exhibit at a temperature of 200°C a higher vapour pressure than that of normal mineral oils at 140°C. Testing must make use of the vapour-pressure device described in Annex VI.

d) <u>Measurement of pH value</u>

To avoid corrosion of metals and in particular of bi-metal combinations, the pH value of the non-flammable fluids must lie between 6.5 and 10. The measurement must be carried out by the method outlined in Annex VII.

e) <u>Determination of shear strength</u>

A test to determine the shear strength is considered necessary. A method for determination has not yet been finally established.

f) <u>Determination of the anti-corrosion action</u>

The anti-corrosion action of the non-flammable fluids is to be determined by the method described in Annex IX, for the following metals: Steel, cadmium steel ,copper, zinc, aluminium, brass.

g) <u>Test to determine the ageing of fluids</u>

The methods for determining the resistance to ageing of

i) fluids containing no water are described in Annex X (A) and

ii) water-containing fluids in Annex X (B).

In determining ageing, the test is carried out at 95°C in the presence of copper and iron as catalysts, oxygen being led in to the fluid continously.

h) <u>Method of determining resistance to swelling of packings and seals</u>

In order to avoid losses of non-flammable fluids through packings and seals, the swelling of the packing or sealing material must not exceed 4%.

The method for determining this swelling of packings and seals is described in Annex XI.

i) <u>Determination of the lubricating value</u>

The provision of adequate lubricating action is intended to eliminate excessive wear. The lubricating action is to be determined with the four-sphere testing apparatus, employing the method of progressive loading.

At the moment attempts are being made to simplify the test method, so that a precise description of the test is not at present available.

k) <u>Determination of tendency to foam formation</u>

Non-flammable fluids should have the lowest possible tendency to form foam. The method of determination is described in Annex XIII.

l) <u>Miscibility and compatibility</u>

For economic reasons it must be possible,

i) to mix, on the basis of <u>miscibility</u>, products of similar composition but of different origin, and

ii) to mix, on the basis of <u>compatibility</u>, a new product with a similar product which has already been in use.

A method for testing these requirements is still in process of being worked out.

m) <u>Determination of emulsion stability</u>

The test for emulsion stability is described in Annex XV.

4. CATEGORIES OF NON-FLAMMABLE FLUIDS AVAILABLE

The fluids available at the present time and falling under the heading of non-flammable fluids can be divided into the following categories:

I.- Mineral-oil emulsions with a high water content and containing additives to improve stability or lubricating value;

II.- Polyethylene glycols in aqueous solution;

III.- Chlorinated hydrocarbons or a mixture of chlorinated hydrocarbons and phosphate esters;

IV.- Phosphate esters.

The Committee of Experts has not yet had an opportunity of drawing up a list of the products at present offered on the open market and which could be subjected to the tests listed above with some reasonable prospect of success. A specification of these products will be drawn up in common accord in the light of tests which are being performed to provide a basis for a preliminary choice, simultaneously in Germany, Belgium and France, the parallel tests being executed with portions from the same samples.

x

x x

Annex I

SPRAY IGNITION TEST WITH A JET ATOMIZED UNDER A PRESSURE OF 70 KG/SQ.CM

PRINCIPLE

The flame of an oxy-acetylene torch is directed on to an atomized jet of the fluid under test. The changes in the flame are observed.

APPARATUS

1. A container for the test fluid under atmospheric pressure, with a minimum capacity of 1 litre.
2. The pressure required for the spray jet is produced by one of the two devices shown in Diagrams A or B (see page 10 a) :

   Diagram A : A pressure device, consisting of a nitrogen cylinder with a pressure-reducing valve set to 70 ± 3 kg/sq.cm.,
   a hydraulic cylinder for the test fluid under pressure,
   a discharge-to-atmosphere vent for the nitrogen and a feed connection to the atomizing spray nuzzle.
   The latter is directly connected to a valve.

   Diagram B : A pressure device, consisting of a pressure pump connected to the atomizing spray nozzle via a metal tube on which are fitted the pressure gauge for checking purposes and a pressure regulator, which forces excess fluid back into the tank.

   The pressure regulator is set at 70 ± 2 kg/sq.cm. The atomizing spray nozzle is connected directly to a valve.

3. A test spray nozzle as shown in the drawing (see diagram). This consists of a disc of hard steel with a 0.4 mm. diameter discharge orifice in the centre; the edges of this orifice are sharp. The disc must present a smooth surface of 10 mm. diameter to the test fluid (see diagram, detail R); the plate with the 0.4 mm. orifice is 1.6 mm. thick. It is advisable to make the disc forming the nozzle easy to remove, to facilitate cleaning, or if necessary, to be able to clear the blocked nozzle without difficulty.
4. An oxy-acetylene torch (800 litres), which must burn with a blue flame adjusted to a length of approximately 100 mm.
5. A metal screen 75 cm. broad and 100 cm. high, set up at right angles to the jet at a distance of 170 to 180 cm. from the nozzle tip.

TEST PROCEDURE

Once the fluid, which must be at a temperature of between + 15°C and + 35 °C, has been put into the tank, the pressure is adjusted to 70 ± 3 kg/sq.cm. The valve of the nozzle is then opened, and an attempt is made to ignite the atomized jet at the mouth of the orifice by means of an oxy-acetylene torch flame held at right angles to the axis of the jet. If the fluid cannot be ignited at the mouth of the orifice, the test is repeated, gradually moving the torch flame away from the tip of the nozzle, to a maximum distance of 1.20 m.

RECORDING OF TEST RESULTS

The results must be recorded as follows :

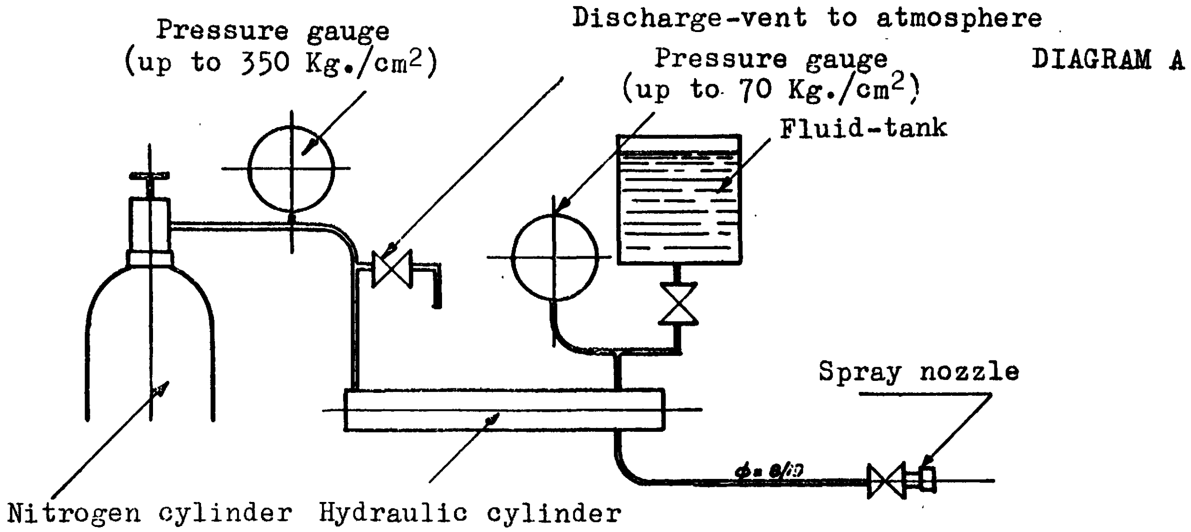
1. no ignition occurs,
2. very slow flame formation,
3. complete flame formation (fluid burns).

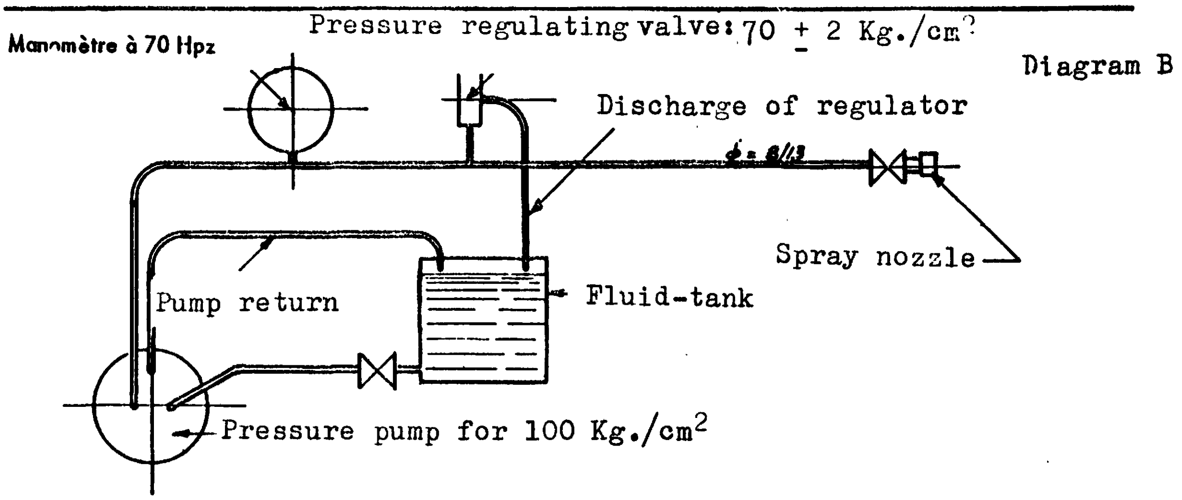
In addition it must be indicated at what distance from the top of the nozzle the flame is carried away by the stream of fluid in the atomized spray jet and whether the flame dies out of its own accord or whether it continues to burn after the torch has been withdrawn.

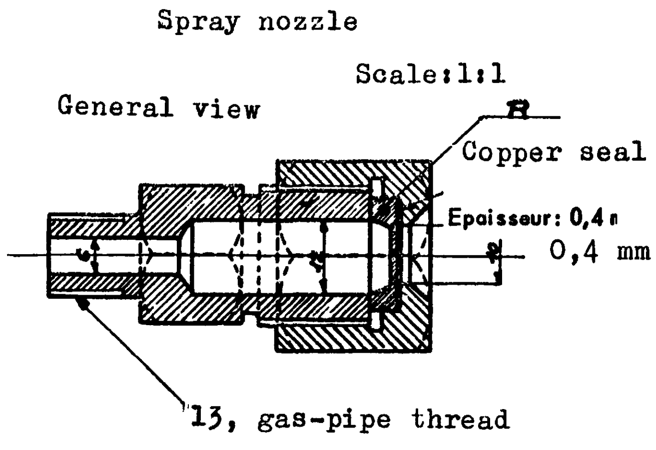
Note : This method is based on the American Method AMS-3150 B. The atomising pressure for the fluid to be tested and the dimensions of the nozzle are the same as in Method AMS-3150 B.

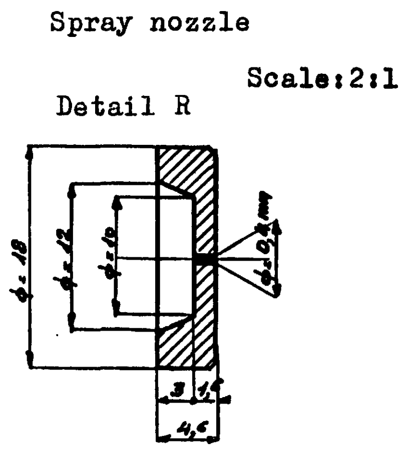
ANNEX I

SPRAY IGNITION TEST









ANNEX II

FLAME-PROPAGATION TEST IN A MIXTURE OF THE FLUID WITH COAL-DUST

PRINCIPLE

The propagation of a flame is measured in a mixture of 75% by vol. of coal-dust and 25% by vol. of fluid. The test is carried out in a room at normal air temperature without artificial ventilation.

APPARATUS

1. Adjustable Bunsen burner (see diagram page 12 c)
2. Ring with 140 mm. internal diameter
3. A stop plate
4. Support for items (2) and (3)
5. Steel plates to carry the test pieces (Page 12 b)
6. Thermo-couple and pyrometer
7. Graduated scale with adjustable support
8. Metal frame for making test pieces (Page 12 b)
9. Slides for making test pieces (Page 12 b)
10. Laboratory timer or stop-watch.

The test piece must be 250 mm. long, 20 mm. broad an 2 mm. thick. The steel plates (5) have a datum mark, to facilitate keeping the length of the sample piece to 250 mm. measured from one end. Correct adjustment of the width is obtained by using the slides (9) the jig for making the test pieces is shown in the attached drawing (see diagram page 12 b), which also illustrates the plates,slides and metal frames used.

The mixture of coal-dust and fluid - which is a mixture by volume - is to be prepared in sufficient quantities to enable at least 5, or if required, 10 tests to be carried out - each with some 120 to 130 cu.cm. - allowing for losses in handling. In the case of mixtures of coal-dust and water it is advisable to add to the water one part per 1,000 of wetting agent. The mixture is prepared by hand in a mortar.

COAL-DUST

The coal-dust used for the tests is drawn from Montrambert coal, prepared by the "Centre d'Etudes et de Recherches des Charbonnages de France"(CHERCHAR) in Verneuil-en-Halatte (Oise) and supplied by them. The average characteristics of this dust were as follows :

Moisture.............................. 1.4%

Ash (dry basis)....................... 9.6%

Volatile matter (dry basis)........... 31 %

Size consist .... 60 to 100 microns.

TEST PROCEDURE

The test mixture for five tests is prepared as described above, one hour before the beginning of the test. Each test piece is attached to a standard ring (2) above a Bunsen burner of a design as per drawing on Page 12c. The longitudinal stop (3) and the stops on the ring hold the test piece accurately in position. The flame must be adjusted to a height of approximately 140 mm.

The temperature of the flamen measured approximately 5 mm. below the ring (2) must be 1000 ± 30°C. The Bunsen burner is set up insuch a way that its axis lies under one end of the test piece (Page 12a); the distance between the tip of the flame and the bottom side of the test piece is 45 mm. A timer or stop-watch is switched on at the moment when the flame is placed under the test piece. After a heating period of 5 minutes the burner is turned off. The factors measured are

1. the spread of the extreme tip of the flame each minute (measured in mm. from the datum mark (7), beginning at the zero line on the scale, which is also the datum mark);
2. the time taken for the flame on the test piece to die out;
3. the farthest distance covered by the tip of the flame;
4. the anomalies : glowing after extinction of the flame, renewed ignition, etc.

Each test with a given fluid consists of five measurements, but each test piece is used once only.

RECORDING OF THE RESULTS

The results obtained are expressed as the arithmetic mean of the five measurements. The tolerance between two successive tests is ± 7% for the same operator.

NOTES

a) In preparing the test piece care must be taken to mix the paste thoroughly.

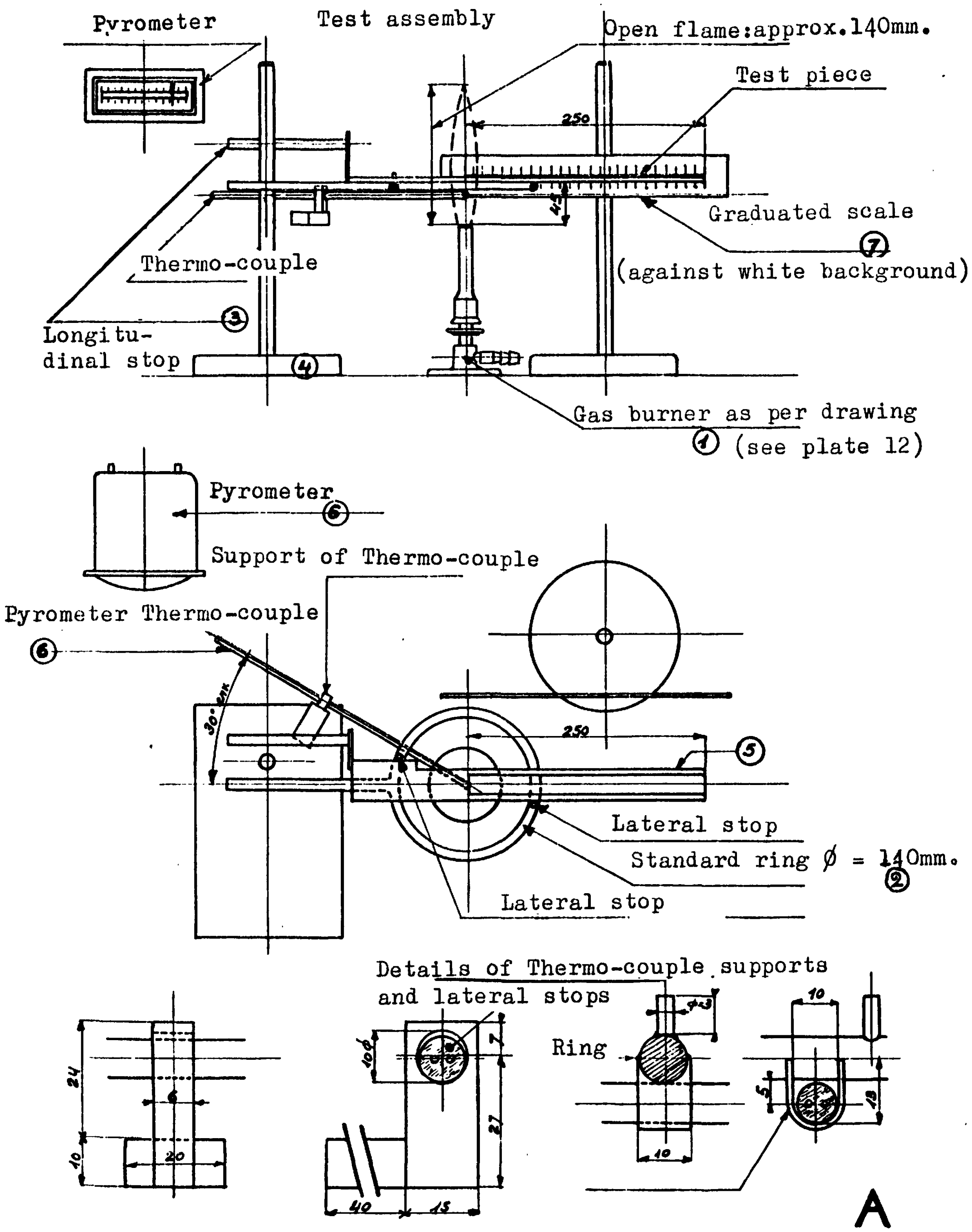
b) The steel support for the test piece is scraped clean after the determination, cooled and used again. Any traces of the earlier sample remaining on the plate are removed with emery cloth No.0..

c) It is advisable to retrace the datum mark with a metal scriber after every 10 or so tests.

ANNEX II

FLAME-PROPAGATION TEST IN A MIXTURE OF THE FLUID WITH COAL-DUST

Scale: approx.1:5

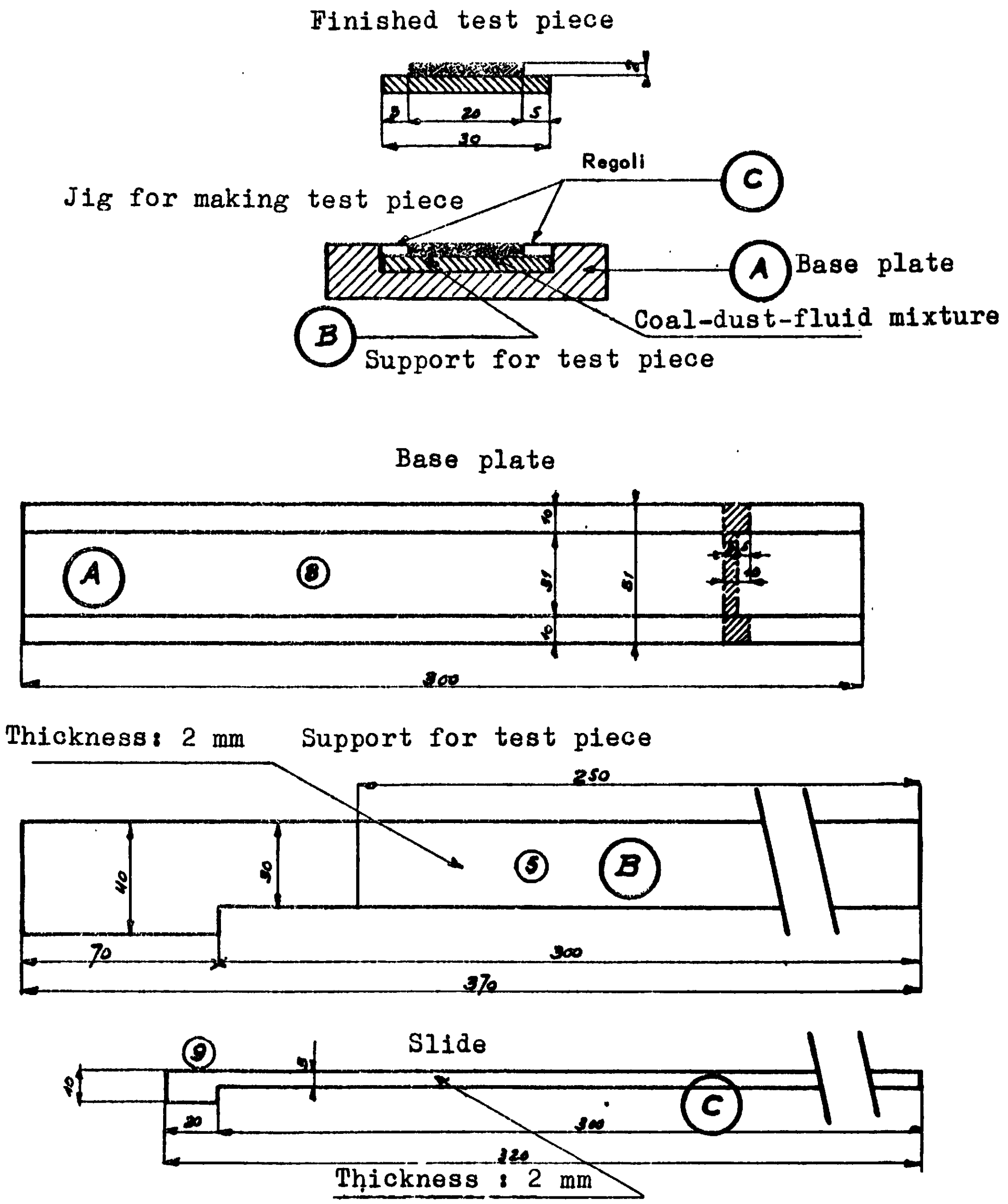


A

ANNEX II

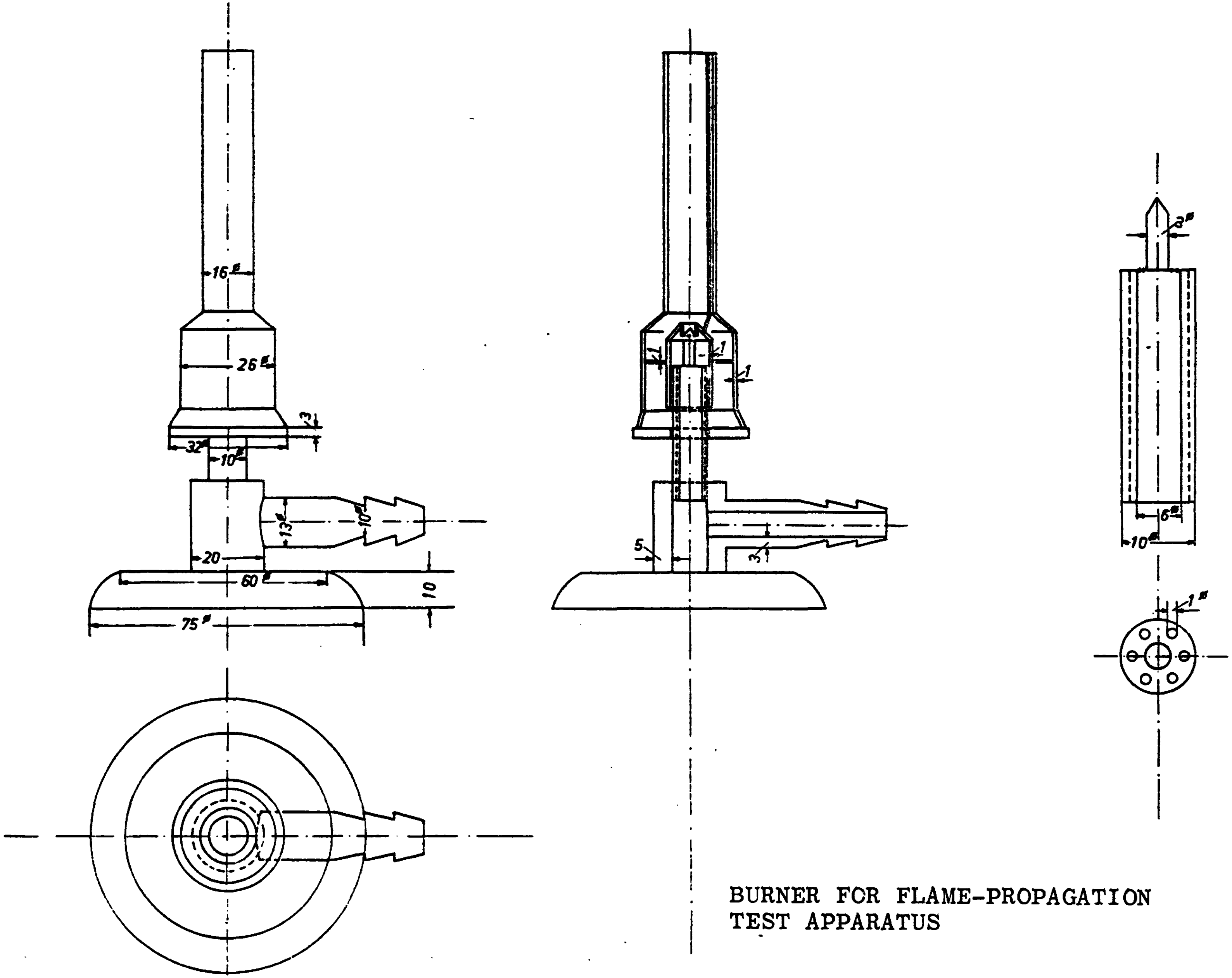
MAKING OF TEST PIECE

Scale: 1:1 and 1:2



B

ANNEX II



BURNER FOR FLAME-PROPAGATION
TEST APPARATUS

ANNEX III

AUTO-IGNITION TEST IN ATMOSPHERIC AIR

I. PRINCIPLE

The object of the test is to determine whether a hot liquid lubricant will undergo auto-ignition on contact with the air, when it is forced under pressure through an orifice in a thin jet, without a flame or a hot point being present. In this determination the test must be carried out under very carefully determined conditions of temperature and pressure.

The test sets out essentially to simulate the release of energy by the hot lubricant when a fusible plug melts. The test is, in principle, carried out only on fluids which do not contain water, but can be applied if necessary to "water-in-oil" emulsions.

II. APPARATUS

The apparatus consists essentially of a heated cylinder containing the fluid to be tested (approximately 250 cu.m.). One end of the cylinder is sealed with a fluid-tight piston, the cavity behind which is filled with a fluid under a pressure of 7 kg/sq.cm. The other end of the cylinder is closed by a fusible plug consisting of an alloy melting at approximately 140°C. The outlet orifice or neck of two concentric cones, whose generating lines are parallel and at a maximum of 1 mm. apart. The inner cone is held in place by a ring of insulating material pierced by eight holes approximately 1 mm. x 6 mm.

By means of an electrical resistance all the surfaces of the cones are brought to the same temperature as the fluid contained in the cylinder. The surface of the outer cone is connected to earth, while the surface of the inner cone is electrically insulated against short circuits.

In addition to the apparatus described above, the test calls for the following devices :

- a device for filling the cylinder with the test fluid;
- an air-discharge vent;
- a pressure regulator with discharge device;
- two pyrometers to measure the temperature of the test fluid and of the oulet orifice (neck);
- the adjustable resistances for the electrical pre-heating devices;
- a device for feeding the fluid under pressure with a pressure gauge for checking.

The apparatus is shown diagrammatically in the accompanying sketch which also includes a section through the neck.

III. PREPARATION OF THE FUSIBLE PLUGS

1. Composition

The plugs are made of a bismuth-tin alloy containing 60% by weight of bismuth and 40% of tin. With cast (not cold-hammered) metal the melting point lies around 140/142°C.

2. Preparation

Starting with the mixture of powdered metals, strips 16 mm. wide and 1 mm. thick are cast in the metal mould shown in the sketch on page 15b; the volume of one such strip is approximately 1.7 cc.

The alloy is cast by placing the filled mould on a heating plate and bringing it up to 180°C. After this casting process the mould is taken off the heating plate to allow the alloy to cool slowly.

3. Cutting the plugs

This is carried out on the jig (mould and punch) shown in the sketch. Six plugs can be cut from one strip.

IV. PREPARATION OF THE TEST

1. Cleaning

The outlet cone (neck) is removed and each individual component thoroughly cleaned. The bottom of the cylinder on which the outled cone rests is also removed, to allow of cleaning the cylinders. For this purpose the piston is pushed back as far as the inlet for the fluid under pressure; this is done with the valve closed, by unscrewing the drain plug of pressure fluid circuit, so that fluid can flow out without any air entering behind the piston.

The air inlet and discharge pipes are rinsed out and cleaned with carbon tetrachloride. It is strongly recommended to use this particular solvent for this purpose.

2. Assembly

The drain plug of pressurized fluid circuit is carefully screwed home again. The bottom of the cylinder is then replaced to the level of the outlet cone (neck) and the fusible plug also refitted. The outlet cone is replaced and fastened; it surrounds the fusible plug and bears on it once it is screwed right home. The neck heater is then connected up and the two pyrometers replaced.

3. Filling

The air inlet valve is opened first, followed by the filling valve. The inlet valve for the fluid under pressure is closed and the piston pushed right back to allow of filling the cylinder. The test fluid is then slowly poured in through the funnel, until it begins to flow out through the air-discharge pipe. After this the filling valve is closed first, followed by the air-discharge valve. The apparatus is now ready for use. The cylinder has a capacity of approximately 250 cc; allowing for the contents of the piping, quantity required for the test samples is about 350 cc.

TEST PROCEDURE

The inlet valve for the fluid under pressure is opened, care being taken to ensure that

1. the pressure of the fluid is, in fact, 7 kg/sq.cm.,
2. the pressure regulator does not allow any of the test fluid to pass.

The electrical preheating device for the test cylinder is now switched on, the heater being adjusted to give a temperature rise of roughly 3°C per minute. The neck heater is then switched on and set accurately to the same heating rate. It is a good sign if a small difference of temperature is observed between the neck and the test fluid, since this ensures that the melting of the plug is brought about by the fluid under test; a lag of some 20°C in the pre-heating temperature of the neck is sufficient.

Once the temperature of the fluid under test has reached 120°C, the rate of heating must be reduced to 2°C per minute, to ensure a continuous temperature equilibrium of the whole apparatus. Above 140 to 145°C the entire apparatus must be observed more closely, so that the temperature at which the fluid under test begins to flow out can be recorded.

The jet of fluid must not ingnite on contact with the air if the lubricant is to be considered as non-flammable. In the case of mineral oils ignition will take place at a distance of 0.20 to 0.30 m. from the tip of the outlet cone. The ignition is best observed against a black background, so that any possible effects can be recorded of the production of static electricity as the fluid passes through the outlet cones.

As soon as the plug has melted, the current for the electrical pre-heating apparatus is switched off.

Auto-ignition is not absolutely certain to occur (90% of cases with mineral oil) and it is therefore necessary to repeat the test five times.

VI. REMARKS

1. Measurement of static electricity produced

If called for, a voltmeter can be connected between the axis supporting the inner cone and the ring of the neck. The terminals are already fitted; the voltmeter must be graduated up to 10 kilovolts.

2. Fusible alloys

It is possible to use with higher melting points than that described under III - 1; the latter is in fact the alloy used for the manufacture of fusible plugs for hydraulic couplings.

The following table indicates the composition of several simple alloys with melting points between 140 and 183°C.

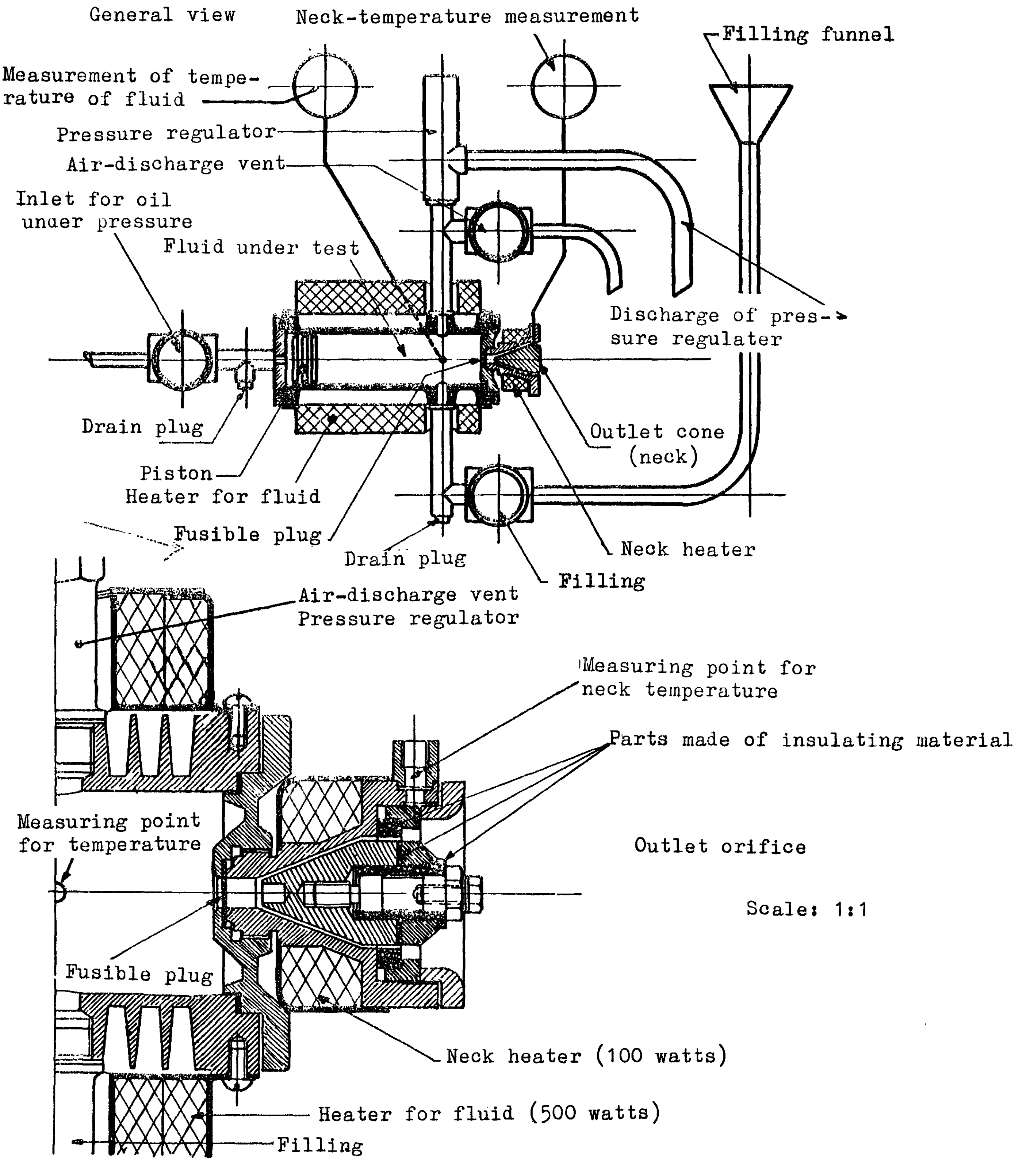
Melting temperature	Alloy Composition			
	Tin	Lead	Bismuth	Zinc
140°	3	-	2	-
144°	3	1	-	-
151°	1	1	-	-
168°	9	2	-	1
183°	1	2	-	-

3. Tests with a smaller outlet orifice

It is possible to intensify the phenomenon, and especially its electrical effects, by using cones and a ring producing a jet of fluid 0.5 mm. in diameter.

ANNEX III

AUTO-IGNITION TEST IN ATMOSPHERIC AIR

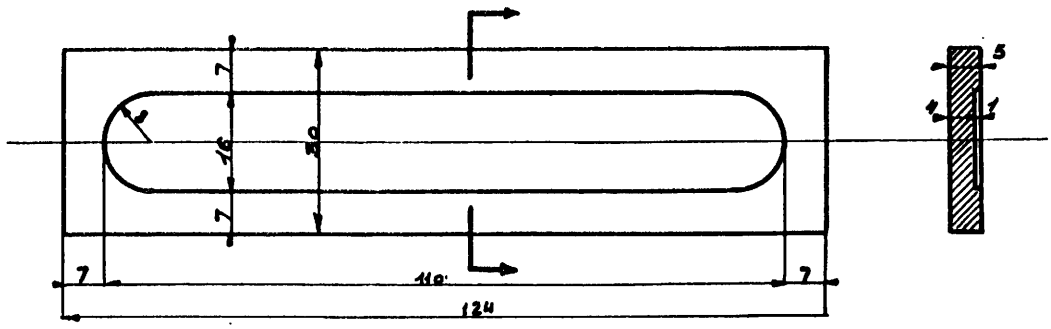


ANNEX III

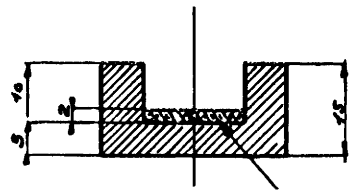
AUTO-IGNITION TEST IN ATMOSPHERIC AIR

Jig for making fusible plugs

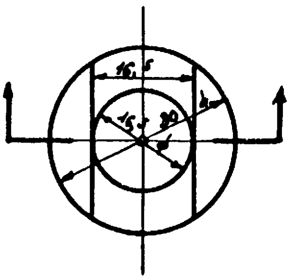
Mould



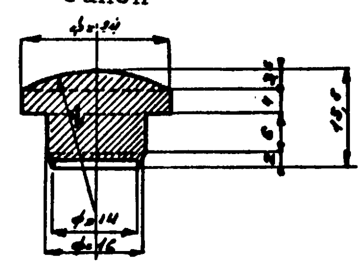
Mould cavity



Red copper disc



Punch



Scale: 1:1

DETERMINATION OF FLOW TEMPERATURE

(French Standard NF T 60 - 122 - June 1956+)

INTRODUCTION REMARKS

With the apparatus used, the flow temperature can be determined from a very thin layer of the lubricant; this precaution is necessary because of the poor conductivity of solidified lubricants; the test is carried out in a heating bath of accurately-known temperature and under thermal conditions which allow for the structural changes ocurring as a result of overheating or cooling and avoid any irregularities which might result from these changes. Variations of temperature between successive tests should, as a general rule, not exceed a few tenths of 1°C.

Particular attention is drawn to the fact that tests to determine the viscosity at low temperatures on the one hand, and tests to determine the flow temperature on the other, are essentially different tests. In each case a special test is used, and the measurement results are valid only for the type of test in which they were obtained

The flow temperature is applicable to all determinations in the low-temperature range. However, this method cannot be recommended for solid or highly viscous products -e.g. petroleum jelly). In this instance Ubbelohde's method (Standard NF T 60-102) is preferable, although the flow temperature method yields more or less equivalent values.

I. PRINCIPLE

The melting temperature is the temperature of the lubricant at which the lubricant, after having been thoroughly and rapidly frozen by suitable treatment and then gradually warmed up again, loses its solidity in such a way that it releases a movable element, which is maintained under constant pressure; this movable element was frozen into the lubricant at the moment of freezing.

II. APPARATUS

The apparatus illustrated in the accompanying diagrams (pages 19a = b) consists of a ring-shaped container (A) (which represents the movable element) for the material to be examined. The dimensions of this container are: Internal diameter between inner walls 15 mm.; internal diameter between outer walls 21 mm.; radial distance between the two walls 3 mm.,wall thickness 0.4 mm.,depth 11 mm., and thickness of the bottom 1.5 mm. This container is fastened to a hollow metal rod (C) by means of a disc pierced at (B) - the rod tapering to a smooth point (D). The vertical metal rod can be inserted in a brass tube serving as a sleeve (E). The brass tube has an internal diameter of 15 mm., an external diameter of 16 mm., and is 234 mm. long; at its lower end is a cylindrical element (F) 17 mm. in internal diameter, 18 mm. in external diameter and 31.5 mm. high, which slides into the ring-shaped container A. The cylinder F is pierced by two orifices (G) which are diametrically opposed; they are 12 mm. high and 5 mm. wide, the bottom of each orifice lies 13.5 mm. above the bottom of the cylinder.

Rod C is set centrally and is maintained in this position with a play of 0.1 mm. in the lower part of the sleeve E by means of a ring (H) and in the upper part by the locking head I. To reduce the conductivity of the metal and to avoid the formation of rime, sleeve E is provided with six pairs of 10 mm. holes, as shown in the diagram; rod C is also perforated, by 17 pairs of holes, each 2,5 mm. in diameter. The middle of the perforated part of rod C bears on the top of locking head I. This makes it possible to inser a pin (J) in whicheven hole in rod C has its edge level with the top of the locking head I, and thereby lock the movable part in the sleeve; a fixed arm (M) with a locking screw at one end holds

+) Published by the Association Française de Normalisation (AFNOR), Paris sleeve E firmly in its vertical position, but is not connected ro rod C nor to container A. The weight of the movable element is calibrated at exactly 20 gr; this movable element moves downwards if not retained. At the beginning of the test there is rigid connection between container A which is filled with frozen fluid and element F which was immersed in the lubricant before the latter was frozen. As soon as the melting process begins, the movable element slides downwards until it reaches its end position fixed by pin J which was removed from its original position after the freezing process and inserted in the last hole of rod C.

The whole apparatus is now immersed in a double-walled vessel containing 0.13 litres of acetone. An alcohol rod thermometer indicates the temperature of this bath. The upper end of rod C can be brought into contact with the highly sensitive feeler L which closes an electric circuit as soon as rod C begins to move downwards, thus making it possible to operate an acoustic signal.

III. TEST PROCEDURE

1.- The fluid under test is maintained for 15 minutes in a water bath at 5C°C.

2.- The test fluid, still warm, is then filled into into the ring-shaped container A of the apparatus, after which rod C is immediately inserted in sleeve E, a process which is facilated by the smooth tip of rod C; the lower end of the sleeve is now placed in the ring-shaped container until it touches the bottom. Any fluid which has spilled over from the ring-shaped container must be dried off. The movable element is arrested by placing the pin in the hole in rod C which lies immediately above locking head I. All these operations must be carried out quickly.

3.- The fluid must now be frozen; this is done by gradually (but without stopping) immersing the lower part of the apparatus in an acetone bath containing a slight excess of carbon dioxide snow. This low degree of saturation with solid carbon dioxide must be maintained for 5 minutes. Moreover, care must be taken to ensure that the vessel containing the cooled acetone remains filled up to the indicator mark (corresponding to approximately 130 cc).

4.- Without removing the ring-shaped container from the bath, the apparatus is now fixed in its stand. The thermometer must be inserted in such a way that its bulb lies at the level of the ring-shaped container. Pin J must then be removed and placed in the uppermost hole of rod C. The temperature of the bath is now allowed to rise of its own accord.

It is not necessary to stir the acetone bath, since the rising bubbles of carbon dioxide produce a continously homogeneous temperature.

5.- At a given moment the ring-shaped container starts to move down under its own weight and thus leaves the stationary sleeve. Immediately this movement begins an electric circuit is closed and an acoustic signal given. The downward movement of the container is checked by the pin J, on the latter's touching the top of the locking head I of the sleeve.

IV. EVALUATION OF TEST RESULTS

The temperature at which the ring-shaped container frees itself from the sleeve is taken to be the normal flow temperature.

If the flow temperature is below -40°C., the test fluid is left in the saturated solution of carbon dioxide snow for 60 minutes, instead of five.

Special case of substances with flow temperatures above 0°C.

If the flow temperature of the test material is above 0°C., the acetone bath will warm up only slowly from this temperature. To counteract this, and also to permit the determination of flow temperatures above room temperature, a heating plate is inserted between the base of the apparatus and the outer vessel. Lamps are used to regulate the intensity of the current in the heating coil under the plate in such a way that the temperature in the acetone bath rises evenly at approximately 0.8°C. per minute.

The procedure is similar to the method of operation indicated above. However, as soon as the temperature in the acetone bath has reached 0°C., the current in the heating plate should be switched on; the test is then continued and, as stated above, the temperature recorded at which the ring-shaped container frees itself completely under the action of its own weight from the sleeve.

V. TESTS TO DETERMINE THE EFFECTS OF LONG EXPOSURE TO COLD

In certain cases the user may wish to apply a cold test, to make quite sure that, down to a given minimum temperature, the fluid will in no circumstances show any signs of paraffin crystallization, will remain sufficienthy liquid and, if solid substances are precipitated, will retain mechanical properties such that the fluid can continue to circulate without difficulty under given conditions.

It is therefore necessary to carry out, for each of these special conditions a separate test in which the fluid is exposed to the required temperature for an appropriate length of time and then tested for the particular property in question.

VI. COOLING TESTS

A quantity of 0.05 litres of the test material, when poured into a glass tube of 15 mm. internal diameter and exposed for two hours to a temperature of -15°C, must not precipitate more than 2 percent by volume of solid matter, the remainder of the fluid remaining absolutely clear. No particles of any appreciable size must remain adhering to the walls of the glass tube.

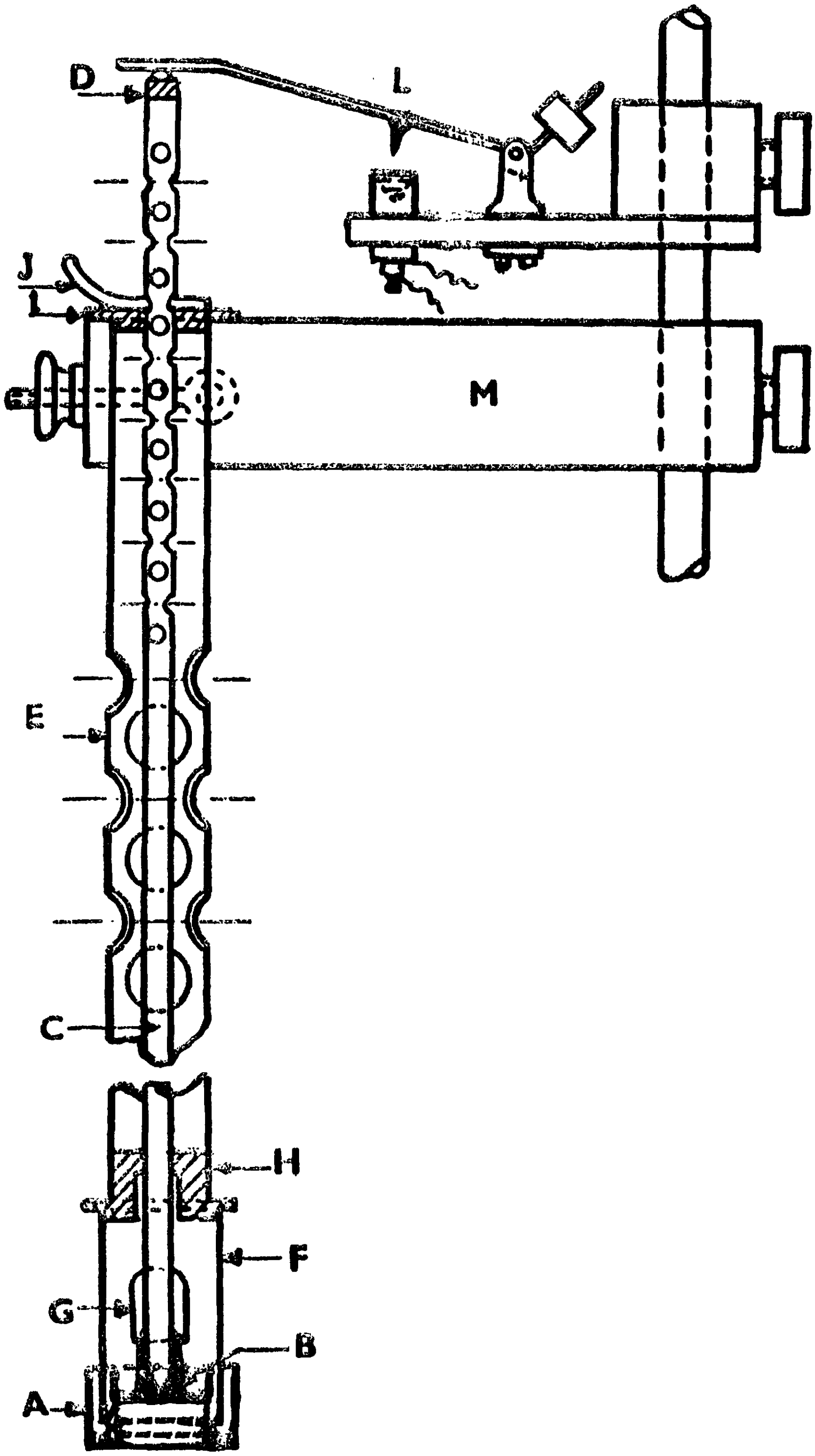
VII. TEST REPORT

For each individual test, all the test conditions must be recorded, as must also any occurrences likely to affect the test result.

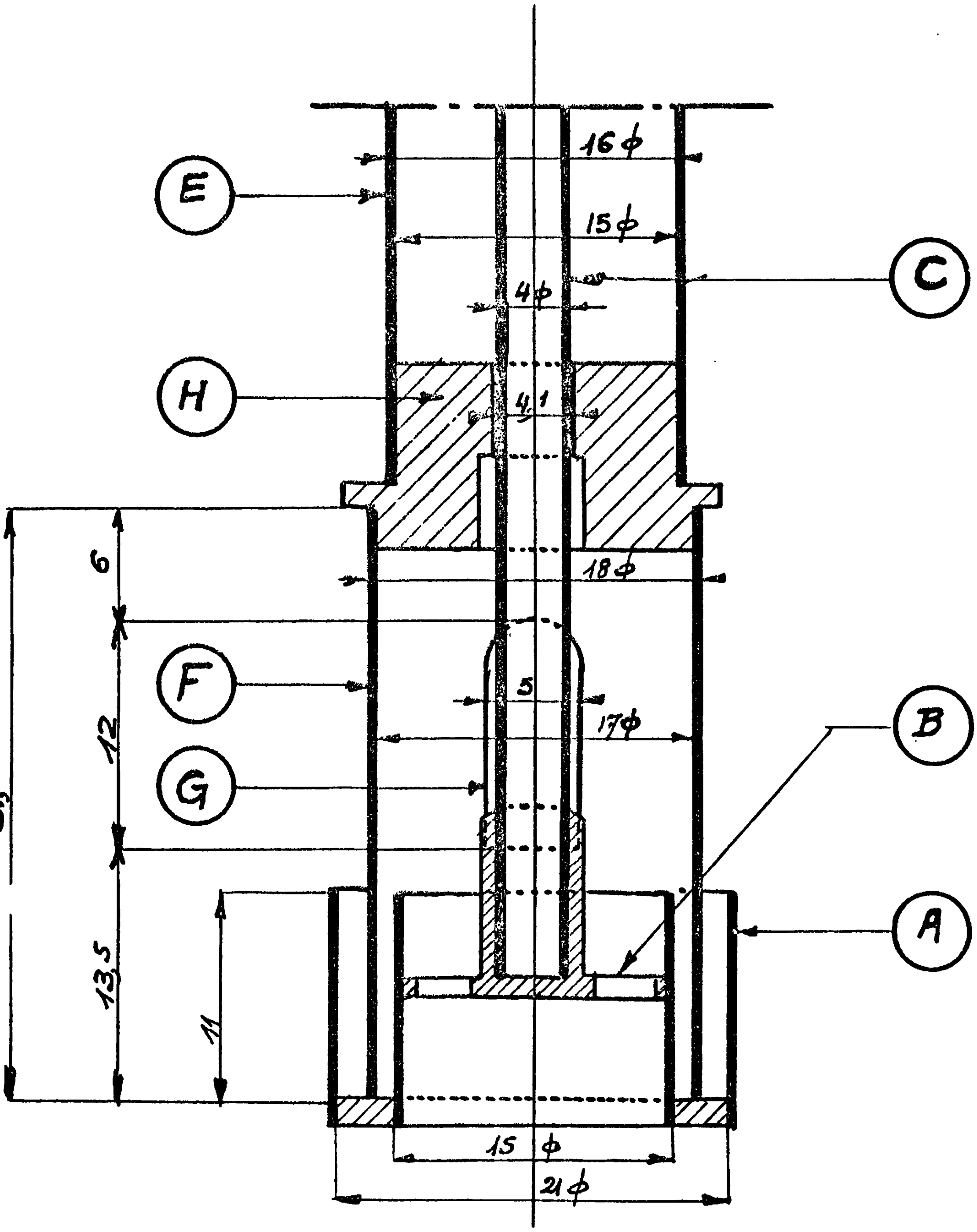
ANNEX IV

APPARATUS FOR MEASURING FLOW TEMPERATURE

(NF - T - 60 122)



ANNEX IV



Scale 2:1

ANNEX V

DETERMINATION OF KINEMATIC VISCOSITY

I.- PRINCIPLE

A tube, calibrated and marked with two measuring marks, is filled with the test fluid. A calibrated sphere is then introduced into the tube and the falling time of the tube between the two measurement marks is recorded. The falling time so recorded can then be used to derive the viscosity by means of the following simple calculation:

N_o = Absolute viscosity of the fluid in centipoises

N_c = Kinematic viscosity of the fluid in centistokes,

K = Calibration for the measurement unit "calibrated tube/drop-sphere employed"

T = Falling time measured in seconds,

D = Density of the sphere at measurement temperature,

d = Density of the test fluid at measurement temperature.

This gives us the formula : $N_o = T \times (D - d) \times K$

$$N_c = \frac{No}{d} = T \times \frac{D - d}{d} \times K$$

DENSITY

The densities inserted in this calculation are the densities at the temperature of measurement; these are normally indicated for + 15°C, although for water the value is that at + 4°C. The required corrections can be applied only for homogeneous fluids, and this applies in only certain special cases with non-flammable fluids. For these fluids direct determination of the density is necessary.

Conversion of the density:

c = Correction coefficient for density for a deviation of 1°C.

D_o= Density at + 15°C

e = Difference between measurement temperature at + 15°C in degrees centigrade.

This gives us: $d = d_o \pm c \times e$

The correction is positive if the measurement temperature lies below + 15°C and negative if it lies above this value.

II.- APPARATUS

- 1. - Viscosimeter

The measurements can be carried out with two types of apparatus based on the same principle, but of different construction:

a) The Höppler viscosimeter, Type BH, with which measurement is carried out in a tube inclined at an angle of 20° to the vertical;

b) The I F C viscosimeter in which the measurement is carried out in a tube inclined at 30° to the vertical.

Since the number of measurement operations possible depends on the number of spheres provided in the individual types of apparatus, the possible measurement ranges are given in the following table:

Spheres	Höppler, Type B H				I F C			
1	0.3	to	3	cst.	1	to	50	cst.
2	3	to	30	cst.	50	to	2,500	cst.
3	25	to	250	cst.	2,500	to	25,500	cst.
4	250	to	2,500	cst.				
5	2,500	to	25,000	cst.				
6	8,000	to	80,000	cst.				

Steel spheres are used in the I F C apparatus, while in the Höppler apparatus Type B H they are made of either steel or glass.

2. - Thermostats

The accuracy of the measurements depends on the accuracy and the constancy of the test temperature. It is virtually essential to operate with a thermostat, whose temperature must be maintained constant.

a) with an accuracy of ± 0.05°C at measurement temperatures below + 20°C;

b) with an accuracy of ± 0.10°C at measurement temperatures below + 20°C.

For a measurement range from - 20°C up to 100°C it is recommended to use two different bath fluids according to the measurement temperature required,

c) purified kerosene (or aviation spirit) for temperatures below + 20°C;

d) pure glycerine or white vaseline oil for temperatures above + 20°C.

3. - Description of the apparatus and method of use

The Höppler apparatus Type BH and the I F C apparatus are diagrammatically illustrated in the accompanying sketches. Detailed descriptions are given in the instructions for use issued by the manufacturers, in the French Standard AFNOR - T 42-011 and in the corresponding German Standard DIN 53015.

III.- MEASUREMENT PROCEDURE

The fluid is poured into the calibrated tube; the sphere is also inserted and the apparatus closed again, once any bubbles which may have formed during filling have been removed. The fluid is brought up to test temperature, and six measurements carried out. The time T quoted in the formula given above is the arithmetic mean of the times recorded during six measurements. These times lie between 25 and 300 seconds.

This condition requires the use of various spheres for the same fluid, and in particular for measurements at temperatures below + 50°C. The tube must be emptied each time a sphere is changed (40 cc. with the Höppler BH apparatus and 30 cc. with the I F C apparatus); in this special case it is not necessary to clean the interior of the calibrated tube.

IV - NOTES

1. Constants K

The constants K are independent of the test temperature. They are determined for a given calibrated tube and a precisely-defined inclination of the tube (30° for the I F C apparatus and 20° for the Höppler BH apparatus). When a calibrated tube or any of the spheres are changed, or when measurements are undertaken at an angle other than 30° (using the I F C apparatus) these constants must be determined anew, using a calibration fluid.

These constants must be indicated in the test report for each individual apparatus.

2. Thixotropic fluids

In the case of thixotropic fluids the measured falling times will become shorter, from the first measurement onwards, until they reach a constant minimum value at the end of the measurement. The figure to be accepted is the minimum time at which the gel disappears. The difference between the first falling time and the minimum time is an index of the thixotropy of the test fluid.

3. Cleaning the calibrated tube and the spheres

The tube is cleaned with solvents and pure ether. In the case of aqueous solutions, cleaning must be carried out by means of a hot solution of soda containing 5 % concentrated ammonia to remove any grease, and then flushed with distilled water.

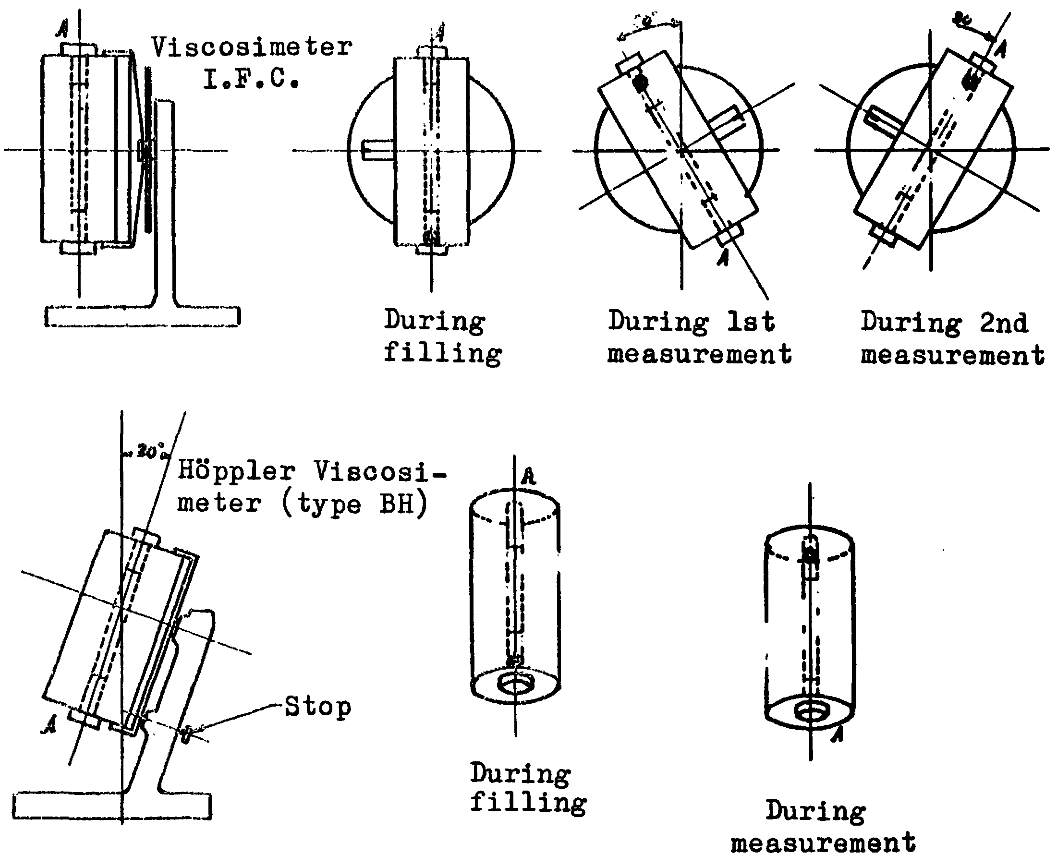
Spheres are to be cleaned with solvents and with ether, and handled with clean tongs to avoid contact with the fingers.

x

x x

ANNEX V

MEASUREMENT OF KINEMATIC VISCOSITY



ANNEX VI

DETERMINATION OF THE VAPOUR PRESSURE OF FLUIDS FOR HYDRAULIC SYSTEMS

I. PRINCIPLE

The vapour pressure of fluids used for hydraulic systems requires to be determined under given conditions at temperatures ranging from room temperature to maximum temperature of utilisation. The highest testing temperature is + 80°C for fluids with a high water content and + 200°C, for fluids not containing water (less than 1 % water). The values for vapour pressure are expressed in kg/cm2.

II. APPARATUS

1. A bomb which can be dismantled,
2. a mercury pressure gauge
3. a thermostat,
4. a thermometer.

1- Dismantleable bomb

The bomb used is derived from the Reid bomb, but constructed in such a way that it can be cleaned easily. It consists of two connecting chambers with the following figures dimensions:

a) Chamber for test fluid

internal diameter 54 mm.

height of the inner cylindrical portion 60 mm;

b) Air chamber

internal diameter 54 mm.

height of the inner cylindrical portion 250 mm.

The two chambers are connected by an intermediate piece with a lateral orifice serving as a vent during filling, and as a level indicator for the test fluid. Above the air chamber is the connecting tube to which the mercury is attached. The thermometer is also attached to this tube; the point at which the thermometer is introduced is sealed off. To make it possible to isolate the bomb, a tight cock is fitted in the connection between the bomb and the mercury gauge.

The volumetric ratio between the air chamber and the fluid chamber is very nearly 4. The diagram on page 26a shows the bomb assembly.

2- Mercury pressure gauge

This pressure gauge corresponds to the accompanying sketch. At the lower end is a tight sealing-off cock by means of which the level of the mercury can be adjusted to the zero point of the gauge. The mercury gauge is connected to the air chamber by a reinforced rubber tube which is not subject to chemical attack, and has an internal diameter of roughly 3 mm. The gauge is provided with a millimetre scale.

3- Thermostat bath

The thermostat bath must be big enough to allow of the completely assembled bomb being immersed in it sufficiently deeply for the upper part of the air chamber to be at least 30 mm. below the level of the fluid bath.

It is preferable to use oil as the bath fluid, to facilitate reaching a temperature of 200°C.

The heating apparatus must be such that a stable temperature can be maintained for each stage of measurement.

4. Temperature-measuring device

Bath

The temperature of the bath in the thermostat should be measured by means of a thermometer with a centigrade scale.

Test fluid

The temperature-measuring device can be either a thermometer with a centigrade scale, or a thermistor pyrometer housed in a cylindrical sleeve with a maximum external diameter of 8 mm.

5. Safety precautions

Each new bomb must be tested for water- and air-tightness, by being subjected to an air pressure of 7 kg/cm^2. No air should escape from the bomb when it is under water.

III. TEST METHOD

1. Preparation of the test

The individual components of the bomb should be thoroughly cleaned, rinsed and dried and then maintained at a temperature of 25°C.

The quantity of fluid required (approximately 160 cc.) for the test must be kept for at least one hour at a temperature of 25°C. $\pm$ 1.

2. Filling the fluid chamber

This chamber is to be filled before it is assembled with the other components. The piece connecting it with the air chamber is then attached; during this operation, it is essential not to forget to remove the screw which closes the air vent. The lower chamber should then be further filled until the fluid reaches the level of the air vent. At this moment the air vent should be closed by means of the screw provided for the purpose; the air chamber is then set in place and the upper orifice closed. The cock at the pressure-measuring point is meanwhile left open, to avoid the occurence of any initial excess pressure in the bomb.

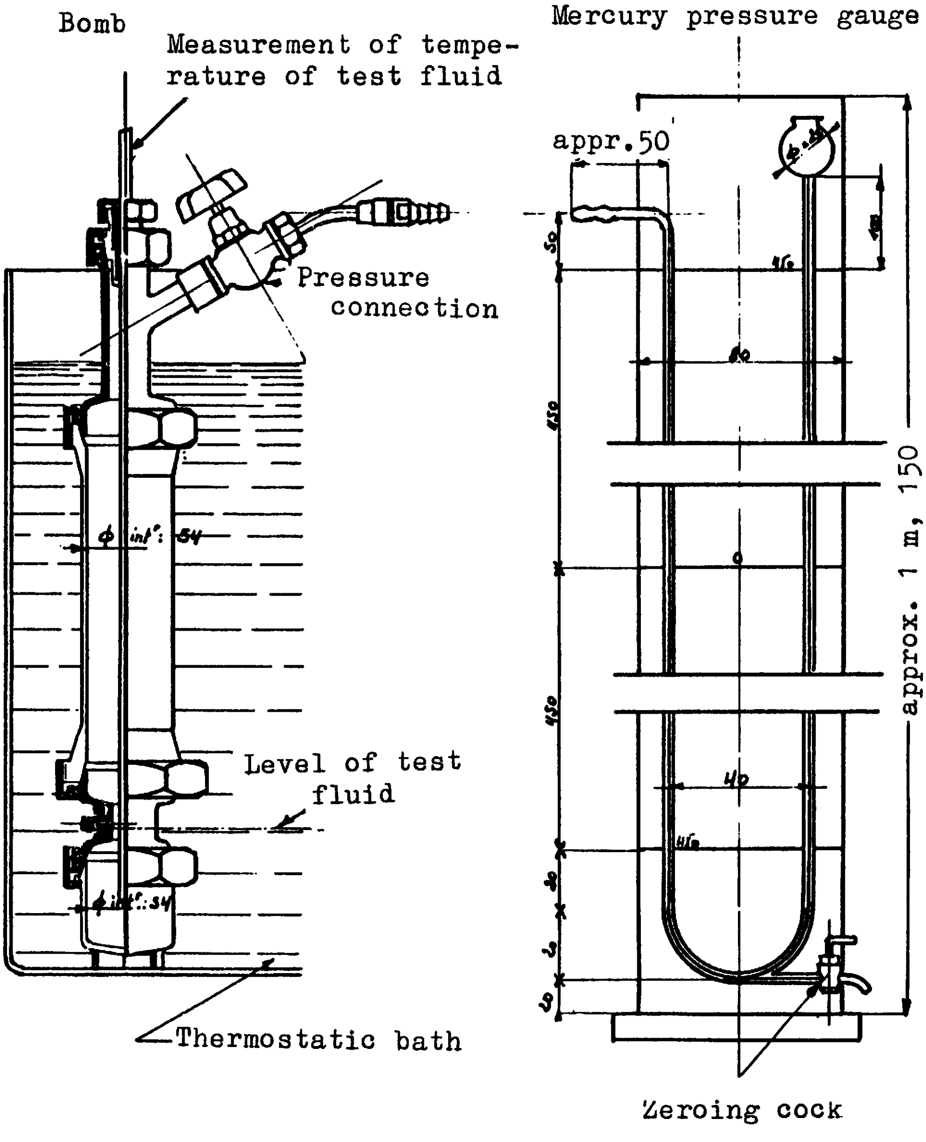
The temperature-measuring device is then attached; the measuring head must lie 30 mm. from the bottom of the lower chamber, in the middle of the test fluid.

3. Test procedure

The bomb is placed in the thermostat which is maintained at a temperature of 25°C $\pm$ 1°C and the mercury gauge connected. When the cock at the pressure-measuring point is open, the mercury gauge must indicate precisely zero. Heating is carried out in stages of 25°C.; measurements are taken at 50, 75, 100, 125, 150, 175 and 200°C. The rate of heating is adjusted so that the temperature rises 1°C per minute within each step of 25°C. In each heating stage the thermostat bath must be capable of keeping the temperature constant within $\pm$ 5 minutes; the pressure should be read at the beginning of this period of 5 minutes and at the end by means of the mercury gauge.

ANNEX VI

VAPOUR PRESSURE



ANNEX VII

DETERMINATION OF pH VALUE

1. FIELD OF APPLICATION

The method serves to determine the degree of acidity (pH value) of water-containing fluids employed in hydraulic systems.

2. PRINCIPLE

The pH value is obtained by means of an electrometric determination of the potential difference between two electrodes plunged into the test fluid. Glass-calomel elctrodes are used. The measurement is carried out at 18°C.

3. APPARATUS AND REAGENTS

a) pH-meter

b) Glass electrode (measurement electrode)

c) Saturated calomel electrode (reference electrode)

d) Buffer solution.

I. Buffer solution pH = 7

1) 1.1876 g. $Na_2\ HPO_4$ + AH_2O in 100 ml. dist. H_2O

2) 2.1008 g. $C_6H_8O_7$ + H_2O (Citric acid) in

20 ml. 1 n - NaOH + 80 ml. dist. H_2O

Mixture: 32.94 ml. solution^1 + 7.06 ml. solution^2

II. Buffer solution pH = 10

1) 1.91 g $Na_2B_4O_7$ + 10 H_2O (borax) in 100 ml.dist. H_2O

2) 0.1 n - NaOH

Mixture: 59.5 ml. solution^1 + 40.5 ml. solution^2

4. PREPARATION

The two electrodes are connected to the measuring device and inserted successively in buffer solutions I and II which have been brought up to 18°C. The actual readings given by the apparatus are compared with the theoretical values. If the theoretical values (pH 7 and pH 10) are not those indicated by the apparatus, the actual readings are adjusted in accordance with the instructions for use of the apparatus.

5. TEST PROCEDURE

The test fluid is warmed up to 18°C.in a glass beaker. The electrodes (washed clean with distilled water) are then inserted and the pH value read off on the pH-meter.

6. PRESENTATION OF RESULTS

The results are given to the nearest 0.1 pH unit.

ANNEX IX

DETERMINATION OF ANTI-CORROSION ACTION

1. FIELD OF APPLICATION

The method is employed to determine the anti-corrosion action of fluids used in hydraulic systems. The method can be applied to all types of hydraulic fluid (mineral-oil products, synthetic fluids, emulsions).

2. PRINCIPLE

Samples of sheets of various materials are immersed in the test fluid for a fixed period of time. Changes in the surface of the material and changes in the colour of the test solution are determined in relation to time.

3. APPARATUS AND REAGENTS

a) Glass beakers, 400 ml. capacity;

b) Glass hooks, from which the sample sheets can be freely suspended in the beaker;

c) Thermostatically-controlled heating bath which maintains the test fluid in the beaker at a temperatureof 35 ± 0.2°C.
The heating bath must be provided with a stirring device ensuring uniform temperature distribution throughout the bath.

d) Emery paper No. 0.;

e) Cotton wool;

f) Normal petrol, boiling range 65 to 95°C.;

g) Pure benzene;

h) Sample sheet 100 mm. x 20 mm. x 1 mm. thick, with a 4 mm. diameter hole at the upper edge of one narrow side, so that the plate can be hung on a glass hook.

The following materials must be available for the test:

Steel, strength 50 to 60 kg/mm^2,

Electrolytic copper,

Zinc, pure,

Aluminium, pure,

Cadmium-plated steel (steel with a cadmium coating at least 25u thick

Brass (70 % copper).

4. PREPARATION

The sample sheets should be prepared with suitable emery paper, until finally emery paper No. 0 gives the best possible surface. The sheets are then held in tweezers and cleaned with dry cotton wool, followed by cotton wool soakes in normal petrol; the traces of cotton wool are washed off with pure petrol and then with benzene.

As soon as the last traces of solvent adhering to the sample sheets have evaporated, the sheets must be used for the corrosion test.

10 beakers should be filled for the entire test - each with 250 cc. of fluid. The glass beakers are then placed in the thermostatically-contolled heating bath and the temperature of the heating bath adjusted to give a constant temperature of 35 ± 0.2°C. in the test fluid.

6 of the beakers receive one each of the following sample sheets - steel, copper, zinc, aluminium, cadmium-plated steel and brass - suspended in such a w way that approx. 60 mm. of the sample sheet is immersed in the test fluid. To test the behaviour of pairs of substances sheets of the following metals are immersed in the remaining four beakers,

Steel/Cadmium-plated steel,

Copper/Zinc,

Aluminium/Zinc and

Steel/Aluminium.

The two sample sheets should hang approximately 1 mm. apart.

5. PROCEDURE

Care must be taken during the test to maintain the temperature in the heating bath constant. Evaporation losses should be made good as necessary. The sample sheets should be withdrawn and examined every 8 days. The complete test must run for a minimum of 40 days.

6. ASSESSMENT

Changes in the surface of the test substance must be described, with respect to any oxidation colour or deposits. In addition, the colour and appearance of the test solution at each separate examination of the sample sheet must be recorded.

ANNEX X (A)

TEST TO DETERMINE THE AGEING OF FLUIDS CONTAINING NO WATER

NOTE

This method uses the apparatus and the ageing conditions described in the standard method ASTM D 943-54. The method used to study the aged sample has been modified to cover the field of application of fluids containing no water.

1. FIELD OF APPLICATION

This method serves to determine the characteristics of ageing of non-flammable fluids containing no water used in hydraulic systems.

2. PRINCIPLE

The sample is subjected to a temperature of 95°C., in the presence of water and oxygen, with iron and copper present to act as catalysts.

3. APPARATUS AND CHEMICALS

a) Oxidizing cell (fig. 1).

b) A thermostatically-controlled heating bath which maintains the sample in the oxidizing cell at a temperature of 95 ± 0.2°C., provided with a suitable stirring device to ensure that the bath temperature is uniform.

The dimensions of the bath must be such that the required number of oxidizing cells 350 mm. in height can be completely surrounded by the fluid in the bath.

c) Flow-meter with a minimum capacity of 3 litres/hour and an accuracy of ± 0.1 l/h.

d) A device for winding the catalysing coils (fig. 2).

e) Thermometer graduated from 75 to 125°C.

f) A catalyst consisting of low-alloy steel, No.16; made by Washburn and Moen (low-alloy steel wire, material type A, specification ASTM A 129, 1st part, ASTM Standards 1955, for open metal fire grids of ordinary quality), the wire being 1.59 mm. in diameter, together with a wire of electrolytic copper, No.14, made by the American Wire Company, the wire being 1.625 mm. in diameter.

g) Hydrochloric acid, concentrated industrial grade (= 1.18).

h) Hydrofluoric acid, concentrated industrial grade (approx. 50 %).

i) Ordinary petrol, boiling range 65 to 95°C.

j) Nitric acid, concentrated industrial grade (= 1.42)

k) Oxygen in a container with a pressure regulator to ensure a uniform flow of gas. It is advisable to use an oxygen bottle with a two-step regulator.

4. PREPARATION OF THE APPARATUS

a) Cleaning the catalyst

On a day fixed for the start of the test, 3 m. of steel wire and 3 m. of copper wire are cleaned with cotton wool soaked in ordinary petrol; the surface of the wire is then polished with emery paper No. 100 (00)
Any traces of metal or emery are then wiped off with dry cotton waste. In all subsequent operations, the wire should be handled with cotton cloth or cotton gloves to avoid contact with the operator's skin.

b) Preparation of the coils

The two wires are firmly joined at one end by making about six twists, and then wound on a threaded spindle. The free ends of the steel wire and copper wire are then also attached by six twists; the coils are removed from the spindle and then reduced in length until the top edge of the coils - when placed above the oxygen-inlet orifice - stands 13 mm. above the boundary surface between the air and the water, when the latter has been poured in. This adjustment of length makes it possible to take samples periodically from inside the oxidizing cell for analysis purposes, without materially changing the ratio of the volumes to be examined with respect to the active surface area of the catalyst.

c) Cleaning the oxidizing cell

The inlet tubes and reaction vessels are cleaned by rinsing with acetone, tap water, chromo-sulphuric acid and again tap water, until the latter contains no more acid. The objects are then twice rinsed with small quantities of acetone and three times with destilled water. Finally, the reaction vessel is filled with distilled water, the oxygen inlet pipe is put in place, together with the cooling jacket, and the whole assembly is left in this condition for 24 hours before geginning the test. Shortly before the test begins, the vessels are emptied and dried, and the outer walls of the inlet pipe end the cooling jacket dried with cotton waste.

d) Cleaning the vessels after use

After the reaction vessels should be washed with normal petrol and wiped with a long-handled brush. This cleaning process is repeated with acetone replacing the petrol, after which the tubes are filled with oxidizing mixture composed of three parts of HCl and one part of HNO_3 which is left in the apparatus for at least 24 hours at room temperature. The aparatus is then rinsed with tap water to remove all traces of acid and the organic products of the reaction are removed by means of acetone. If a ring-shaped mark remains in the interior of the vessel, it should be rinsed with a mixture of equal parts of hydrofluoric acid and hydrochloric acid. This mixture af acids should be left in the vessel until the ring-shaped mark disappears or dissolves, and the acid is then rinsed away with large quantities of tap water. The final cleaning is then carried out as in paragraph b).

5. ANALYS PROCEDURE

a) The bath is heated to a temperature sufficiently high to ensure that the test fluid, contained in the required number of reaction vessels, reaches the prescribed temperature of 95 ± 0.2°C.

b) The catalyzing coils are then slid over the inlet orifice of the oxygen inlet pipe and coil and pipe are centred. A quantity of 300 ml. of test fluid is poured on to the coils until they are completely wetted. The reaction vessel is then immersed in the heating bath in such a way that the fluid in the bath stands at least 75 mm. above the surface of the oil. The cooling jacket is then pushed on the inlet pipe and connected to the cooling water supply (the temperature of the cooling water must not exceed 35°C. during the test).

c) The oxygen inlet pipe is connected to the oxygen bottle via the flowmeter, the quantity of gas being adjusted to 3 ± litres/hour, and the flow of gas is allowed to continue for 30 minutes before pouring 60 ml. of distilled water into the oxidizing cell. The time when this is done is recorded.

It is essential to adjust the volume of oxygen at least twice a day to comply with the prescribed tolerances.

d) At least three hours before the beginning of the test the temperature of the mixture in the reaction vessel must be checked every hour until the temperature measured on two successive occasions is constant at 95 ± 0.2°C. Thereafter it is necessary to check once a day that the bath temperature remains constant over the entire test period.

e) By constantly topping-up with distilled water the level of fluid in the oxidizing cell is maintained constant.

In certain conditions, because of deposits or the formation of emulsions, the fluid cannot easily be inspected or checked. For this reason it is necessary to mark the fluid level before the test begins. If this level is maintained by periodic topping-up the volume of water in the cell remains constant. If test samples are removed from the cell, the total reduced volume obtained in this way is marked and the volume of water adjusted exactly to this mark.

6. ANALYTICAL DETERMINATION OF THE AGEING PROCESS

a) During the ageing process, a sample is taken roughly every 8 hours from the centre of the fluid in the reaction vessel - the sample quantity being about 10 ml.; the sample is intended for analysis and the oxygen supply should be stopped while the sample is taken.

b) The sample of 10 ml. is divided into two parts, one (approx. 5 g.) being used to determine the neutralization index, the other to determine the presence of substances (particles of sludge) insoluble in petrol.

c) Determination of the neutralization index

This determination is carried out by the normal commercial method using alkali blue as as a coloured indicator.

d) Determination of the proportion of particles insoluble in petrol

Some 5 g. of the sample are dissolved in a flask in 10 times this quantity of pure petrol. This solution is filtered under slight suction on a membrane filter which has previously been weighed (type : average pore diameter 0.4 microns, filter diameter 40 mm.).

Care must be taken to ensure that the filter is not subjected to dry soction because this blocks the pores. The filter is then washed with pure petrol until the filtrate is completely clear. After it has been allowed to stand for an hour, the petrol is completely evaporated from the filter. The membrane filter is then placed to dry for half-an-hour in a desiccator and weighed. It is advisable to carry out a blank filtering test with pure petrol, since the filter itself may undergo a weight loss of 1 to 2 mg. when treated with petrol.

e) The duration of the test must not exceed 1,000 hours of ageing. Once the ageing is finished, other tests of many different kinds can be carried out if this is desired.

ANNEX X (A)

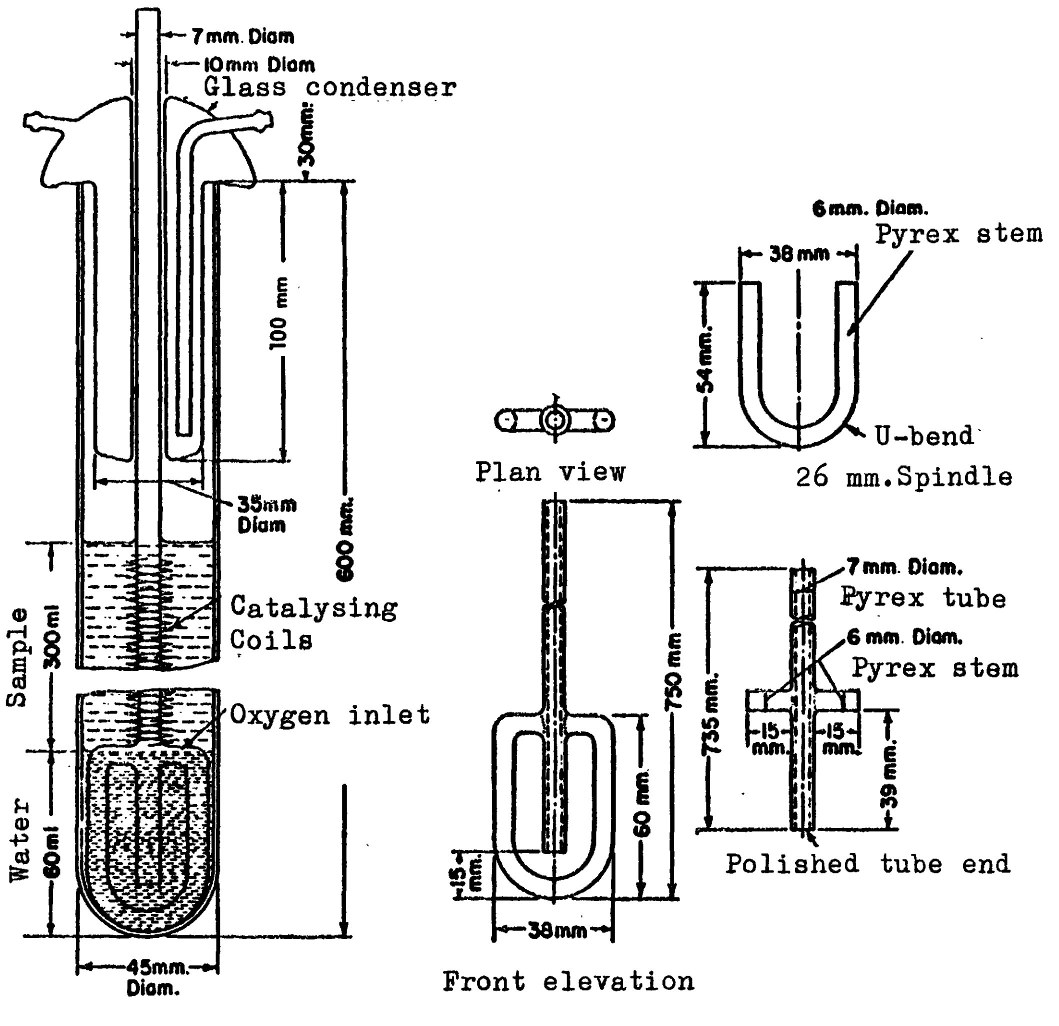


Fig. 1: OXIDIZING CELL

ANNEX X (A)

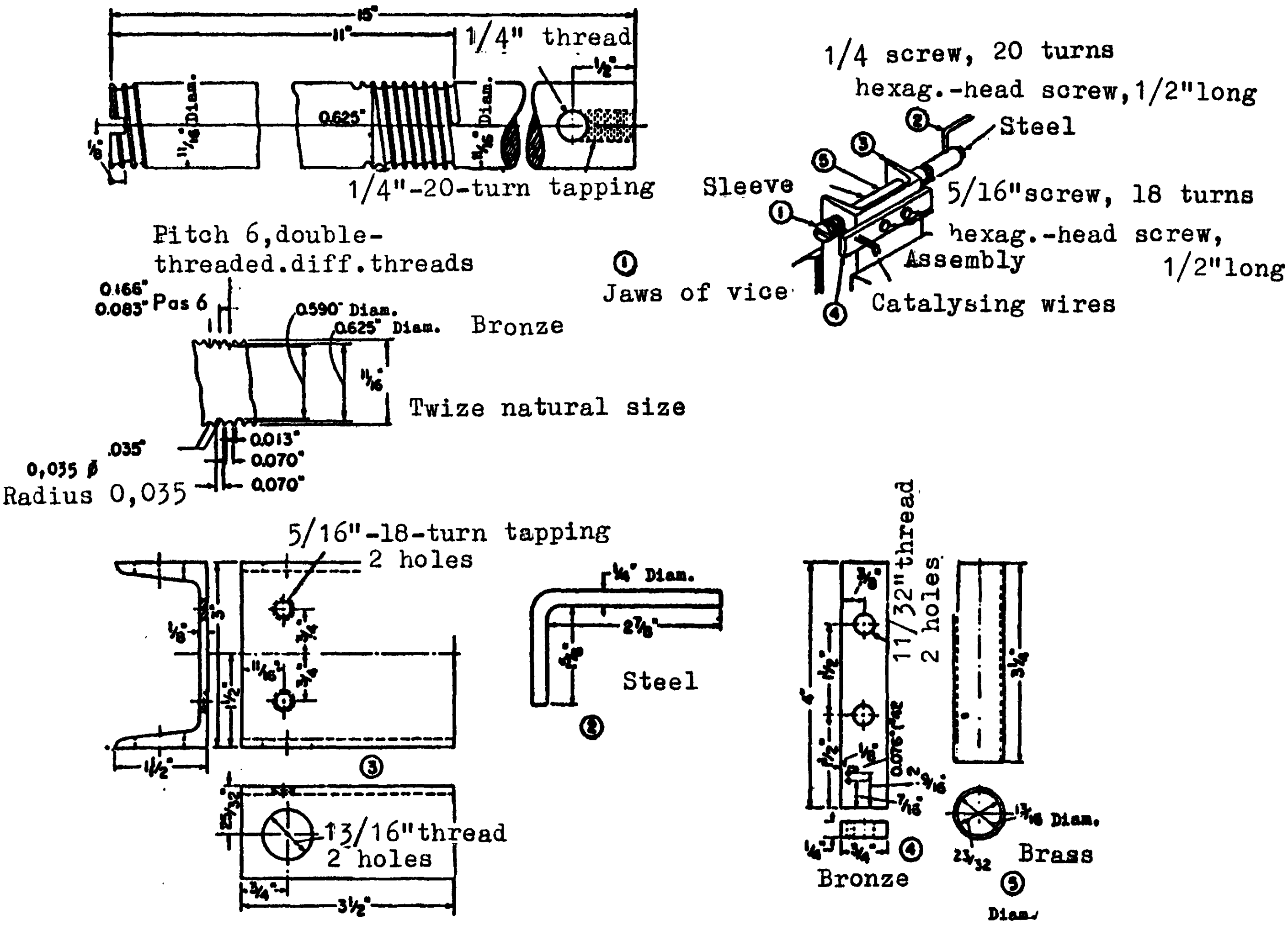


Fig.2: SPINDEL FOR WINDING CATALYZING COILS

ANNEX X (B)

TEST TO DETERMINE THE AGEING OF WATER-CONTAINING FLUIDS

REMARKS

The method uses the apparatus and applies the ageing conditions laid down by method ASTM D 943-54. The apparatus, the determination of ageing and the examination of the aged samples have been modified to suit the application to water-containing fluids.

1. RANGE OF APPLICATION

This method serves to determine the characteristics of ageing of water-containing fluids used in hydraulic systems.

2. PRINCIPLE

The test fluid is subjected to a temperature of 95°C., in the presence of oxygen and after the addition of iron and copper as catalysts.

3. APPARATUS AND REAGENTS

a) Oxidizing cell (fig. 1).

The cooling jacket of the oxidizing cell differs from that discribed in Annex X (A) in that its envelope is not 100 mm., but 200 mm. long (fig. 1).

b) A thermostatically-controlled and adjustable heating bath which maintains the fluid in the oxidizing cell at a temperature of 95 ± 0.2°C., provided with a stirring device to ensure that the temperature of the bath is uniform throughout. (The dimensions of the bath must be such that the required number of oxidizing cells 350 mm. in height can be completely surrouded by the fluid in the bath.

c) Flow-meter with minimum capacity of 3 litres/hour and an accuracy of ± 0.1 l/h.

d) A device for winding the catalyzing coils (fig. 2).

e) Thermometer graduated from 75 to 125°C.

f) A catalyst consisting of a low-alloy steel wire, NO.16, made by Washburn and Moen (low-alloy steel wire, material type A,specification ASTM A 129, 1st part, ASTM Standards 1955, for open metal fire grids of ordinary quality), the wire being 1.59 mm. in diameter, together with a wire of electrolytic copper, No.14, made by the American Wire Company, the wire being 1.625 mm. in diameter.

g) Hydrochloric acid, concentrated industrial grade (= 1.18).

h) Hydrofluoric acid, concentrated industrial grade (approx. 50 %).

i) Ordinary petrol, boiling range 65 to 95°C.

j) Nitric acid, concentrated industrial grade (= 1.42)

k) Oxygen in a container with a pressure regulator to ensure a uniform flow of gas. It is advisable to use an oxygen bottle with a two-step regulator.

4. PREPARATION OF THE APPARATUS

a) Cleaning the catalyst

On the day fixed for the start of the test, 3 m. of steel wire and 3 m. of copper wire are cleaned with cotton wool soaked in ordinary petrol; the surfice of the wire is then polished with emery paper No.100 (00). Any traces of metal or emery are then wiped off with dry cotton waste. In all subsequent operations, the wire should be handled with cotton cloth or cotton gloves to avoid contact with the operator's skin.

b) Preparation of the coils

The two wires are firmly joined at one end by making about six twists, and then wound on a threaded spindle. The free ends of the steel wire and copper wire are then also attached by six twists; the coils are removed from the spindle, and then reduced in length until the top edge of the coils - when placed above the oxygen-inlet orifice - stands 13 mm. above the boundery surface between the air and the water, when the latter has been poured in. This adjustement of length makes it possible to take samples periodically from inside the oxidizing cell for analysis purposes, without materially changing the ratio of the volumes to be examined with respect to the active surface area of the catalyst.

c) Cleaning the oxidizing cell

The inlet tubes and reaction vessels are cleaned by rinsing with acetone, with tap water, chromo-sulphuric acid and again tap water, until the latter contains no more acid. The objects are then twice rinsed with small quantities of acetone and three times with distilled water. Finally, the reaction vessel is filled with distilled water, the oxygen inlet pipe is put in place, together with the cooling jacket, and the whole assembly is left in this condition for 24 hours before beginning the test. Shortly before the test begins , the vessels are emptied and dried, and the outer walls of the inlet pipe and the cooling jacket dried with cotton waste.

d) Cleaning the vessels after use

After use the reaction vessels should be washed with normal petrol and wiped with a long-handled brush. This cleaning process is repeated with acetone replacing the petrol, after which the tubes are filled with an oxidizing mixture composed of three parts of HCI and one part of HNO_3 which is left in the apparatus for at least 24 hours at room temperature. The apparatus is then rinsed with tap water to remove all traces of acid and the organic products of the reaction are removed by means of acetone. If a ring-shaped mark remains in the interior of the vessel, it should be rinsed with a mixture of equal parts of hydrofluoric acid and hydrochloric acid. This mixture of acids should be left in the vessel until the ring-shaped mark disappears or dissolves, end the acid is then rinsed away with large quantities of tap water. The final cleaning is then carried out as in paragraph b).

5. ANALYSIS PROCEDURE

a) The bath is heated to a temperature sufficiently high to ensure that the test fluid, contained in the required number of reaction vessels, reaches the prescribed temperature of 95 $\pm$ 0.2°C.

b) The catalyzing coils are then slid over the inlet orifice of the oxygen inlet pipe and coil and pipe are centred. A quantity of 300 ml. of test fluid is poured on to the coils until they are completely wetted. The reaction vessel is then immersed in the heating bath in such a way that the fluid in the bath stands at least 75 mm. above the surface of the oil. The cooling jacket is then pushed on the inlet pipe and connected to the cooling water supply (the temperature of the cooling water must not exceed 35°C. during the test)

c) The oxygen inlet pipe is connected to the oxygen bottle via the flow-meter, the quantity of gas being adjusted to 3 $\pm$ 0.5 litres/hour, and the flow of gas is allowed to continue for 30 minutes before pouring 60 ml. of distilled water into the oxidizing cell. The time when this is done is recorded.

It is essential to adjust the volume of oxygen at least twice a day to comply with the prescribed tolerances.

d) At least three hours before the beginning of the test the temperature of the mixture in the reaction vessel must be checked every hour until the temperature measured on two successive occasions is constant at 95 $\pm$ 0.2°C. Thereafter it is necessary to check once a day that the bath temperature remains constant over the entire test period.

e) By constantly topping-up with distilled water the level of fluid in the oxiizing cell is maintained in spite of evaporation losses. In certain conditions, because of deposits or the formation of emulsions, the fluid cannot easily be inspected or checked. For this reason it is necessary to mark the fluid level before the test begins. If test samples are removed from the cell, the total reduced volume obtained in this way is marked and the volume of water adjusted exactly to this mark.

6. ANALYTICAL DETERMINATION OF THE AGEING PROCESS

a) During the ageing process, a sample is taken roughly every 8 hours from the centre of the fluid in the reaction vessel - the sample quantity being about 10 ml.; the sample is intended for analysis and the oxygen should be stopped while the sample is taken.

b) The 5 ml. sample is divided into two parts, one part (approx. 5 gm. being used to determine the neutralization index and acidity (pH value), the remainder to determine the insoluble substances (deposition of sludge). The determination of these waste substances is restricted to the solutions, and does not apply to emulsions.

c) Determination of the neutralization index

If it is not possible to determine the neutralization index by the normal commercial method using alkali blue as a coloured indicator, the value must be determined potentiometrically. In this case, either the total acid number (TAN) or the total base number (TBN) must be determined as laid down in method ASTM D 664-54. The pH value is measured by means of a compound alkaline-resistant glass electrode.

d) Determination of the content of insoluble matter

Approximately 5 g. of the fluid are filtered under slight vacuum using a previously-weighed membrane filter (type: average pore diameter 0.4 microns, filter diameter 40 mm.). Care must be taken to ensure that the filter is not subjected to dry suction because this blocks the pores. The filter is then washed with distilled water until the filtrate is completely clear.

The membrane filter is then placed in a desiccator for one hour, after which it is weighed. It is advisable to carry out a blank, filter test with distilled water, and determine the variation in weight.

e) The duration of the test must not exceed 1,000 hours of ageing. Once the ageing is finished, other tests of many different kinds can be carried out if this is desired.

ANNEX X (B)

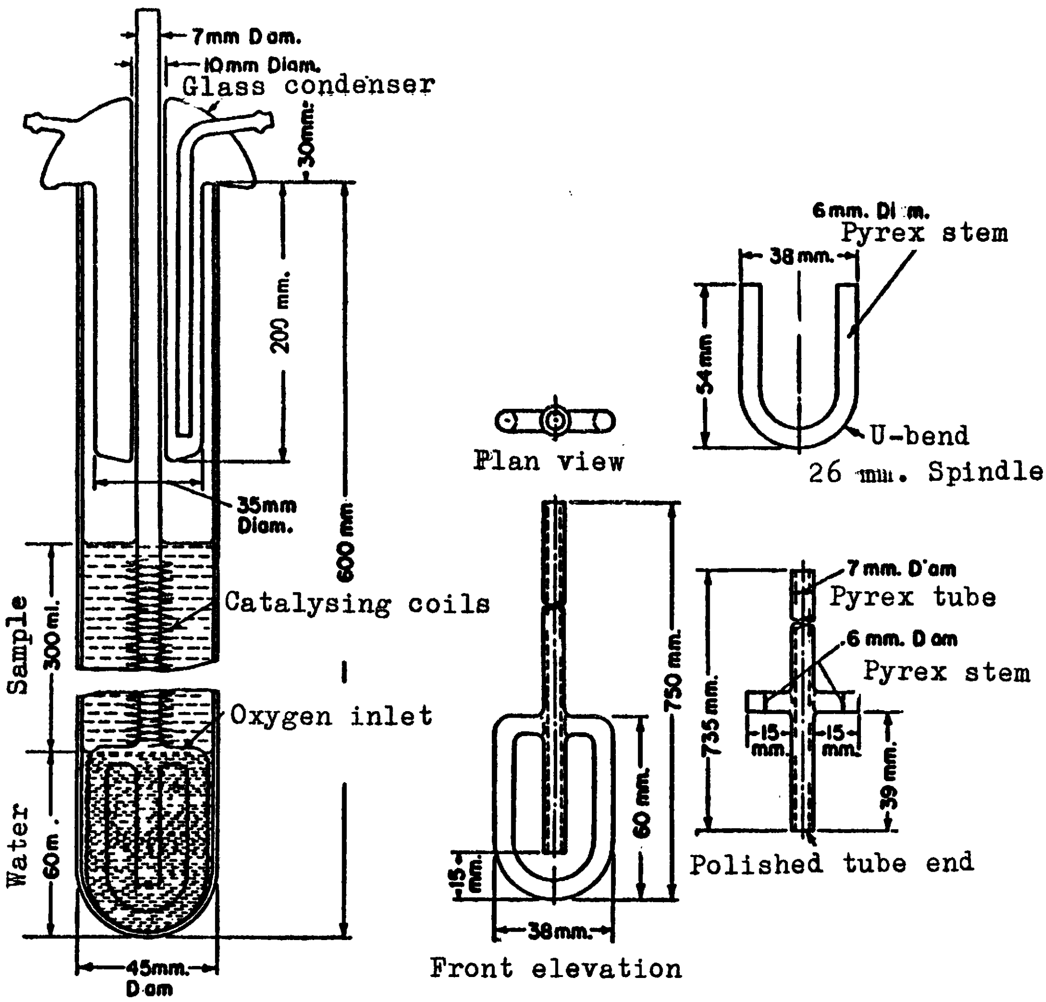


Fig. 1: OXYDIZING CELL

ANNEX X (B)

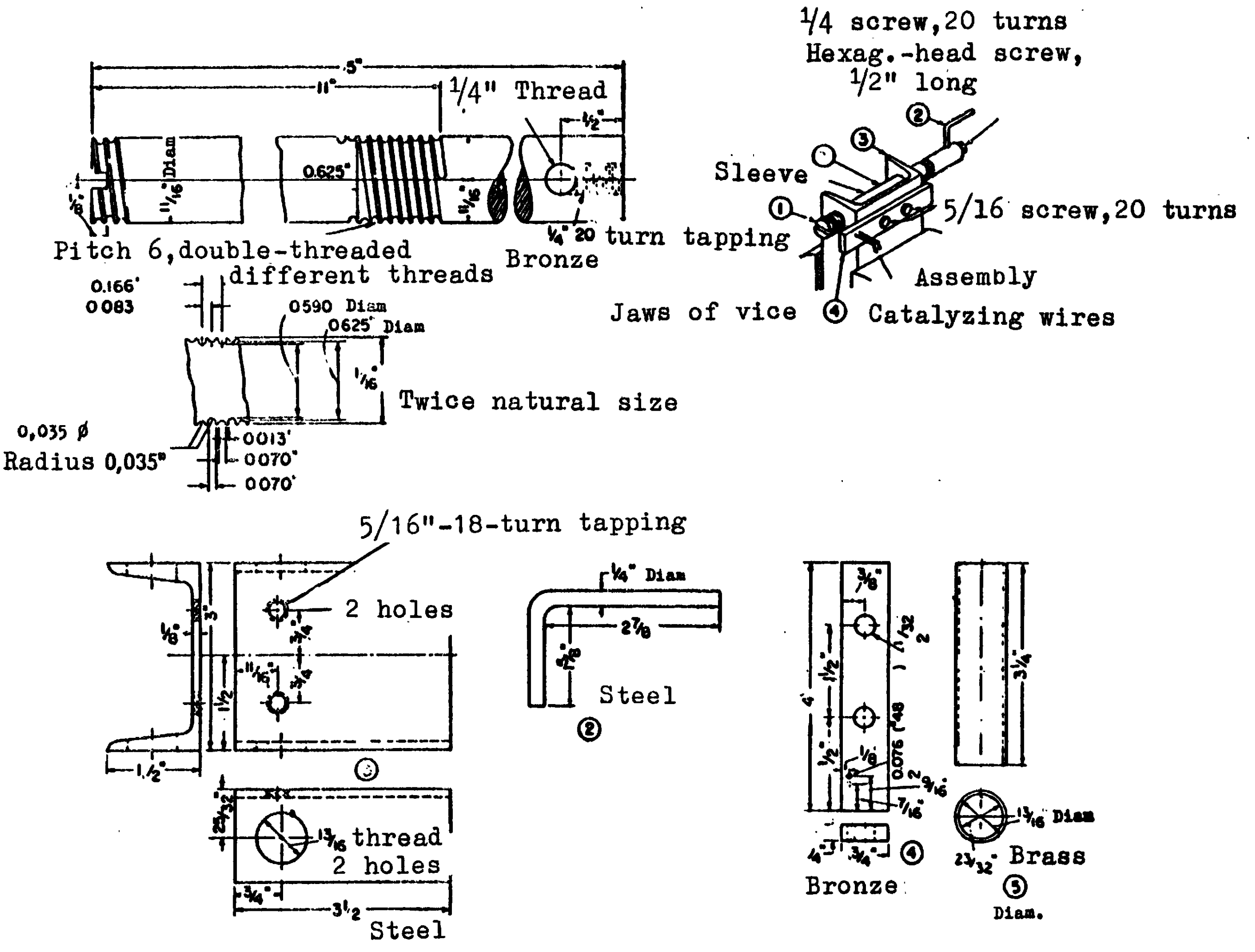


Fig. 2: SPINDLE FOR WINDING CATALYZING COILS

ANNEX XI

METHOD OF DETERMINING THE RESISTANCE TO SWELLING OF PACKINGS AND SEALS

APPLICATION

This method is used to determine the behaviour of non-flammable fluids on contact with packing and sealing materials.

PRINCIPLE

Sample pieces of the packing material are suspended in the test fluid under clearly-defined conditions, and the resultant change in volume is measured.

DESCRIPTION OF THE SAMPLE PIECES

Circular samples - 40 mm. in diameter end 6 mm. thick - are cut from the packing material.

TEST PROCEDURE

Two sample pieces are prepared for each test. For the test, the samples are cleaned with a rag dipped in anhydric alcohol. The volume of the samples is then determined. This is done by calculating the weight of the samples, first when exposed to the atmosphere and secondly when immersed in water. Before the test, the sample pieces must be dried and subjected for a long time at a temperature of 20°C.

A certain quantity of fluid is poured into a beaker so that the ratio between the volume of fluid and the volume of the sample is 1 t 15 (5 g. of sample call for roughly 100 ml. of fluid).

The beaker is maintained for 168 consecutive hours (7 days) at a temperature of 70 ± 1°C. Following this, the sample pieces are cleaned with anhydric alcohol and dried between two filter papers. 5 minutes after being dried, the volume of each of the two samples must be determined by the method described above.

In this way the proportional increase in volume - which is taken as the swelling index - can be arrived at by the following formula:

$$V = \frac{V_2 - V_1}{D_1} \times 100$$

in which

V = proportional increase in volume of the sample·

V_1 = volume of the sample before immersion·

V_2 = volume of the sample after immersion.

If the different values deviate by more than 1 % (in absolute figures) from the average value, the test should be repeated.

ANNEX XIII

DETERMINATION OF TENDENCY TO FOAM FORMATION
EXTRACT FROM GERMAN STANDARD DIN 51 566

1. APPLICATION

Homogeneous hydraulic fluids with or without addition of water.

2. PRINCIPLE

To determine the volume of foam formed by introducing into the fluid, at different temperatures, a thoroughly diffused current of air.

3. APPARATUS

3.1 1,000 ml. measuring cylinder

The graduated scale must cover 365 mm. ± 15 mm.

3.2 Air inlet tube with diffusion plug of alundum (Norton Company, Refract. Division, Worcester, 6, Mass., USA designation No. ME-46239, Grade : fine). The air inlet tube is made of glass and is at least 450 mm. long. The diffusion plug,which is spherical, porous and made of sintered aluminium oxide, and 25 mm. in diameter, is fixed to the lower end of the inlet tube.

3.3 A thermostatically-controlled bath, consisting of a glass vessel filled with water, provided with a heating device, automatic temperature control and a stirrer. The glass vessel should be big enough to allow the measuring cylinder to be immersed up to the 900 ml. mark. The temperature of the heating bath must be adjustable to 25°C. ± 0.5° or 95°C.± 0.5.

3.4 Flowmeter to provide adjustment of the prescribed flow of air.

The types used are either the normal rotameter or the fluid-filled U-tube type of flowmeter which indicates the pressure difference upstream and downstream of a capillary tube inserted in the air current. (It is advisable to have a capillary-like constriction of the bottom point of the U-tube to damp oscillations of the fluid caused by pressure variations).

3.5 Stop watch.

3.6 Thermometer: precision thermometer 0 to 100°C., with scale divided in 0.2°C.

4. CHEMICAL REAGENTS

4.1 Normal petrol

4.2 Chemically pure acetone.

4.3 Pure benzene.

5. PREPARATIONS FOR THE TEST

5.1 To eliminate all the fluid residues from previous tests, which might in certain circumstances distort the results, it is necessary to clean the test apparatus very thoroughly. This obligatory cleaning process particularly applies to

a) the measuring cylinder: this must be very carefully cleaned with normal petrol, then with acetone and finally with distilled water, after which it is dried with a current of dry, pure (oil-free) air·

b) the diffusion plug in the air inlet tube: this plug must be cleaned successively with normal petrol, pure benzene and finally with a fresh supply of ordinary petrol, the plug being immersed in about 300 ml. of each of these solvents in turn, the solvents being vacuum-aspirated and then forced out under pressure (repeated 5 times for each solvent). The tube and diffusion plug are then dried in dry air (oil-free). Finally, the tube is wiped with a clean, dry cloth.

5.2 The air inlet tube is then introduced into the orifice of a rubber cork (pierced by two holes) which seals the measuring cylinder, the tube being so inserted that the diffusion plug just touches the bottom of the measuring cylinder.

5.3 Then some 200 ml. of the sample are heated to 50°C.± 2° in a clean glass vessel and then cooled to 25° ± 2°. In addition, the heating bath is adjusted to 25°C. ± 0.5°. The measuring cylinder is filled up to the 190 ml. mark with the prepared sample, and then placed in the heating bath in such a way that the water reaches at least the 900 ml. mark.

6. TEST PROCEDURE

6.1 Once the fluid in the measuring cylinder has reached the temperature of the bath, the rubber cork carrying the air inlet tube is placed on the measuring cylinder (the diffusion plug just touching the bottom of the cylinder) and a period of 5 minutes is allowed to elapse for the plug to become saturated with fluid. During this operation, the air supply must not be opened. The tube is then connected to the air supply and a flow of air of 94 ml. ± 5 ml. per minute introduced.(The air must be dry and oil-free. If necessary, a tube containing calcium chloride and another tube filled with cotton-wool should be placed in the air line). When a period of 5 minutes ± 10 seconds has elapsed after the appearance of the first air bubbles on the surface of the diffusion plug, the flow of air is cut off and the volume of foam formed immediately measured, and expressed in millilitres. The term volume of foam should be understood as referring to the distance between the upper edge (average value) of the layer of foam and the surface of the fluid below this.

Without removing the air inlet, the measuring cylinder is left for a further 10 minutes ± seconds in the water bath, after which the foam volume is measured again.

6.2 For a similar test carried out at 95° C., the preparations are identical with those described in section 5 above, but the bath is heated to 95°C. ± 0.5°. Of course, the heating of the fluid in the measuring cylinder to the bath temperature procedes more slowly.

A freshly-cleaned air inlet tube and diffusion plug should be used for the introduction of the air.

The measurement is carried out as in section 6.1 above, after the necessary lapse of time for bubble formation or settlement.

6.3 The foam remaining after the test described in section 6.2 is then broken up by light stirring. The fluid is cooled to below 40°C., by allowing the measuring cylinder to stand open to the air at room temperature. Once the fluid has reached the heating bath temperature, a freshly-cleaned air inlet tube and diffusion plug are inserted. Then the process described in section 6.1 is repeated and the foam volume measured after the lapse of time for bubble formation or settlement.

7. RECORDING OF RESULTS

TABLE

Temperature of the samples of fluid	Volume of foam measured immediately after air introduction	Foam volume after 10 minutes
25°C.	.... ml.	.... ml.
95°C.	.... ml.	.... ml.
25°C. after determination at 95°C.	.... ml.	.... ml.

ANNEX XV

DETERMINATION OF EMULSION STABILITY

PRINCIPLE

To check that the emulsion when ready for use is stable when stored at three temperatures: + 5°C., + 20°C., + 40°C.

These three temperatures represent the conditions which may be encountered in colliery stores.

APPARATUS

- three cylindrical test tubes each of 250 cc.capacity
- thermostats for temperatures of + 5 and + 40°C. ± 1°C.

TEST PROCEDURE

1. Sample preparation

The volume of the sample is to be approximately 800 cc. Two cases may arise:

a) the emulsion is ready for use:

b) only a concentrate is provided, and the emulsion must be made up before use

In the second case, the emulsion is to be made up using water with a hydrotimetric total value of 40 ± 5, by means of mechanical stirring for at least 5 minutes.

2. Treatment

The sample is distributed equally among the three 250 cc. test tubes. These are then subjected to the temperature conditions listed above, i.e.: one tube in the bath thermostatically controlled at + 5°C., one tube in the bath at + 40°C. and the third in an unventilated enclosed space at laboratory temperature.

3. Observations

The samples are examined every 24 hours. No oil should rise to the surface after

1,000 hours for emulsions of the oil-in-water type·

600 hours for the emulsions of the water-in-oil type.

Only creamy layer not exceeding 2 mm. in thickness can be accepted.

ANNEX B

R E P O R T

ON TOUR OF CENTRAL RESCUE STATIONS

IN THE COMMUNITY COUNTRIES AND GREAT BRITAIN

CONTENTS

INTRODUCTION

The Conference on Safety in Coalmines discussed the organization of mine rescue services in the Community countries and Great Britain, and noted that were a number of differences from one country to another (e.g. national rescue headquarters as against regional rescue stations), due either to the general overall organization of the coalmining industry or to the geographical location and layout of the coal-fields and pits.

On this point the Conference arrived at the following conclusions:

1. The Conference recommends that the rescue services be organized on a geographical basis enough for them to dispose of adequate equipment and personnel.

2. The Conference considers that a functional liaison should be established first between the rescue services of the different coalfiels of each country, and then between one country and another. It recommends that a system be organized enabling the rescue services of the different countries to assist one another, and to ensure maximum speed and efficiency in any emergency.

3. The Conference considers that a regular exchange of experience should be organized among the rescue services of the different countries in regard both to the improvement and to the co-ordination of the methods and means employed (training of rescue personnel, equipment used, etc.).

The Mines Safety Commission instructed the Working Party on the Co-ordination of Mine Rescue Arrangements, comprising the superintendents of the Central Rescue Stations in the different countries, to establish the necessary contacts preparatory to going in detail into these recommendations, and where appropriate submitting proposals to the Commission.

At an introductory meeting on November 22, 1957, devoted principally to a general exchange of information, it was urged that the Working Party should tour the central rescue stations in all the member countries and in the United Kingdom, in order to observe methods of using equipment and any special features of rescue organization, compare notes with the personnel of the rescue stations visited, establish friendly relations with those responsible for rescue arrangements in the different countries, and finally work out practical conclusions from the information gathered.

Visits were duly paid to the following rescue stations:

1. Lens, France (March 23, 1958);
2. Friedrichsthal, Saar, Germany (June 20, 1958);
3. Essen-Kray, Germany (September 25, 1958);
4. Heerlen, Netherlands (January 22, 1959);
5. Doncaster and Mansfield, U.K. (June 3-4, 1959);
6. Sulcis, Italy (October 6, 1959);
7. Hasselt, Belgium (May 3, 1960).

Having completed its round of visits, the Working Party now submits to the Commission the following Report on present rescue arrangements in the Community countries and Great Britain; the Report, which follows a standard layout, is intended to afford a comparison as to the main essentials in the respective cases.

REPORT ON PRESENT MINE RESCUE ARRANGEMENTS

SECTION I : ORGANIZATION

A. GENERAL REMARKS

1. FEDERAL REPUBLIC OF GERMANY

The Federal Republic has five Central Rescue Stations: two in Land North Rhine/Westphalia at Essen and Aachen (Dortmund and Bonn Divisional Inspectorates respectively), one in Land Lower Saxony at Clausthal-Zellerfeld, one in Land Bavaria at Hohenpeissenberg and one in the Saar at Friedrichsthal. Land Hesse, Land Rhineland-Palatinate and Land Württemberg have no Central Rescue Stations of their own: the first two come under Aachen and the third under Hohenpeissenberg.

For number of rescue posts affiliated to these Central Rescue Stations, see accompanying table, item (h).

k) Any national-level arrangements; aims and objects thereof

The Central Rescue Stations have regional responsibility only.

Co-ordination among all official quarters concerned with mine rescue arrangements is assured by the German Mine Rescue Committee, which deals with all matters in this connection and decides as to the suitability of respirators and reviving apparature for underground and surface use. These are then approved by the Inspectorate.

The organizational pattern of the rescue arrangements is pretty well identical in all coalfields. Responsibility for the Central Rescue Stations lies, in Aachen, Essen and Friedrichsthal, directly with the affiliated collieries, in Clausthal-Zellerfeld and Munich with the regional authorities plus, in the case of Munich, the Association of Colliery Managements (Bergbau-Berufsgenossenschaft).

The rescue regulations are set forth in each Divisional Inspectorate's "provisions concerning rescue services."

The five Central Rescue Stations all have much the same responsibilities. Those of the Essen Station, which has easily the largest Division in the country (with 130 of the 232 rescue posts and 5,625 of the 8,490 rescue men), are essentially as follows:

1. Organization of rescue services in the Ruhr;
2. Supervision of rescue personnel and rescue posts at the collieries;
3. Training of brigade leaders, team leaders and rescue equipment-maintenance men;
4. Organization of gas-fighting, arrangements at the surface in the coking-plants and by-products installations;
5. Supervision of gas-fighting posts and personnel;
6. Training of officers, team leaders and equipment-maintenance men, of the gas-fighting corps;
7. Testing of breathing apparatus for approval by the German Mine Rescue Committee as suitable for use below and above ground (the Hohenpeissenberg Station has been appointed as the Committee's second testing point);

	Aachen coalfield	Ruhr coalfield	Lower Saxon coalfield	S. German coalfield	Saar coalfield	Total
a) Central Rescue Station	Aachen	Essen	Clausthal-Zellerfeld	Hohen-peissenberg	Friedrichs-thal	
b) Station officials	4	12	4	-	2	22
c) Permanent rescue men immediately available in emergency	-	36 +	-	-	9 ++	45
d) Rescue men at collieries	794	5474	962	247	834	8311
e) Total, rescue men (c + d)	794	5510	962	247	843	8356
f) Total underground personnel employed	24000	260000	22500	9650	38000	354150
g) Rescue men per 1000 underground workers	33,2	21,6	42,9	25,7	22,4	24,0
h) Colliery rescue posts	24	130	47	11	18	230

+) 12 men each form the Rheinelbe, Rheinpreussen and Prosper rescue brigades, whose total strength is 135.

++) Those on duty of the 20 full-time rescue men at the Central Rescue Station.

N.B. A number of reserve personnel trained in the use of rescue equipment are also available.

8. Research on possible improvements to all rescue and gas-protection equipment;
9. Advising of collieries on fire prevention; preparatory organization of measures to be taken in the event of major accidents; co-operation in framing and implementation of rescue and firefighting instructions;
10. Training of supervisory personnel responsible for fire prevention and firefighting;
11. Development of firefighting equipment, installations and methods, and testing of fire extinguishers for official approval;
12. Analysis of samples of methane and fire fumes and evaluation of results;
13. Testing of CO-filter self-rescuers for approval by the German Mine Rescue Committee (second testing point at Hohenpeissenberg);
14. Introduction of CO-filters self-rescuers at collieries, and supervision of all matters in connection with this equipment.

2. BELGIUM

Belgium has five coalfields, the Borinage, the Centre, Charleroi-Namur, Liège and the Campine. The first four have each one Central Rescue Station; in the Campine each collierry has its own rescue service, and there is a Rescue Services Co-ordination Centre (Coördinatiecentrum Reddingswezen) at Kiewit-Hasselt which is responsible for the theoretical and practical training and drilling of rescue men and for research and documentation on rescue questions.

The Rescue Stations are located as follows:

1. Borinage coalfield at Frameries;
2. Centre coalfield at Ressaix;
3. Charleroi-Namur coalfield at Marcinelle;
4. Liège coalfield at Glain-lez-Liège;
5. Campine coalfield, at each colliery, viz. Beeringen, Eisden, Helchteren-Zolder, Houthalen, Waterschei, Winterslag and Zwartberg.

The rescue personnel fall into two categories, "permanent rescue men" and "rescue men". For details see table following, items (a)-(f).

g) Total underground personnel employed (as at December 1, 1959)

Borinage	13.250
Centre	10.840
Charleroi-Namur	21.730
Liège	16.870
Campine	29.500
TOTAL	92.190

h) Rescue men per 1000 underground workers

There are 1,395 rescue men to this total of 92,190 underground personnel, giving a proportion of 15.13 per thousand.

i) Rescue stations

As noted above, there are four regional Stations and seven local stations with a Co-ordination Centre (Coördinatiecentrum Reddingswezen).

k) Any national-level arrangements; aims and objects thereof

Rescue arrangements are governed by the Regent's Decree of September 25, 1947, which provides that these may be either local or regional.

Rescue station	Station officials	Permanent rescue men immediately available in emergency	Permanent rescue men in reserve	Total, permanent rescue men (c+d)	Grand total, permanent rescue men and rescue men
(a)	(b)	(c)	(d)	(e)	(f)
Borinage	4	4	15	19	193
Centre	4	3	16	19	167
Charleroi	4	4	14	18	309
Liège	4	3	32	35	290
Beeringen	3	-	-	-	57
Eisden	3	-	-	-	56
Zolder	3	-	-	-	67
Houthalen	3	-	-	-	75
Waterschei	3	-	-	-	72
Winterslag	3	-	-	-	48
Zwartberg	3	-	-	-	61
Co-ordination Centre	5	-	-	-	-
Belgium	42	14	77	91	1.395

N.B. These figures do not include supervisory personnel trained in rescue work.

At national level, there is also a National Rescue Stations Co-ordination Centre which is required:

1. to conduct, financially support and promote studies, research and experiments of all kinds connected with mine rescue work and accident prevention, and disseminate the results;
2. to co-ordinate the work of the different Rescue Stations in material, technical and medical respects, and organize relations with all authorities, institutions and bodies (public and private) whose co-operation is needed in an emergency;
3. to give active assistance in any emergency;
4. to secure and furnish all requisite services and to buy, sell, transfer, hire or let all fixed and movable property necessary to its object;
5. to act on behalf of the Belgian Rescue Stations collectively in dealings with all regional, national and international authorities and institutions, and to co-operate with them.

3. FRANCE

The French collieries in the different coalfiels are grouped in nine Divisions (houillères), which have full technical and financial independence. In addition, there are a number of small non-nationalized mines, which are thus independent altogether.

Rescue arrangements hence vary a good deal: in the Centre/Midi in particular they differ substantially according to the size and dispersedness of the coalfield. The Nord/Pas-de-Calais and Lorraine Divisions and the three Centre/Midi Divisions whose operations are geographically co-ordinated have each a Central Rescue Station, while the remaining four Centre/Midi Divisions have only local rescue posts. The following particulars therefore apply only to the first five Groups; omitted are:

1. the Aquitaine coalfield with 5 sub-posts, each with 20-40 rescue men;
2. the Provence coalfield with 4 posts, each with 12-15 rescue men;
3. the Auvergne coalfield with 5 posts, each with 12-40 rescue men;
4. the Dauphiné coalfield with 1 post.

k) Any national-level arrangements; aims and objects thereof

The enactments in force concerning rescue posts are:

the "Code Minier" (Mines Code), Articles 87-90;

the Decree of May 4, 1951 (General Regulations), Articles 320-323;

the Order of May 29, 1929, as amended by the Order of August 19, 1936;

the Circular of August 19, 1936, accompanying the Order of the same date;

any Departmental Orders.

As a rule there is one rescue post per pit. There are no full-time rescue men at the colliery rescue posts, except in the case of Lorraine.

	Nord/Pas-de-Calais	Lorraine	CENTRE-MIDI		
			Loire	Cévennes	Blanzy
a) Central Rescue Station	Lens	Merlebach	St. Etienne	La Grand' Combe	Montceau-les-Mines
b) Station officials	4	6	2	2	2
c) Permanent rescue men immediately available in emergency	0	12	0	0	0
d) C.R.S. rescue men	38	0	20	54	44
e) Colliery rescue men	704 +	618	230	150	80
f) Total, rescue men	742	630	250	204	124
g) Total underground personnel employed at Jan. 1, 1960	80078	24294	7910	7690	5444
h) Rescue men per '000 underground workers	9,2	25,9	31,6	26,5	22,7
i) Sub-posts	64	7	8	9	3

+) These figures do not include supervisory personnel trained in rescue work.

The rescue men are all workmen or supervisory personnel employed at the colliery. They are supposed to be distributed proportionately over the three shifts.

The Central Rescue Stations have one or more full-time mechanics employed on the maintenance of rescue equipment, and a Station head.

There is a special team for burn cases in Paris to co-ordinate the treatment and if necessary the transport of burns victims in the event of major group accidents; it is in direct contact with the Air Force to ensure their speedy evacuation.

4. NETHERLANDS

The Limburg collieries have no Central Rescue Station: each has its own rescue service, so that the total for the coalfield is 12, which come, for the purposes of co-ordination, under the national Commission of Safety Engineers.

In addition to the rescue and firefighting equipment available for each mine's rescue service, the most centrally-located colliery, Oranje-Nassau Mijn I, at Heerlen, is shortly to be provided with a stock of material, for the erection of fire-stoppings, which will come for administrative purposes under the Commission of Safety Engineers and will be permanently at the disposal of all collieries.

All rescue men are volunteers. They number 669, as against a total of 30,179 underground workers, giving a proportion of 22 per thousand.

The enactments governing rescue arrangements are

a) the "Mijnreglement" (Mines Regulations) of 1939, Articles 172-173;

b) Directives Nos. 62-64 and 84-87 of the Inspector-General of Mines.

5. ITALY

The Sulcis (Carbonia) coalfield has no central rescue organization. There are in all 68 trained, non-permanent rescue men, as against 2,560 underground workers, giving a proportion of 26.6 per thousand.

B. TRAINING AND PRACTICE

1. FEDERAL REPUBLIC OF GERMANY

a) Minimum age: usually 21

b) Maximum age: 45; for the heads of the Essen and Saar Stations, 50.

c) Minimum service below ground: 1 year; in the Saar, 3 years.

d) Medical examinations: every three years; at Clausthal and in the Saar, every 2 years.

e) Practices per annum:
Theory:

Brigade leader)
Team leader)
Rescue man) 2; in the Saar, 1.
Maintenance man)

Smoke chamber:

Brigade leader)
Team leader)
Rescue man) 4.
Maintenance man (if fit))

Underground:

Brigade leader)
Team leader) Aachen, Essen and Hohenpeissenberg, 1;
Rescue man) Clausthal 2; Saar 3.
Maintenance man (if fit))

2. BELGIUM

a) Minimum age: 21

b) Maximum age: 45

c) Minimum service below ground: 3 years

d) Medical examinations: once a year, and after any prolonged illness or serious injury

e) Practices per annum:

	Theory	Smoke chamber	Underground
Brigade leader	20	12	8
Team leader	20	12	8
Permanent rescue man	20	12	8
Rescue man	8	4	4
Maintenance man	1	-	-

Each theory session takes place on the same day as a practice in the smoke chamber or underground.

3. FRANCE

The French industry has no standard nation-wide system: the arrangements for each of the five Central Rescue Stations are thus given separately.

1) Lens

a) Minimum age: not specified.

b) Maximum age: not specified; employment as a rescue man is terminated as and when the medical officer recommends.

c) Minimum service below ground: not specified.

d) Medical examinations: once a year and after any illness.

e) Practices per annum:

	Theory	Smoke chamber	Underground
Rescue post personnel:			
- Brigade leader	6	2	4
- Team leader	6	2	4
- Rescue man	6	2	4
- Maintenance man	2	-	-
Central Rescue Station personnel	12	12	-

There are two maintenance men on full-time duty.

2) Merlebach

a) Minimum age: 21

b) Maximum age: 40-45, according to medical officer's recommendation.

c) Minimum service below ground: 3 years.

d) Medical examinations: once a year.

e) Practices per annum:

	Theory	Smoke chamber	Underground
Brigade leader	8	4	4
Team leader	8	4	4
Rescue man	8	4	4
Maintenance man	8	-	No fixed number

There are two maintenance men on full-time duty.

3) St. Etienne

a) Minimum age: not specified.

b) Maximum age: not specified.

c) Minimum service below ground: not specified.

d) Medical examinations: once a year and after any illness.

e) Practices per annum:

	Theory	Smoke chamber	Underground
Brigade leader	4	-	-
Team leader	4	4	-
Rescue man	4	4	-
Maintenance man	4	-	-
C.R.S. rescue man	8	8	-

There are two maintenance men on full-time duty.

4) La Grand' Combe

a) Minimum age: 22.

b) Maximum age: 45.

c) Minimum service below ground: not specified.

d) Medical examinations: every three years.

e) Practices per annum:

	Theory	Smoke chamber	Underground
Brigade leader	12	4	Not specified
Team leader	12	4	"
Rescue man	12	4	"
Maintenance man	12	4	"
C.R.S. rescue man	12	4	"

5) Montceau-les-Mines

a) Minimum age: not specified.

b) Maximum age: not specified.

c) Minimum service below ground: not specified.

d) Medical examinations: once a year.

e) Practices per annum:

	Theory	Smoke chamber	Underground
Brigade leader	1	1	1
Team leader	1	1	1
Rescue man	1	1	1
Maintenance man	2	-	-

There is one maintenance man on full-time duty.

4. NETHERLANDS

a) Minimum age: not statutorily fixed; usually 23.

b) Maximum age: not statutorily fixed; usually 45.

c) Minimum service below ground: not statutorily fixed; usually about 3 years.

d) Medical examination: on joining the rescue corps and thereafter once a year.

e) Practices per annum: statutory minimum 5 (3 underground and 2 in the smoke chamber); various additional theory and practical training sessions are held as need arises.

5. ITALY

a) Minimum age: 24.

b) Maximum age: 50.

c) Minimum service below ground: not specified.

d) Medical examinations: once a year.

e) Practices per annum:

	Theory	Smoke chamber	Underground
Brigade leader	12	-	12
Team leader	12	-	12
Rescue man	12	-	12
Maintenance man	12	-	12

In addition, all colliery managers, under-managers, overmen and deputies (221 in all) attend the practices of the safety service for 1-2 months.

C. ORGANIZATION OF RESCUE OPERATIONS

1. FEDERAL REPUBLIC OF GERMANY

a) Alarm

By whom given

Colliery-manager, under-manager or his nominee

To whom given and in what order

No prescribed order. Master rescue plan indicates all services to be alerted for immediate and subsequent co-operation in the event of a major accident. Central Rescue Station must in any case be alerted forthwith.

How given

Individual verbal warning messages by runner or dispatch-rider, distribution of emergency warning cards; Aachen and Essen are also equipped with v.h.f. radio-communication and telephone, teleprinter and electric signalling links.

b) Direction of rescue operations

Under Article 205,1 of the Mines Act, responsibility for rescue operations lies in all cases with the Divisional Inspector. The colliery manager, or failing him the under-manager or senior official present, deputizes for him until his arrival.

c) Action by rescue personnel

Strength of team

Rescue teams consist of a team leader (of supervisory grade) and four rescue men under him. In principle action can be taken only by the full team; smaller teams of a leader and two men are allowed to operate only where the circumstances are known, the distances inconsiderable and the conditions easy.

Relief team

Teams must not act unless a relief team equipped with respirators is either on the spot or directly on its way to the standby base.

Standby base

Where operations have to be conducted underground, a standby base must be installed at a safe place as close as possible to the scene of action; at this the relief team waits and spare equipment and reviving apparatus are held in readiness, with a maintenance man to make used appliances promptly available for further use.

2. BELGIUM

a) Alarm

By whom given

Whoever observes an accident notifies his superior, who in his turn alerts the Central Rescue Station and the Colliery manager or his nominee; the latter has action taken in accordance with the general instructions posted up in all collieries.

To whom given and in what order

Stage 1 : to the Central Rescue Station serving the colliery;

stage 2 : to the next nearest Central Rescue Station;

stage 3 : to Central Rescue Stations farther away, in order of distance.

How given

By telephone: all collieriès have an internal telephone system (underground and surface), and several lines to the public system. Rescue workers are alerted by telephone, siren, messenger, driver, dispatch-rider, etc.

b) Direction of rescue operation

Rescue operations are directed by the Inspector of Mines; until his arrival, by the Colliery Manager.

c) Action by rescue personnel

Rescue teams consist of a team leader and four men under him, usually accompanied by an engineer.

The first team cannot start work until the second has been alerted.

Whenever possible, a standby base is installed below ground, usually with servicing facilities for respirators. Every eight hours, i.e. after being used three times, respirators are sent to the surface for thorough testing, cleaning and disinfection. Each rescue man has his own mouthpiece, reserved for his personal use.

3. FRANCE

a) Alarm

By whom given

By the colliery concerned.

To whom given and in what order

May be given only within the colliery or to the Central Rescue Station, according to the seriousness of the occurrence.

How given

By various means depending on local conditions: messenger, telephone, siren, electric signalling to homes.

b) Direction of rescue operations

The Colliery Manager takes charge until a representative of the Mines Inspectorate arrives; the latter may then take over if he wishes. In the absence of the Colliery Manager, the senior underground engineer present deputizes for him.

c) Action by rescue personnel

Strength of team

4 men and a team leader, who is usually a deputy.

Relief team

There is ordinarily one relief team standing by for each team in action. Sometimes, however, if there are more than three teams in action, only two relief teams are maintained, e.g. one in the intake and one in the return airway.

Standby base

Not always provided. If found necessary, a base is installed with a relief team, rescue equipment and spare parts, a telephone, a first-aid man, a maintenance-man, and so on.

4. NETHERLANDS

a) Alarm

Given on the instructions of the Colliery Manager or his nominee, by siren, telephone, messenger, alarm bells in homes, radio calls.

b) Direction of rescue operations

The Colliery Manager or his nominee takes control, with the agreement of the Mines Inspectorate.

c) Strength of rescue teams

5-6 men.

5. ITALY

a) Alarm

By whom given

The colliery concerned.

To whom given and in what order

No special provisions.

How given

By telephone. The collieries have an underground telephone system connected to the surface and to other collieries in the area.

b) Direction of rescue operations

Rescue operations are directed by the Colliery Manager, sometimes together with the Divisional Inspector of Mines. Before his arrival, the under-manager takes charge.

D. MUTUAL ASSISTANCE IN MAJOR EMERGENCIES

1. FEDERAL REPUBLIC OF GERMANY

A master rescue plan laying down mutual-assistance arrangements exists at each Central Rescue Station. The collieries have undertaken to give one another all help required.

The Central Rescue Stations are notified of any rescue operation involving the use of breathing apparatus.

2. BELGIUM

Mutual-assistance arrangements are defined in each colliery's own regulations, and co-ordinated by the National Rescue Stations Co-ordination Centre.

In the first stage, the colliery alerts the Central Rescue Station to which it is affiliated, or in the case of the Campine, the colliery's own rescue station and, at the same time, the Coördinatiecentrum Reddingswezen; in the second stage, notification also goes to the next nearest Station, and in the third to Stations farther away, in order of distance.

3. FRANCE

In the Nord/Pas-de-Calais the Central Rescue Station at Lens and the various rescue posts have a mutual-assistance plan. The Merlebach Station and the Lorraine rescue posts have similar arrangements, and there is also a mutual-assistance agreement between the Lorraine and Saar coalfields.

In the Centre/Midi neighbouring rescue posts may be alerted if need be, starting with the nearest at hand.

4. NETHERLANDS

Any colliery at which a major accident has occured can ask any or all the rest for assistance.

5. ITALY

Arrangements exist for the Sulcis collieries to aid one another in case of need.

E. STOCKS OF SELF-CONTAINED OXYGEN RESPIRATORS GIVING PROTECTION FOR TWO HOURS AND LONGER

1. FEDERAL REPUBLIC OF GERMANY

Two-hour protection	Aachen	Essen	Clausthal-Zellerfeld	Hohen-peissenberg	Saar	Total
Dräger 1924	4	-	-	5	-	9
Dräger 160	4	-	-	6	-	10
Dräger 160A	194	1555	383	98	295	2525
Auer MR II/32	58	214	-	-	-	272
Sub-total	260	1769	383	109	295	2816
Longer protection						
Dräger 170/400	22	758	27	40	-	847
Dräger 172	1	258	36	-	-	295
Auer MR 54/400	1	66	-	-	-	67
Auer MR 56/400	5	35	-	-	-	40
Sub-total	29	1117	63	40	-	1249
Grand total	289	2886	446	149	295	4065
Per '000 underground workers	12,4	11,1	19,8	15,4	7,8	11,5

2. BELGIUM

Two-hour protection :

Dräger 160 A :

Borinage	26	
Centre	20	
Charleroi-Namur	11	
Liège	24	
Campine	84	
Sub-total		165

Aerenchon :

Borinage	2	
Campine	2	
Sub-total		4
Grand total		169

Per '000 underground workers : 1.83

Longer protection :

Dräger 170/400 :

Borinage	8	
Centre	6	
Charleroi-Namur	24	
Liège	6	
Campine	40	
Sub-total		84

Dräger 172/BG :

Borinage	4	
Centre	2	
Charleroi-Namur	-	
Liège	8	
Campine	16	
Sub-total		30
Grand total		114

Per '000 underground workers : 1.24

3. FRANCE

a) Nord/Pas-de-Calais

Fenzy 56 (2 1/2 h.)	384 (incl. 20 at C.R.S., Lens); per '000 underground workers, 4.5

b) Lorraine

Fenzy 56 (2 1/2 h.)	38; per '000 underground workers, 1.52
Dräger 160A (2 h.)	142; per '000 underground workers, 5.68
Total	180; per '000 underground workers, 7.20

c) Loire

Fenzy 56 (2 1/2 h)	66; per '000 underground workers, 7.7

d) Cévennes

Fenzy 22 (2 1/2 h.)	27; per '000 underground workers, 3,5
Fenzy 47 (2 1/2 h.)	13; per '000 underground workers, 1,6
Fenzy 56 (2 1/2 h.)	53; per '000 underground workers, 6,9
Total	93; per '000 underground workers, 12,0

e) Blanzy

Fenzy 56 (2 1/2 h)	18; per '000 underground workers, 3.75

4. NETHERLANDS

Two-hour protection :

Dräger BG 160A	150
Auer MR 32	20
Total	170; per '000 underground workers, 5.6

Longer protection :

Dräger BG 172	32
Auer MR 54/400	25
Total	57; per '000 underground workers, 1.9

5. ITALY

Two-hour protection :

Dräger BG 160	73; per '000 underground workers, 28.5
Auer MR II	27; per '000 underground workers, 10.5
Total	100; per '000 underground workers, 39.0

Longer protection :

Dräger 170/400	13; per '000 underground workers, 5.1

F. OTHER EQUIPMENT

1. FEDERAL REPUBLIC OF GERMANY

a) CO recorders

10 in the Ruhr.

b) CH_4 recorders

2 Mono CH_4 recorders at the Essen C.R.S., 95 at various Ruhr collieries, 1 in the saar: total, 98.

c) Materials for the erection of fire-stoppings

Collieries have materials available for emergency use, e.g. sandbags, fire-stopping cushions, air-sampling tubes and steel doors. Some enterprises have central stores for their collieries, with large quantities of fire-fighting materials; so also have the Central Rescue Stations. The Essen and Saar Stations have 30-40,000 sandbags, 5,000 kg. Sillan rock wool, steel doors and air-sampling pipes for stoppings, pumps of various kinds, cement-guns and cement mixers, etc.

d) Mobile laboratories

The Essen and Saar Stations each have a mobile laboratory equipped to analyse mine gases and fumes on the spot in the pits. The Essen laboratory has an Orsat apparatus for analysing carbon dioxide, oxygen, methane, hydrogen and nitrogen, a Wösthoff CO recorder and a Maihak CH_4 recorder, together with equipment for analysing fire fumes.

e) Motor transport for personnel and equipment

Each colliery's own fleet of vehicles can be used for transporting the rescue personnel and equipment. The Saar Central Rescue Station, and the three permanent rescue brigades and several collieries in the Ruhr, have special vehicles of their own for this purpose, and the Essen Station has a special van for its mobile laboratory. All the Central Rescue Stations have cars or station wagons for carrying personnel and equipment.

2. BELGIUM

See table following.

3. FRANCE

Nord/Pas-de-Calais

The Division has no CO or CH_4 recorders.

Equipment and materials necessary for the erection of fire-stoppings

Sandbags	23,000
Rock-wool cushions (1 m x 50 cm x 25 cm)	200
Cocoon sprayers	11
Cement-guns	7
Slurry pumps	9
Mobile laboratories	none
Permanent laboratories	8

Motor-cars for personnel and equipment :

Each colliery Group has a sufficient number of vehicles to enable rescue workers and equipment to be moved quickly. The Central Rescue Station has vehicles to carry 16 rescue men with full equipment and 2 maintenance men with all they need for testing and servicing the rescue appliances. Should it be necessary, each Group is required to put any vehicle asked for at the disposal of the Central Rescue Station.

Lorraine

The Division possesses one Mono CH_4 recorder, but no CO recorder.

Materials for stoppings: 6,000 sandbags, glass wool, cocoon sprayer, iso-foam.

A mobile laboratory is in process of being fitted out. Two cars are provided for transporting personnel and equipment.

Loire

The Division has no gas recorders. Materials for stoppings: 5,000 sandbags, 1 cocooner, 12 Projex slurry pumps and one cement-gun. A car is regularly available for carrying personnel and equipment.

Cévennes

6,000 sandbags for erection of stoppings; 1 car for transporting personnel and equipment.

Blanzy

Materials for stoppings: sandbags, a cocoon sprayer and 12 slurry pumps. The transport service provides the vehicles needed for moving personnel and equipment.

4. NETHERLANDS

a) CO recorders : none.

b) CH_4 recorders : 10, at the State Mines.

c) Materials for stoppings : each colliery has cushions for two stoppings, and sand for bagging. There is a central store containing, for the use of all collieries, the equipment and materials for stoppings listed in the Section following, which is dispatched immediately to the colliery concerned on the outbreak of fire.

d) Mobile laboratory : the State Mines central laboratory holds the necessary a analysis apparatus at the collieries'disposal; in the event of fire this is sent at once to the colliery concerned, together with the appropriate personnel.

e) Transport of personnel and equipment : each colliery has a sufficient number of cars and lorries.

5. ITALY

The Sulcis coalfield has two mobile laboratories and a stock of sandbags, steel doors, etc., for erecting stoppings. The vehicles for moving the personnel and equipment are supplied by the transport service.

F. Other equipment	Borinage	Centre	Charleroi-Namur	Liège	Campine	Total
CO recorders	-	-	-	-	-	-
CH_4 recorders	-	-	-	-	2	2
Mobile laboratories	2	2	2	2	9	17
CO detectors	4	3	4	1	30	42
O_2 indicators	-	2	-	-	8	10
Methanometers	1	2	1	2	32	38
Anemometers	1	1	1	1	10	14
Hygrometers	3	2	1	4	48	58
Reviving apparatus	1	4	7	4	12	28
Materials for stoppings						
Glass-wool cushions	371	200	-	125	2.070	2.766
Inflatable brattice-cloth balloons	30	-	19	-	-	49
Jute bags	10.000	5.055	5.037	6.500	33.732	60.324
Bagging machines	1	1	-	1	2	5
Stone-dust injectors	1	1	1	1	4	8
Cement-guns	-	-	-	1	71	2
Air-sampling pipes	17,5 m	11 m	25 m	14,4 m	72 m	139,9 m
Grouting machines	-	-	-	1	2	3
Cars for transporting personnel and equipment	3	2	4	2	8	19

SECTION II : PREPARATORY MEASURES FOR SERIOUS CASES

A. EQUIPEMENT AND MATERIALS TO BE HELD IN READINESS UNDER EXISTING REGULATIONS (further to I F)

1. FEDERAL REPUBLIC OF GERMANY

The Directives of March 23, 1951, concerning fire prevention and firefighting at collieries in the Dortmund Division provide on page 16 (II: Stoppings, 1: Preparatory Measures, c) as follows:

"At each colliery there must be sufficient material for the erection of stoppings and seals, e.g. sandbags and dry sand for filling them, stone dust in bags, rock or glass wool, bricks and cement. The amounts of these and the points at which they are stored must be indicated on the firefighting plan (see Part Two, Section II, p. 22); the amounts must be determined in proportion to the fire hazard at the pit concerned." (They naturally also depend on the size of the pit.)

The Directives continue on the page 22 referred to (Part Two, II: Underground Fire Plan, 1-2):

"1) Each colliery must have an Underground Fire Plan, forming part of its general plan of operations (Article 250 of the Mines Regulations).

"2) The Underground Fire plan must give particulars of the general measures to be taken under the provisions referred to. It must also list all special measures necessitated by conditions at the pit concerned."

Stores of material for stoppings have thus to be shown in the underground fire plan; they may be established both above and below ground.

Concerning actual firefighting material and equipment to be kept below ground, the Directives provide:

"C. Firefighting

1° - Facilities

e) Fire posts and fire fighting cars :

At each main level a Fire Post must be installed at a suitable point close to a main shaft; at this must be kept sufficient supplies of items of firefighting equipment and tools, tapping appliances for water mains, hoses high-pressure jet nozzles, hose couplings, grappling-hooks, and mine fire-extinguishers. Sub-posts should also be installed as may be deemed necessary or useful in individual districts.
In or near the Fire Posts a fire-fighting car must be kept, with the items necessary for firefighting (in particular tools, spanners and wrenches, bolts and screws, packing, etc.). The fire-fighting car must have sufficient space to carry the tapping appliance, hoses and high-pressure jet nozzles kept at the Fire Post. Care must be taken to ensure that the fire-fighting car can be brought at any time as rapidly as possible to the scene of action."

- Saar

The official regulations as to equipment storage, fire plans and fire posts are the same as those for the Federal Republic. The Directives of June 19, 1957, concerning fire prevention and firefighting at collieries in the Saarbrücken Division, lay down in Annex 3 the equipment and material to be stored, Sections I and II listing the items to be kept at fire posts and sub-posts below ground and Section III those at the surface.

These are: extinguishers, fittings and appliances for extinction with water, and materials for emergency stone-dust barriers, for partitions, and for forward fire dams, stoppings and seals.

2. BELGIUM

The equipment and materials to be held in readiness for firefighting purposes is prescribed in the Royal Decree of November 3, 1958: it comprises all items necessary both for direct and for indirect action.

These are as follows:

- Direct action

  a) Fire extinguishers;

  b) sand or equivalent pulverulent matter;

  c) a system of water mains with an adequate number of hydratant points, especially at all points liable to outbreaks of fire;

  d) rubber hoses and high-pressure jet nozzles;

  e) stocks of other equipment (picks, axes, spades, drilling and tapping tools etc...).

- Indirect action

  All material needed for building stoppings (glass-wool cushions, sandbags, sand, bricks, walling, blocks, cement, piping for air-sampling pipes, covers etc.)

The equipment for direct action must be stored below ground, that for indirect action at a convenient place from which it can be moved quickly to the point where it is to be used (in practice, part is kept below ground and the rest at the surface near the shafts).

N.B. In the Campine, the Mines Inspectorate requires special firefighting arrangements to be made.

3. FRANCE

- Nord/Pas-de-Calais

  In addition to the firefighting equipment kept at specified points and the water mains extending up to the workings, there are:

  - 5-10 fire extinguishers at the landings in the intake airways;
  - in each district or group of districts, according to their size and fire hazard a stock of equipment including
  - flexible hoses at least as long as the permitted distance between hydrants in the district,
  - a high pressure jet nozzle,
  - a coupling for connecting a flexible hose to a standard pipe joint,
  - the spanners, joints, bolts, etc., needed for connecting couplings to hoses and pipes;
  - at the air-intake landings of the winding shafts, or at a point situated centrally in relation to the workings and in the air-intake one or more mine-cars

with fire-fighting equipment always in readiness for movement to any point along a haulage road.

Each subsidiary rescue post has at least four closed-circuit respirators and enough in reserve to enable a first exploration team to operate unaided for five hours.

Each Colliery Group has a central equipment store with:

1. spare parts for respirators;

2. various appliances and items of rescue equipment for the use of subsidiary rescue posts if required.

The Central Rescue Station has 50 CO filter appliances with refills, and other equipment of various kinds.

- Lorraine :

Not described in this and following Sections, as at the time of writing the Central Rescue Station was undergoing reorganization.

- Loire :

At the surface, stocks at the central store include:

a) piping, pipe fittings, collars, clips and hangers, taps, joints;

b) rubber hoses;

c) lining and infilling materials for stoppings and seals.

At the top of each pit's downcast shaft, fire-extinguishers.

- Cévennes and Blanzy

Below ground at each pit;

a) equipment for adapting 40 mm. and 60 mm. piping (pipe fittings, collars, clips and hangers, taps, joints, etc.);

b) rubber hoses;

c) lining equipment and materials for stoppings and seals (support canvas, pegs, staples, wire, etc.

Above ground at each pit (top of downcast shaft), fire-extinguishers and unfilled sandbags.

4. ITALY

Under the existing regulations, the following firefighting equipment must be kept in readiness :

1) Surface

Asbestos suits, reviving apparatus, ladders, ropes and other rescue equipment, brattice cloths and air pipes.

2) Underground

Water laid on under pressure for fire-fighting, with hoses and standard hydrant points; fireproof doors to isolate fire zones; where there are no water mains, sandbags and fire-extinguishers.

5. NETHERLANDS

Under the Mines Regulations of 1939, adequate stocks of rescue equipment must be kept available above ground.

In accordance with the arrangements for co-ordinated rescue services in the Limburg coalfield, the colliery managements have laid down that

a) each pit must have, inter alia,

- fully-equipped fire-fighting cars,
- high-pressure jet nozzles, spray nozzles, foam blowers and foams,
- movable stone-dust barriers,
- sample containers,
- Dräger CO recorders and self-rescuers,
- fireproof clothing,
- sampling tubes,
- matting, glass wool, sand and clay for emergency stoppings;

b) a central store serving all the collieries must have, inter alia,

- air-sampling tubes for stoppings,
- plastic air ducts and compressed-air fans,
- cement-mixers and cement-pumps,
- shale injectors and cement-guns,
- handling and transport intallations.

B. SCHEDULE OF PERSONS TO BE ALERTED UNDER EXISTING REGULATIONS (further to 1,C/D)

1. FEDERAL REPUBLIC OF GERMANY

The following procedure is laid down in the official Special Instructions to Colliery Managements for Major Emergencies.

"A. Immediate measures

1. Alarm

Immediately a mine accident on whatever scale is reported, the following must be alerted or notified in accordance with the alarm schedule set forth in the colliery rescue plan :

a) the colliery's own rescue corps;

b) the colliery manager and the colliery underground manager;

c) the colliery personnel mentioned under B,3
(B. Direction of rescue operations

3. The following must be available to assist the direction of the rescue operations :

a) the ventilation deputy, with his ventilation log-books, the ventilation plan, and his recording instruments;

b) the fire deputy, with the firefighting plan;

c) the surveyor, with all the plans of the mine;

d) a responsible official of the underground mechanical-engineering staff, with all the plans of the mains-network;

e) the surface-installations manager, and if necessary the chief engineer;

f) the security officer;

g) the colliery medical officer;

h) the chief safety officer;

i) a competent member of the workers' delegation.

- See also Dortmund Divisional Inspectorate's instructions of July 1, 1953, concerning colliery rescue arrangements, Annex 16, p. 69).

d) the District Inspector of Mines;

e) the Central Rescue Station

(cf. Article 265 of the Dortmund Division Mines Regulations of May 1, 1935, currently applicable revised edition of July 1, 1935 :

"The collierty manager must see to it that relief teams with equipment are standing by when or immediately after the rescue teams go into action. Should his own rescue personnel not be sufficiently numerous, he must apply, at the same time as he is mobilizing them, for assistance from the nearby collieries shown in the master rescue plan. He must also, in any event, inform the Central Rescue Station at once").

- Saar

The Directives of June 19, 1957, concerning firefighting at collieries in the Saarbrücken Division, and the Directives concerning rescue preparations and operations, provide that the following shall be alerted :

a) by responsible officials below ground

1) the Central Rescue Station,

2) the underground manager;

b) by the underground manager

1) the rescue brigade, ventilation deputy and fire deputy,

2) the districts in danger,

3) the department affected,

4) the Regional Mines Inspectorate,

5) the central laboratory;

c) by the official in charge of rescue operations

1) any neighbouring pits likely to be endangered,

2) outside rescue brigades,

3) doctors, ambulance men, hospitals,

4) the Divisional Mines Inspectorate.

2. BELGIUM

The persons to be alerted are listed in order in the General Instructions for major emergencies liable to require the services of Central Rescue Stations, which provide inter alia as follows.

I.- Action to be taken by officials present at the surface on being notified of an accident

1) Inform Central Rescue Station (in the case of collieries not possessing rescue services of their own). In the case of collieries having their own rescue services (Campine), this does not apply.

2) Inform colliery engineers, underground manager, chief safety officer, chief security officer and head of administration department.

3) Inform colliery rescue team-leavers, by all means available (telephone, driver, dispatch, rider, runner).

II.- Action to be taken by operational department

1) Inform Managing Director.

2) Inform Mines Inspectorate, Divisional Director, Chief Divisional Engineer, District Engineer, Workers' Delegate to Mines Inspectorate.

3) Inform medical service (medical officer, first-aid men).

4) Inform chief deputies or overmen, senior surface officials, safety deputies, tallymen and assistant tallymen, the surveyor.

III.- Action to be taken by chief colliery surface engineers

1) If necessary, inform technical personnel and rescue team leaders of other pits of the company.

2) If necessary, inform the Red Cross.

The Central Rescue Station must

1) inform the medical department of the Joint Insurance Office;

2) inform surgical departments of hospitals;

3) inform the National Rescue Centre, which will if necessary alert Central Rescue Stations elsewhere in Belgium.

3. FRANCE

- Nord/Pas-de-Calais

The official Instructions concerning underground explosions liable to involve rescue operations (which also apply in the case of mine fires and underground combustion) lay down the following alarm arrangements.

I.-SURFACE DEPARTMENTS AT COLLIERY PIT AFFECTED

Action to be taken at once by personnel present at the surface on receiving notification of the accident, and thereafter by engineers appointed to take control at the surface in emergency.

Inform :

1) colliery engineers, if absent :

2) central executive of the Colliery Group ;

3) by express messenger, rescue men at the surface whose names and addresses are posted up in the lamp-room, and rescue-appliance maintenance man;

4) district medical officer;

5) workers' safety delegate.

II.-CENTRAL EXECUTIVE OF THE COLLIERY GROUP

Action to be taken forthwith on receiving notification of the accident.

Inform :

1) Mines Inspectorate. If telephone out of order, send top-priority telegram (under Article 583 of Telegraph Service Instructions);

2) Central Rescue Station,

- preferably by inter-Group telephone,
- failing that via State telephone Lens 129, or failing that via Lens 420 (Lens Group switchboard, which will connect caller with Central Rescue Station). For all such calls, specify

  "PRIORITY, RESCUE OPERATION",
- failing that by top-priority telegram (Article 583) worded as follows : "Central Rescue Station, Lens : Send help, accident at Blank Colliery, Blank Group";

3) Divisional Board;

4) Group rescue posts, transport service (to take rescue personnel and equipment to colliery affected), central stores (to prepare supply of rescue appliances);

5) engineers appointed in advance to take control at the surface at the surface at the pit affected;

6) engineers appointed to be responsible for testing and servicing of rescue appliances;

7) medical service;

8) local authorities and police;

9) in the case of very serious accidents, neighbouring Groups.

- Loire, Blanzy, Cévennes

Very similar procedure; carried out by the colliery manager.

4. ITALY

Alarm goes first to head of fire brigade; then to Mines Inspector.

5. NETHERLANDS

Directive No. 86 of the Inspector-General of Mines lays down that the following are to be informed forthwith in the event of a mine fire or explosion :

1) rescue service;
2) colliery engineers;
3) local Inspector of Mines;
4) colliery scheduled to assist;
5) Chief Medical Officer;
6) Heerlen hospital.

C. PREMISES AND LOCATIONS TO BE FIXED IN ADVANCE UNDER EXISTING REGULATIONS

1. FEDERAL REPUBLIC OF GERMANY

The Special Instructions to Colliery Managements for Major Emergencies provide in Section D (Further Rescue Arrangements), subsection 14 (Accommodation to be Reserved) that premises must be set aside to serve as

a) Incident Headquarters;
b) control post;
c) assembly base for colliery's own and outside rescue teams;
d) canteen;
e) casualty station;
f) Press information room;
g) mortuary.

- Saar

The Directives concerning rescue preparations and operations drawn up in agreement with the Saarbrücken Divisional Inspectorate require the following premises and locations to be fixed in advance :

1) incident headquarters with office facilities attached;
2) casualty station with examination room for medical staff;
3) mortuary;
4) assembly base for outside rescue teams and ambulance men;
5) canteen for outside rescue teams and ambulance men;
6) car park;
7) Press information room.

2. BELGIUM

The Decree of September 25, 1947, in the Annexes to Section IV provides that all collieries must have rest rooms with beds and all necessary first-aid equipment, and in addition a casualty station for medical and surgical treatment. It further specifies the requirements to be fulfilled by these, their equipment and staffing arrangements.

The instructions for major emergencies require in addition that special extra accomodation should be prepared for casualties; this must be heated and provided with first-aid boxes, bedding, blankets, etc. The instructions also require the installation of

1) incident headquarters with telephone;

2) premises for setting up mobile laboratories;

3) a rescue men's rest room;

6) premises for storing and servicing rescue equipment.

3. FRANCE

- Nord/Pas-de-Calais

The instructions concerning underground explosions liable to involve rescue operations require that the following accommodation be provided :

1) room for rescue personnel and their spare equipment;

2) casualty station (motor transport to be available to take casualties to hospital);

3) mortuary.

All collieries have permanent medical rooms; in case of need extra accommodation is prepared.

- Loire, Cévennes, Blanzy

All collieries have at any rate rooms (medically equipped or otherwise) which can be reserved for rescue men.

4. ITALY

Rooms have to be provided for first aid to casualties.

5. NETHERLANDS

No statutory provision is made for such accommodation. At each colliery casualty stations, etc., are installed at the surface as required, in addition to the permanent medical rooms.

D. PLANS (E.G. FIREFIGHTING PLAN, PLAN OF TELEPHONE SYSTEM) TO BE AVAILABLE UNDER EXISTING REGULATIONS

1. FEDERAL REPUBLIC OF GERMANY

The Directives concerning fire prevention and firefighting provide (in Part Two, II : Underground Fire Plan, 3, p. 22) as follows :

"The Underground Fire Plan must include a Firefighting Plan, drawn up in accordance with the Mine Plan, in simple perspective, to scale with the Ventilation Plan, and appended as a detail to the Mine Plan. The Firefighting Plan must show

a) the entire water-mains network with indication of pipe diameters and water preassures, main valves and shut-off gates and air/water reversing valves, also all water-storage tanks with their contents, and all reducing valves with indication of both pressures;

b) points where fire-fighting cars, materials for building stoppings, etc., are kept;

c) fire posts, with number and type of appliances kept there;

d) type of fire-protection in each staple-pit and built-in ventilation doors;

e) fireproof section of roadways, with indication of their length;

f) automatic fire-extinguishers;

g) all fixed extinguishers;

h) all underground telephone installations.

"The Firefighting Plan must be posted up conspicuously in the manager's office and in the rescue equipment room."

Inspectorate Directive No. I 3604/65/52, of January 21, 1952, also provides that in addition to the Firefighting Plan showing the water-mains network there must be a plan of the normal-pressure compressed-air mains.

- Saar

In addition to the relevant mine plans, collieries must have

1) a ventilation and stone-dust plan;

2) a firefighting plan with annexed tracings of the water and compressed-air mains and of the gas mains.

The firefighting plan contains the particulars listed in a) - h) above.

2. BELGIUM

The Royal Decree of November 3, 1958, requires managers to have and keep up to date a "general action plan" in respect of fire, showing the ventilation circuits, main gradients, volume and direction of air-currents, CH_4 contents in return airways, location of conveyors, electrical installations, electric cables, ventilation doors, fans, stores, telephones, vehicle depôts, etc.

In addition, the firefighting plan shows the location of all firefighting installations and appliances (water mains, hydrant points, stocks of hoses, sand, fire-extinguishers, etc.).

3. FRANCE

- Nord/Pas-de-Calais

Each colliery is required to keep the following plans and to bring them up to date quarterly :

1) plan of water-supply system of underground workings, where appropriate showing storage tanks and pressure and volume regulators;

2) plans showing

- storage points for firefighting equipment and extinguishers,
- fireproof zones,
- telephones,
- electricity networks.

Ventilation plans are also kept, showing in addition to airways and air-currents the position of stone-dust barriers and stone-dust sections of roadways.

- Loire

Plans are kept, and revised annually, of

1) firefighting facilities (showing location of extinguishers);

2) water mains;

3) compressed-air mains;

4) slurry-pumping systems;

5) telephone network;

6) ventilation (showing air-currents and volume, stone-dust barriers and stone-dusted sections of roadways).

- Cévennes, Blanzy

Plans are kept, and revised at intervals (varying according to the installations concerned, but not exceeding one year), of the air dusts and water mains, electrical installations, telephones, storage points for extinguishers, ventilation (showing air-currents and volume stone-dust, barriers, etc.) and, at some pits, slurry-pumping installations.

4. ITALY

Collieries must have a telephone network and a firefighting plan approved by the Inspector of Mines.

5. NETHERLANDS

All collieries are or will shortly be required by law to keep

1) a ventilation plan with all relevant particulars;

2) plans of the underground telephone network, fire-extinguishers available below ground, water mains below ground, stone-dust barriers below ground, and transformer houses below ground.

E. ANY OTHER ARRANGEMENTS TO BE MADE UNDER EXISTING REGULATIONS

1. FEDERAL REPUBLIC OF GERMANY

The Dortmund Divisional Inspectorate's rescue instructions of July 1, 1953, in Annex 16, p. 70, require that persons shall be detailed, inter alia, to

"supervise the issue of information;

check and look after the colliery's own rescue personnel and rescue teams sent to assist by other collieries;

control at colliery gates of admission to colliery premises;

control at pit banks of persons entering and leaving the mine;

attend to dead and injured;

supervise main fans;

man the store;

organize reserve supplies of equipment;

man the laboratory on a continuous basis."

- Saar

Extra or special personnel to be assigned to duty at

1) surface telephone switchboard, and if necessary important telephone below ground;

2) colliery gates;

3) all points of access to the underground installations;

4) fans;

5) winding engines (personnel to be doubled);

6) tally room;
7) lamp room;
8) rescue post;
9) stores.

The decision whether to send for the mobile equipment from the central laboratory for analysing air samples or to have these analysed at the central laboratory is taken according to the particular circumstances.

2. BELGIUM

In addition to the General Instructions for all mines, there are supplementary instructions largely similar to those for Germany and France; these are embodied in a Schedule of Measures to be taken in the event of an emergency liable to require the services of Central Rescue Stations.

3. FRANCE

- Nord/Pas-de-Calais

The instructions already quoted also require the following action to be taken :

1) at pit bank, control persons entering and leaving the mine;
2) in lamp room, control of all lamps issued and returned;
3) fans to be checked;
4) operation of air compressors to be checked;
5) electric and flame safety lamps to be sent for unless colliery has substantial numbers in stock;
6) security arrangements to be instituted at the surface;
7) all communications from below ground to be channelled to the manager's office, and main items of information recorded in writing, with the names of those supplying them;
8) duty rota of officials, clerical staff and workmen to be fixed so that rescue operations can proceed continuously without undue strain on the personnel.

- Loire, Cévennes, Blanzy

The above arrangements also apply in these coalfields.

4. ITALY

None.

5. NETHERLANDS

Rules Nos. 62 and 84-87 of the Inspector-General of Mines are to much the same effect as the above directives for Germany, Belgium and France.

SECTION III - MEASURES TO ENSURE PERMANENT AVAILABILITY OF SERVICEABLE RESPIRATORS AND REVIVING APPARATUS

1. FEDERAL REPUBLIC OF GERMANY

A. Regular servicing and testing

The Dortmund Divisional Mines Inspectorate's rescue regulations of July 1, 1953, provide under 10,f that

> "the brigade leader must test once a month all respirators and reviving apparatus, and record the results in the Test Register,"

and under 12,a/d that

> "the rescue-equipment maintenance man is responsible for the servicing, testing and usability of all respirators and reviving apparatus he must test and service the appliances in accordance with the relevant instructions of the Central Rescue Station.(Annex 15, p. 65)."

The relevant passage in Annex 15 to the regulations runs as follows :

"The servicing and testing of the above-listed appliances must be effected in accordance with the following instructions.

Self-contained oxygen respirators

The exterior of the respirators must be kept clean. All leather and rubber parts must be regularly tended to preserve suppleness. When stored the respirator tubes must be so hung that they are not subjected to stretching. The container of each respirator must bear on the lid a serial number and the identification mark of the pit concerned. A tag must be attached to each respirator, showing when last tested and whether serviceable. Any external damage to the container or carrying device must be repaired at the first opportunity.

The oxygen cylindres must be subjected to the regulation pressure test at the prescribed intervals. The numbers of the cylindres and the dates and results of the tests on each must be recorded in a register.

All reducing valves must be listed and must be returned to the manufacturers at intervals not exceeding five years for complete overhaul. The self-contained oxygen respirators must be regularly tested, and any defects made good as promptly as possible by the replacement of the faulty parts.

The following tests must be made :

a) weekly test for leakage and of the pressure in the oxygen cylinder;

b) monthly test for leakage, pressure in the oxygen cylinder and functioning of all parts;

c) test before use;

d) test after use.

Details of the methods to be employed in testing the variuos types of breathing apparatus follow on pp. 67-68 of the Annex.

In addition, the Central Rescue Station carries out a quarterly inspection of the appliances stocked.

B. Testing immediately before use

The Dortmund Division's rescue regulations provide under 16,a that

"a) rescue teams must operate in the presence of noxious gases or oppressive air conditions only with respirators which have been tested immediately before being put on (cf. Article 265 of the Dortmund Division Mines Regulations of May 1, 1935, as reissued on July 1, 1953)."

The testing is effected in accordance with the directives laid down in Annex 15 just quoted.

C. Handling of respirators in any standby base installed below ground

Article 16 of the Dortmund Division's rescue regulations further provides in subsections b) and c) that

"b) a standby base must be installed at a convenient spot in a fresh air current, and the necessary respirators, reviving apparatus and first-aid equipment kept available there . . . the respirators must be taken to the standby base immediately after use and there serviced and made re-usable; the servicing and care of the appliances at the standby base are the responsibility of the maintenance man who must be permanently on duty there (cf. Article 12)."

- Saar

A. Regular servicing and testing

Appliances at rescue posts must be tested by the maintenance man with a testing device after use, or if not used, at regular intervals not exceeding four weeks. The brigade leader must check monthly that this has been done.

At the permanently-manned Central Rescue Station and its sub-stations (the so-called Group Rescue Stations with practice galleries) respirators must be regularly tested once a week, and the results noted on a tag attached to the appliance and recorded, individually for each appliance, in a register (printed form).

Respirators must also be tested every six months by the Central Rescue Station.

B. Testing immediately before use

Every respirator must be tested by a maintenance man with a testing apparatus whenever issued (for practice drill or actual emergency), and the result compared to see whether it corresponds with the result of the previous test. Immediately before the user goes into action (practice or actual emergency), he must make a further test (without apparatus) in accordance with specified instructions.

C. Handling of respirators in any standby base installed below ground

The rules concerning the installation of standby bases and handling and servicing of used appliances are similar to those for the Federal Republic. The components concerned must be immersed and rinsed several times in clean water, well dried and then reassembled. Each respirator must be checked with a testing apparatus after reassembly, and the result noted on a tag attached to the appliance and recorded in a register. Strict care must be taken at the standby base to keep serviced and unserviced, respirators apart.

2. BELGIUM

A. Regular servicing and testing

All respirators must be kept always in serviceable condition.

Immediately after use they are serviced and thoroughly tested by a maintenance man.

B. Testing immediately before use

Immediately before it is issued to the rescue man, the respirator is given a final quick check by the maintenance man as to

a) adjustement of mouthpiece, potassium cartridge, breathing bag and control lever;

c) airtightness of valves;

d) operation of warning signal.

Just before going into action the rescue man makes the same test once more.

These very rough checks take only a few moments.

C. Handling of respirators in any standby base installed below ground

A standby base is usually installed below ground for the servicing of respirators. Every eight hours, i.e. after being used three times, the appliances are brought to the surface for thorough testing, cleaning and disinfection.

Each rescue man has a mouthpiece reserved for his personal use.

3. FRANCE

- Nord/Pas-de-Calais

A. Regular servicing and testing

In addition to the servicing of respirators immediately after use, each rescue post has a man responsible for keeping the appliances in good order and maintaining a supply of accessories in accordance with an inventory posted up.

Every six months the respirators of each rescue post in the Division are tested at the Division's Central Rescue Station by the Station maintenance staff in the presence of responsible officials from the rescue post.

B. Testing immediately before use

Immediately before a respirator is issued to a rescue man the maintenance man must make a quick test; on issue and before use the rescue man in his turn tests the apparatus for leakage, in fresh air.

These tests take only a few moments.

C. Handling of respirators at any standby base installed below ground

If necessary, forward base is installed below ground where respirators can be serviced; an adequate number of spares must be kept there.

- Loire

A. The equipment of each rescue post is inspected at least once a month by or on the instructions of the superintendent of the Central Rescue Station. In addition, the operation of respirators is tested at least once a quarter in the smoke chamber in the course of the rescue practice drills.

B/C. Testing before use handling at standby base : as above (Nord/Pas-de-Calais).

- Cévennes

A. Each rescue post has a specialized fitter responsible for the maintenance of its equipment. The respirators are taken every three months to the Central Rescue Station and tested by Station staff in the smoke chamber.

B/C. Testing before use handling at standby base : as above (Nord/Pas-de-Calais).

- Blanzy

A. The equipment of each rescue post is inspected at least once a month by or on the instructions of the superintendent of the Central Rescue Station. In addition, the operation of respirators is tested at least twice a year, including once in the smoke chamber in the course of rescue practice drill.

B/C. Testing before use handling at standby base : as above (Nord/Pas-de-Calais).

4. ITALY

A. Respirators must be tested monthly.

B. Respirators must be tested before use.

C. There is no specific provision for keeping respirators permanently available below ground.

5. NETHERLANDS

A. All rescue equipment must be kept permanently in usable condition. Appliances must be serviced and tested immediately after use. Any appliance which has not been in use for a month must be tested again.

B. Testing only on oxygen supply and airtightness of oxygen filter and compressed-air tube; also on airtightness of mask.

C. No specific regulations.

SECTION IV - RESCUE ARRANGEMENTS IN GREAT BRITAIN

A. GENERAL REMARKS

The National Coal Board operates approximately 1,000 coalmines which reach from Scotland to Kent, a distance of about 500 miles. The coalfields are split into nine Divisions, subdivided into 48 Areas.

There are 3 Central Rescue Stations located at strategic points throughout the coalfields. Each mine is affiliated to a Central Rescue Station. Each Central Rescue Station normally serves mines within a radius of 15 miles.

There are two types of Station : one with its own permanent corps living in or in the vicinity of the Station with a number of part-time rescue men at the pits served by it (known as a "Scheme A" Station) and one with no permanent corps which operates entirely through rescue brigades maintained at the mines themselves ("Scheme B" Station). There are 15 Scheme A Stations and 16 Scheme B Stations, and the total number of permanent corps rescue men at the former is 240, while the number of part-time rescue men at the mines is 4,250.

Any national-level arrangements

There is no National Rescue Headquarters, but in each Division there is a Divisional Rescue Stations Committee responsible for the rescue organization in the Division.

In addition, there is a National Rescue Committee under the chairmanship of the National Coal Board's Chief Safety Engineer, the members of which are specially selected for their knowledge of rescue within the industry. This Committee deals with all aspects of rescue work, including scientific research.

B. TRAINING AND PRACTICE

All rescue men have, in the first instance, to undergo preliminary training consisting of at least 12 practices before being qualified, and then have to attend six statutory practices a year, two of which must be underground at a mine.

C. ORGANIZATION OF RESCUE OPERATIONS

a) Alarm

Every mine is in telephonic communication with the Central Rescue Station to which it is affiliated. The majority of the Central Rescue Stations are equipped with v.h.f. radio communication, which enables them to keep in touch with their mobile rescue vans and other Rescue Stations in the vicinity.

b) Direction of rescue operations

Rescue operations are directed by the colliery manager; until he arrives on the spot, the senior official present takes charge.

D. MUTUAL ASSISTANCE IN MAJOR EMERGENCIES

If in the case of a serious disaster at a colliery any Division requires further rescue facilities, it calls on any other Divisions for help. In the event of an emergency arising in the small isolated coalfields of south-eastern England, arrangements have been made for any necessary rescue personnel and equipment to be transported by air from Rescue Stations in the nearest Division.

E. STOCKS OF RESPIRATORS GIVING PROTECTION FOR TWO HOURS AND OVER

Two types of self-contained two-hour breathing apparatus are in general use :

1) compressed oxygen (Proto);
2) liquid air (Blackett Brown-Mills Aerophor and Aerencheon, the latter being a lighter type).

Of the 31 Central Rescue Stations,nine are equipped with liquid-air apparatus and 22 with compressed-oxygen apparatus. The Stations serving a particular Division are equipped with the same type of apparatus; thus the Northern (Northumberland and Cumberland), Durham and East Midlands Divisions use the liquid-air type and the other Divisions the compressed-oxygen type.

In addition to the main types of apparatus just referred to, each Central Rescue Station is equipped with six sets of an emergency lightweight short-term compressed-oxygen breathing apparatus (Savox) which has a duration of 30 minutes. Although designed as an emergency apparatus, the Savox can be used with advantage in connection with other work, e.g. the building of stoppings in irrespirable atmospheres.

F. PREPARATORY MEASURES FOR SERIOUS CASES

1) Equipment and materials to be held in readiness under existing regulations

With regard to firefighting, the National Coal Board has issued instructions dealing with the provision of water supply, hydratants, fire stations, fire points, fire hose, portable extinguishers, periodic tests, recording of tests and examinations, and firefighting plans.

As regards other equipment, the Rescue Advisory Committee's, Report No. 2 recommends that stocks be kept of materials,tools, etc., for the erection of fire stoppings; these are held both above and below ground, the amount of equipment kept underground depending on circumstances.

Further recommendations by the report include the following.

"50. Stores for rescue and recovery work.

(a) When an incident occurs, the Storekeeper or other person in charge of stores should submit without delay to Incident Headquarters a stock statement in respect of sand, sandbags, stone-dust, brattice cloth, pipes, bricks, cement, fire-extinguishers spares and refills, tools and any other stores likely to be needed for rescue and recovery work.

(b) If there are any shortages, or if directed by the Manager to increase his stock, the Storekeeper should call at once for additional supplies needed from the Area Supplies Officer, or arrange to get them from a neighbouring colliery. Even if no additional supplies are immediately required it is desirable to make contact with the Area Supplies Officer, so that he may be able subsequently to deal with demands promptly.

(c) The official in direct charge of the surface (para. 38) or the Storekeeper acting under his direction should organize any special arrangements necessary for the transport of stores and materials from store to pit top."

2) Schedule of persons to be alerted under existing regulations

Of the two types of Central Rescue Stations in Britain, Scheme A Stations are alerted at once and a team - or teams - of Permanent-Corps rescue men are dispatched forthwith to the colliery requiring assistance; at the same time the part-time rescue men are also alerted by the Colliery Manager. Scheme B Stations are similarly alerted at once for provision of the necessary breathing apparatus and equipment, and the part-time rescue men summoned by the Colliery Manager. The Colliery Manager must make all necessary arrangements for summoning the rescue workers employed at his particular colliery in order to meet his responsibilities under the Coal and Other Mines (Fire and Rescue) Regulations.

Warning devices (bells, and in some case telephones) are installed at the homes of certain part-time rescue men; other ways summoning rescue workers are by messengers, the police, and other available means.Arrangements are also made for the necessary transport.

The Rescue Advisory Committee's report includes the following further recommendations.

"28. Action messages.

(a) In drawing up a list of the persons, etc., to be summoned by means of action messages (whether by telephone or by messenger), it will be found convenient to commence by grouping them in three categories :

(i) a first-priority list of the persons most urgently required;

(ii) persons who can be called by those notified under (i) under relay arrangements;

(iii) persons, etc., to be summoned or informed as soon as those in (i) have been called. This list should not be too long.

The names can then be arranged in due order and can advantageously be set out in the form of a chart giving telephone numbers. Persons who cannot be communicated with by telephone should be noted in some distinctive way (e.g. in red ink) with addresses and the word "Messenger."

(b) Under the "Uniform Code of Rules for the Conduct and Guidance of Persons Employed in Rescue World" in the Eighth Schedule to the Rescue Regulations, the management are under a statutory obligation in any emergency likely to require the services of a rescue corps or brigades to take the following steps immediately :

(i) telephone to Central Rescue Station;

(ii) summon the trained rescue men belonging to the mine;

(iii) telephone for medical assistance;

(iv) telephone to H.M. District Inspector of Mines, the local office of the N.U.M., and the local office of the N.A.C.O.D.S.

"30. Warning messages.

As explained above, this heading covers messages to persons, etc., who are not required to attend the colliery forthwith or to take any other immediate action, but who are desired to prepare for some possible action later or on receipt of a further message."

3) Premises and locations to be fixed in advance under existing regulations

The Rescue Advisory Committee's report suggest the following.

"36. Incident Headquarters.

(a) It will generally be found advantageous to designate certain rooms in the colliery offices as "Incident Headquarters," and the rooms to be used for this purpose in an emergency should be thought out in advance.

(b) There should be a conference room (e.g. the Manager's private office), which should have a large table on which plans can be laid out, and will be occupied by the Manager or senior official on duty.

(c) If available, a briefing room is useful for instructing under-officials what they have to do in order to carry out written orders embodying decisions taken at conferences of senior officials.

(d) A clerks' office is indispensable, for the Manager or senior official on duty should at all time be provided with adequate clerical assistance for recording events as they occur, noting decisions taken at conferences, issuing instructions and otherwise conducting the large amount of clerical work incidental to a nerve centre of operations.

(e) Copies of the Emergency Organization Plan should be kept in a cupboard clearly labelled "Emergency Organization" in the Manager's office or the room designated as Incident Headquarters, together with the Rescue and Firefighting Plans and the special books, charts, Authorization Cards, and copies of lists and instructions prepared in advance.

"41. Waiting room for relatives, etc.

(a) It is generally desirable to assign in advance as comfortable a room as possible where relatives waiting for news can be accommodated. The room

should have seating arrangements and provide facilities for interviewing relatives and for dealing with inquiries.

(b) Control of the waiting room when in use, and the responsibility for dealing with these inquiries, should be undertaken by the Labour Department.

"43. Car parking.

A space should be set apart for the parking of cars, and a man designated as attendant, with authority to direct the placing of cars and responsibility for them when parked.

"49. Rescue brigade room, etc.

If rescue teams are called in from outside the colliery, they will need a rescue brigade room for their exclusive use, and messing arrangements; they may also need sleeping accommodation. The best way of meeting these needs should be thought out in advance and rooms assigned or accommodation arranged.

"52. Sleeping accommodation.

If transport to and from their homes is not readily available, sleeping accommodation may necessary for volunteer workers and perhaps for rescue men, and the accommodation that can be made available at the colliery. If large numbers of persons have to be provided for, however, it will generally be found best for the Area Welfare or the Labour Officer to arrange local billets for them instead of attempting to provide sleeping arrangements on colliery premises.

"54. Medical and first-aid services.

(a) The Medical Centre or First-Aid Room provided at the colliery will seldom be adequate in a serious emergency. The need for additional accommodation must be envisaged, and should be provided for by designating a room or rooms in advance. Unless the colliery is exceptionally well provided with qualified First-Aid men, it is also well to envisage the need for, and to think out plans for, obtaining the services of additional First-Aid men.

(b) If there are a considerable number of casualties, additional supplies of dressings, antiseptics, bandages, splints, etc., are likely to be required, and plans should be made to obtain these without delay from neighbouring collieries or Area Stores.

(c) The possibilities should be considered of having to set aside suitable accommodation for use as a temporary mortuary.

(d) All these services should normally be arranged by the Colliery Medical Officer, if any, or under the direction of the Divisional Medical Officer, in consultation with the Manager."

4) Plans to be available under existing regulations

The Coal and Other Mines (Fire and Rescue) Regulations require the provision of proper plans in a form suitable for use by rescue workers, kept corrected up to a date not more than three months previously. These show the ventilation and all principal doors, stoppings and air crossings, regulators and telephone stations, with intake airways marked in blue and return airways in red to distinguish them.

5. Any other arrangements to be made under existing regulations

The Rescue Advisory Committee's report recommends a number of further measures with respect to telephone facilities, surface control, recording of events, keys to offices and stores, access to colliery premises, Press arrangements, control of persons entering and leaving the mine, lamp-room organization, volunteer workers, canteen facilities, transport and ambulance transport, identification of the dead, relations with workmen's representatives, relations with Inspector of Mines, sign-posting of underground roadways, and scientific services.

C. MEASURES TO ENSURE PERMANENT AVAILABILITY OF SERVICEABLE RESPIRATORS

1) Regular servicing and testing

All breathing apparatus has to be kept at a Central Rescue Station and has to be examined under the Regulations by a competent person at intervals not exceeding 30 days. A record of all the tests carried out has to be kept at all Central Rescue Stations. In practice, the testing of equipment is carried out at much shorter intervals, and in fact is being constantly done at the Rescue Stations.

Generally speaking, no breathing apparatus is actually kept at a mine, but this can be allowed under exemption from the Inspectorate. In such cases the apparatus has to be examined every 30 days.

2) Testing immediately before use

Before any equipment is put into service it is tested.

3) Handling of respirators in any standby base installed below ground

In the United Kingdom there are no permanent posts installed underground. The system after an emergency is to set up Fresh-Air Bases where arrangements are made for the equipment to be tested and examined after any period of work.

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ANNEX C

COLLIERY MEDICAL SERVICES

CONTENTS

I

LAWS, REGULATIONS AND CONTRACTUAL PROVISIONS CONCERNING MEDICAL SERVICES AND MEDICAL EXAMINATION AND SUPERVISION

A. GERMANY

1. There are no statutory requirements on the subject. The relevant legally binding provisions are laid down in :

   a) an agreement between the national employers' confederation, the national trade union confederation and the industrial medical officers' association, to which are annexed :
      1) directives concerning the profession of industrial medical officer,
      2) model contracts for full-time and part-time industrial medical officers;

   b) Mines Inspectorate orders.

2. The agreement referred to in a) above specifies, inter alia, that :

   a) employers' associations undertake to recommend their members to organize medical services where warranted by the size and character of the enterprise;

   b) these services must be placed in the charge of approved members of the medical profession possessing appropriate qualifications;

   c) works medical services must deal with matters of industrial and social medicine arising out of the particular requirements of the enterprise concerned, advise both the management and the works council concerning these matters, and give medical attention in urgent cases;

   d) responsibility for appointing and dismissing works medical officers rests with the management, in consultation with the works council; the chief medical inspector for the Land must also be consulted;

   e) the head of the works medical service must be directly answerable to the general manager or his deputy;

   f) industrial medical officers' contracts must be so framed as to guarantee them complete independence in the discharge of their duties;

   g) members of the medical profession seeking appointment to a works medical service must fulfil certain requirements (set forth in section 7 of the agreement);

   h) the industrial medical officers' association undertakes to provide introduction and advanced training for works medical officers;

   i) a committee of representatives of the three signatory bodies must be set up to supervise the implementation of the agreement.

3. Mines Inspectorate orders require

   a) pre-entry medical examinations, it being carefully specified who is entitled to perform these, in respect of what points the applicant is to be examined, and what equipment must be available for effecting the examination;

   b) periodic health checks, to be carried out annually in the case of juveniles up to the age of 18, and in the case of mineworkers over 18 at such intervals as the medical officer may deem advisable on the basis of his own observations and of the type of work performed by the man concerned, the interval in no case to exceed three years.

   Both procedures are obligatory.

Thus while the agreement between the employers', workers' and medical officers' associations recommends the establishment of works medical services where justified, it nowhere makes this compulsory; the Mines Inspectorate orders, on the other hand, do insist that medical examinations shall be carried out, and carried out in accordance with certain conditions, but do not require that this shall be done by a works medical officer.

Some small collieries do in fact have their medical examinations effected by outside practitioners or health services.

The provisions just listed do not apply to the Saar, although efforts are being made there to bring arrangements into line with those in the other coalfields of the Federal Republic. Medical examinations in the Saar are organized through the medical department of the Saarbergwerke.

B. FRANCE

1. The ordinance of August 2, 1945, making silicosis one of the recognized compensatable occupational diseases - since it necessitated action to ensure early detection and supervision of silicosis cases - made it essential, in view of the high incidence of the complaint, to institute more medical services and to expand existing ones.

   Some provisions in the decree of June 14, 1946, concerning conditions for mineworkers are also to this effect.

2. The decree of December 24, 1954, concerning particular silicosis-prevention measures in the mines, lays down basic requirements in respect of pre-entry medical examinations and periodic fitness checks for employment in certain types of working in coalmines. All underground workers have by the terms of the decree to undergo medical examination at intervals of not more than between six months and two years : in practice the interval varies, according to the collieries' individual arrangements under this rule, from six months to one year.

   The order of March 18, 1958, lays down recommendations to be made to the medical officers effecting these preventive examinations, and also requires that the equipment used in radiological examination shall be approved beforehand as being in accordance with rules set forth in the order.

3. Legislative Ordinance No. 59/46, of January 6, 1959, lays down detailed provisions with regard to the organization of colliery medical services. These include the following :

   a) collieries must have medical services : where the personnel is sufficiently numerous the medical officer must be a full-time specialist, otherwise two or more collieries may operate a joint medical service;

   b) the main function of colliery medical services must be to prevent the men's health from undergoing any deterioration due to their work, more especially by supervising health conditions on the job, risks of infection, and the individual worker's own state of health;

   c) colliery medical officers must hold a diploma in industrial medicine, in accordance with such conditions and from such time as shall be eventually fixed by implementing decree; they will also be debarred by decree from undertaking certain duties incompatible with their profession.

   The ordinance, which has force of law, will shortly be supplemented by the promulgation of implementing decrees.

C. ITALY

The decree of April 9, 1959, which came into force on January 1, 1960, includes the following provisions.

1. Mineworkers must undergo medical examination

   a) before engagement, to ascertain their fitness <u>for the job envisaged</u>;

   b) annually, to ascertain their continuing fitness.

2. Workers on jobs entailing certain hazards (specified by the decree) must undergo medical examination at more frequent intervals, and also psychotechnical examination.

3. Mines and quarries employing 100 or more workers on the main shift must operate a medical service of their own.

4. The function of the medical service must be

   a) to carry out the medical examinations just referred to;

   b) to give first aid;

   c) to give medical attention to casualties who are able to continue working;

   d) to draw attention to any conditions liable to affect workers' health, and if possible suggest appropriate action;

   e) to encourage workers to be attentive to considerations of health and sickness prevention.

5. Medical services may in certain cases be run jointly by two or more enterprises.

6. The names of the medical officers employed must be submitted to the competent authority.

7. In certain cases the Medical Inspectorate may require an enterprise to employ a resident medical officer.

8. First-aid facilities must be organized at all mines not having a medical service of their own.

The decree further contains provisions concerning obligatory attention to workers involved in accidents (Section 659), first aid (Sections 660-665), emergency measures below ground (Section 666), and medical equipment (Section 667).

Before this decree came into force, as there was no legislation relating specifically to the coal mines, medical services there were organized in line with that relation to the extractive industries in general.

D. NETHERLANDS

As is explained in more detail under II below, Dutch colliery medical services are required:

a) to supervice the health of the personnel;

b) to attend to casualties.

1. In its capacity as a casualty department, the medical service must satisfy the requirements of the Accident Insurance Act of 1921 and be officially recognized as a medical service fulfilling the conditions laid down in Sections 80a ff. of the Act, viz.

   a) the department must be under the fully independent direction of a medical officer qualified under the Act to undertake on behalf of the Rijksverzekeringsbank the medical or surgical care of insured persons suffering injury in industrial accidents, and must be staffed exclusively by medical officers so qualified;

   b) it must be run entirely at the expense of the colliery;

   c) the medical officers referred to in (a) above must be required by the management to give first aid in the event of accidents, to arrange for further medical and/or surgical treatment, and to certify when a man must be granted sick leave and when he is fit to resume work,

d) the appointment of the medical officer must be approved by the Board of the Rijksverzekeringsbank.

The Board of the Rijksverzekeringsbank has laid down the following conditions for admission as a works medical officer.

"As a general rule, candidates must have been in independent general practice for not less than five years, though in exceptional cases this minimum period may be reduced to three years where the candidate has additional specialized or hospital experience, or has spent these years as a surgeon or assistant surgeon in a hospital.

"Where a works medical service has only one medical officer, a second fulfilling the above requirements should also be available to deputize for him.

"Candidates not fulfilling these requirements may nevertheless be admitted if they have successfully completed a course in industrial medicine at the Nederlands Instituut voor Preventieve Geneeskunde, Leyden, followed by a term on the traumatological side at one or more hospitals designated by us, or at large enterprises having an approved medical service which is called upon to deal with substantial numbers of casualties : this term should last between five and twelve months".

2. In their capacity of supervision the health of the personnel, colliery medical services are not at present covered by any specific enactments or regulations, except with regard to particular aspect such as the medical examination of juveniles.

Industrial health arrangements will, however, in the future be governed by the Act of February 19, 1959 (passed, but not yet in force), an instrument designed to supplement the Safety Act of 1934 and the Dock Workers Act, and containing a number of provisions concerning sickness prevention in enterprises. In fact, it merely makes statutory various arrangements which in the main are already standard practice in the larger enterprises.

Sections 8a-8f of the new Act list the preventive measures to be observed in factories and workshops, and defines the functions of the works medical service as follows :

a) to examine new entrants;

b) to examine at regular intervals men whose jobs expose them to particular hazards;

c) to examine men not coming within categories (a) and (b) above;

d) to submit recommendations concerning prevention of occupational diseases;

e) to co-operate on accident prevention;

f) to co-operate on functional rehabilitation within the enterprise;

g) to co-operate on prevention and suppression of any injurious effects to which workers may be exposed in the performance of their duties (e.g. fumes, gases, noxious dusts or radiations);

h) to keep a check on working conditions (temperature, humidity, ventilation, dust concentration, lighting, noise, cleanliness);

i) to keep a check on any injurious effects to which personnel may be exposed as a result of the type of work done, the hours worked, the environment, and the pace of working required (effects of team work, of piece work, and of the introduction of automation);

j) to co-operate towards the maintenance of good industrial relations;

k) to be available for professional consultation at the enterprise;

l) to give first aid in the event of accident or illness, submit recommendations concerning the organization of and recruitment of staff for the first-aid service, and be responsible for the training and instruction of first-aid personnel;

m) to co-operate on job analysis;

n) to co-operate towards reducing absenteeism due to illness;

o) to act as medical advisers to insurance and welfare organizations;

p) to submit any other recommendations and take any other action calculated to further the aims and objects of Section 8 of the Act.

The Act is not actually to apply to the mining industry, but the latter is to be covered by regulations to the same effect now in preparation.

E. BELGIUM

1. Provisions concerning the organization and operation of medical services

The Act of July 15, 1957, amending the consolidated Mines and Quarries Acts previously in force, includes among various other additions to these a Section 76, a relating to the organization of medical services. This provides that the King may, in order to ensure that these operate correctly and efficiently, take all appropriate steps concerning the supervision, control and co-ordination of medical services, which he may insist shall be instituted at deep mines, opencast mines and underground quarries.

The Royal Order embodying these measures is in preparation, but has not yet been promulgated. At present, therefore, there is no Act, regulation or contractual provision concerning the organization, functions and departmental relations of works medical services.

2. Provisions concerning health checks on workers

Enterprises are, however, required to make a number of arrangements in respect of workers' health under the Regent's Order of September 25, 1947, laying down general rules as to industrial health arrangements in deep and opencast mines and underground quarries.

In particular, the order provides that workers, clerical and technical personnel and apprentices must be subjected to health checks under the supervision of the Industrial Medical Inspectorate (Section 33). These are to be carried out at the expense of the employers, who are free to appoint for the purpose doctors and medical bodies of their own choice. They include :

- a medical examination on recruitment, for purposes of selection in accordance with medical criteria;
- for juveniles up to 21, medical examinations at regular intervals to test their fitness for work;
- examinations for symptoms of occupational diseases.

a) Selection of workers in accordance with medical criteria.

Pre-entry examination is compulsory for all juveniles up to 21, and for older workers applying for employment below ground or on any other job in connection with which examination for symptoms of occupational disease is obligatory (Section 36). The examination must be carried out not more than three months before the man starts work. (Section 37).

The order specifies the measures, clinical observations and tests of which the examination must consist (Section 39).

All juveniles and all workers applying for employment below ground in coalmines must in addition undergo a pre-entry chest X-ray examination. Prospective underground workers also have their stools examined under the microscope as a prophylactic measure against hookworm: this examination is subsequently repeated twice, first between the thirtieth and fortieth days following, and second between the ninetieth and hundredth days. It has also to be repeated after any period spent in certain foreign countries (Sections 40 and 40,a)

b) Periodic fitness tests

The periodic health checks for juveniles follow precisely the same lines as the pre-entry examinations (Section 45). They must be repeated each year until the subject reaches the age of 21, at intervals not exceeding thirteen months (Section 43).

Examinations for symptoms of occupational diseases are carried out on all workers whose duties do definitely expose them to the risk of contracting such diseases (Section 47).

In the case of the coalmines, the pneumoconiosis hazard affects all workers regularly employed below ground. They are examined every two years. Regular rescue workers and rescue guides are examined yearly. The examination must include radioscopy or radiophotography of the lungs, supplemented if necessary by a standard-format radiography. The latter is compulsory in the case of rescue workers (Sections 48 and 50).

Workers employed on the maintenance and replenishment of paraffin lamps and other lamps are examined twice yearly for signs of poisoning, by oil or coal distillates (Section 51).

Examination for other occupational diseases is carried out, where warranted by the nature of the work performed, on the surface premises of the colliery. Thus the personnel of hard-coal briquetting-plants are examined every six months for "epitheliomatous skin complaints and other dermatoses" ("pitch cancer") (Section 52).

Employers are required to keep a register of the workers due for the various medical examinations, and to see to it that each does in fact undergo examination at the proper time (Section 61).

Workers may opt to have the regulation examinations made by a doctor of their own choice, outside working hours and at their own expense, provided the doctor abides strictly by the rules laid down concerning these examinations (Section 63).

The regulations in force do not insist that the prescribed examinations shall be carried out by medical services within the enterprise. Nevertheless, most Belgian collieries do in fact have a medical service to carry out these examinations and also to give first aid to injured workers. In addition, there are a number of inter-colliery institutions at which sick and injured can receive the necessary care; there are also sanatoria.

The Institut d'Hygiène des Mines, at Hasselt, studies all matters connected with mineworkers' health, both on the technological and on the medical side. The public authorities also contribute financially to the efforts to promote the health and well-being of the miners, by way of the National Mineworkers' Fund, which is administered by a Board consisting of representatives of the employers' and workers' associations.

F. UNITED KINGDOM

Legally, only persons under the age of 18 are obliged to undergo a full pre-entry medical examination.

However, quite apart from any statutory obligations, the National Coal Board has established medical centres which carry out these examinations, and also examine on the Board's behalf all other prospective entrants to the industry.

Miners of any age may at any time consult the Board's doctors and are offered a chest X-ray examination at five yearly intervals.

A miner refusing this examination is not penalized in any way.

Rescue workers undergo medical examinations once a year : in their case this is compulsory.

II

DUTIES AND RESPONSIBILITIES OF COLLIERY MEDICAL SERVICES

A. GERMANY

The colliery medical services deal only with the physically fit. They are responsible for pre-entry medical examinations and for the regulation health check-ups on juveniles under 18 and on adult workers (for further details see III below). On the basis of these examinations they submit recommendations as to the type of work to which the man in question is medically fit to be assigned.

They do not provide medical care for either workers or their dependents, even in the case of workers suffering from injuries caused by an accident or from occupational diseases.

The chief colliery medical officer supervises the first-aid posts which all collieries are required by the mines regulations to establish (see VI, A, 2 below). Where necessary, the medical staff themselves give first aid in accidents. As soon as this has been done, casualties are removed forthwith to a Bergbau-Berufsgenossenschaft (employers' liability association) hospital; if they are not detained there, they are then referred to the Knappschaft (the miners' friendly society), and can obtain treatment from any Knappschaft doctor practising in their locality.

The Bergbau-Berufsgenossenschaft is an inter-colliery association established to cover the insurance risk in respect of accidents and occupational diseases; it is financed entirely by the employers' contributions, but both the employers and the workers are represented on the Board and at the General Meeting. The Knappschaft is responsible, among other things, for miners' health insurance. The employers furnish 50% of the contributions, and both sides are represented on its Board of Management. The Knappschaft has a panel of doctors in the proportion of one per 900-1,000 insured miners : the miner who becomes a casualty can choose his doctor from the panel, unless he is detained for treatment at a hospital of the Bergbau-Berufsgenossenschaft.

The colliery medical service is never called upon to decide whether a man is fit or unfit for work, or for how long he is to be rated unfit. Sick and injured workers are entirely out of its hands until such time as they return to work : when that time comes, the medical service sees to it that the man is assigned to duties in keeping with his state of health, and if necessary gradually brought back to the point at which he can be put on to his original job.

B. FRANCE

The colliery medical services are mainly concerned with the routine side of industrial medicine, i.e. pre-entry medical examinations and periodic health checks.

In some coalfields, however, medical services have also been organized to treat workers for industrial injuries or occupational diseases, though not for injuries or diseases incurred away from work. As a rule these services operate separately from the regular colliery medical departments; they are, moreover, asked to take over only where the patient so desires, as the latter is left entirely free to choose his own doctor. He can therefore opt to receive treatment either from the colliery's own hospital or from any other hospital or medical practitioner he may prefer, within a reasonable radius; should he or his doctor request a specialist opinion, this is duly arranged without regard to distance.

Where the colliery medical officer is in charge of a case, he assesses the man's fitness or otherwise and fixes the length of time for which he is to be rated unfit. In the event of the patient's disagreeing, an independent examination is made, during which the patient has the assistance of a doctor appointed by the social-security authorities. Where permanent disability has been sustained, its degree is established direct by such a doctor.

C. ITALY

The colliery medical services operate exclusively within the enterprise. Their functions are mainly preventive (pre-entry medical examinations, periodic health checks, hygiene, health education, welfare); they also give first aid in accidents.

They do not as a rule provide definitive medical care for sickness or injury, whether occupational in origin or not : the patient himself freely chooses his doctor or hospital. The only case in which they do give treatment is where a man continues at work notwithstanding a minor illness or injury.

D. NETHERLANDS

The colliery medical services concern themselves with the routine aspects of industrial medicine (pre-entry medical examinations and periodic health checks), with first aid in accidents, and with the treatment of industrial injuries and occupational diseases; they never undertake the treatment of injuries or diseases of non-occupational origin.

The patient is free to choose his doctor, and may decline to be treated by the colliery medical service. He must of course, go to a doctor approved by the social-security authorities, but they will approve any practitioner of recognized professional qualifications; there is no official limit as to the number of doctors he may consult. Where he is treated by his family doctor, however, a doctor appointed by the Rijksverzekeringsbank must decide as to whether he is unfit for work, and if so, for how long. Where he is treated by the colliery medical service, the fitness assessment may be made by the medical officer for a period not exceeding six weeks, provided certain conditions are fulfilled and with the reservation that if the patient does not accept the findings the assessment shall be made by the Rijksverzekeringsbank's doctor.

E. BELGIUM

The position varies considerably from colliery to colliery.

In small and medium-size enterprises, the medical department is often required to carry out the routine examinations, to give first aid and even to undertake the further treatment of injuries not requiring hospitalization. At big collieries, on the other hand there are usually two separate departments, one to carry out medical examinations and the other to deal with casualties.

The arrangements as regards caring for and checking up on those on the sick list vary according as the case is one of industrial injury or of occupational disease. Where the employer or his insurance company operate a hospital and pharmaceutical service at their own expense, a miner injured at work is, in certain circonstances, not entitled to choose his own doctor or pharmacist, nor, if he has to go into hospital, to choose his hospital. The employer or insurance company must, however, designate at least three doctors not working for them, to whom the patient may apply for the continuance and supervision of the treatment originally prescribed and applied, and for assessment of his incapacity for work. Where neither the employer nor his insurance company has any such arrangement, the patient is free to choose his doctor and pharmacist; his choice of hospital is, however, limited to a list approved by the Government.

If the patient is not free to choose his doctor, he may nominate a doctor to keep an eye on his treatment; if he is so free, the employer or insurance company have the same right.

Sufferers from occupational diseases are entitled to choose their doctor.

F. UNITED KINGDOM

The National Coal Board's medical services are concerned with preventive medical services and check-ups only : they do not provide curative medical treatment of any sort other than "first aid". All miners injured in occupational accidents immediately come under the National Health Service : either the man is put in the charge of his own doctor, who decides whether he should be sent to hospital or not, or he is sent direct to hospital and the hospital authorities thereupon notify his doctor.

The certificate of incapacity for work is given by the patient's doctor on his own responsibility. If dishonesty is suspected, the Ministry of Health may have the certificate investigated; in practice, however, it does so only if the patient appeals against the doctor's ruling.

III

NATURE, SCOPE AND OBJECT OF EXAMINATIONS EFFECTED

It proved somewhat of a problem to define the basic criteria adopted for pre-entry medical examinations.

There are two possibilities :

a) the examination may be directed to establishing whether the applicant is medically fit for a particular job below ground to which it is planned to assign him;

b) the aim may be merely to ascertain whether the man is fit for underground employment generally (in which case it remains to establish by what yardstick this general fitness is to be assessed).

In any event, of course, it has to be determined whether the applicant is sufficiently strong and well to stand up to the work below ground.

At the same time, in addition to observing this fundamental rule, the policy adopted by the colliery medical service in regard to its system of pre-entry examinations has necessarily to take into account a number of points, e. g. :

a) what type of work is envisaged;

b) whether the applicant has ever worked below ground before;

c) what the enterprise's regular policy is regarding recruitment and job assignment.

Thus where the entrant is a craftsman, and particularly if he already has some underground experience, it is easier to gain a clear idea of the standard of physical fitness he will require in order to do it.

Where apart from craftsmen the colliery is interested only in recruiting men for actual coal-winning, and finally assigns them to their jobs some time after they have been signed on, the medical service must make it a rule to assess applicants' fitness with reference to the demands of this particular type of work; where men are not being recruited for coal-winning and assignment takes place forthwith, the medical service may apply different criteria, less strict on some points, and more strict on others.

The following subsection, in addition to listing various provisions which are obligatory in all circumstances, gives a few particulars concerning the general principles usually followed in pre-entry medical selection.

A. GERMANY

1. All miners are required to undergo medical examination on recruitment and at regular intervals thereafter. Additional examinations are also carried out before a worker is put on to certain special jobs.

2. The pre-entry medical examination is not made with a view to selection for specific types of work. The competent authority's directives require that applicants shall be examined as to their constitution and general health, and that in the case of juveniles due account shall be taken of the fact that they are still in process of physical development.

   In practice, it is expected of all applicants for work below ground that they should be physically fit to be employed as hewers if necessary, though exceptions may be made in respect of certain craftsmen.

   The worker has to undergo a further special examination before he is appointed to be for example a winding engineman, engine-driver or member of a rescue crew, or is put on to a job requiring particular physical qualifications, such as exceptionally good colour perception or exceptionally quick and reliable reflexes. This special examination is medico-psychological or psychotechnical, and is intended to establish whether the subject possesses the requisite qualities <u>for the work in question</u>.

3. The pre-entry examination includes a detailed clinical examination, particular attention being given to the blood composition and sedimentation rate.

4. The statutory routine health checks on juveniles under 18 must be carried out at least once a year; adult workers may be examined at intervals of anything between one and three years as the medical officer may see fit, or, in consideration of particular circumstances, oftener.

B. FRANCE

As in Germany, colliery medical services carry out pre-entry examinations, periodic preventive checks, and where appropriate special fitness tests before assigning workers to specific jobs.

The usual yardstick in pre-entry examinations is whether the applicant is physically fit for employment as a hewer : as this is one of the most arduous of the underground occupations, any worker graded as suitable for it may be presumed to be in all probability physically able to undertake any job underground which does not demand extra individual faculties requiring to be ascertained by special examination.

C. ITALY

The object of pre-entry medical examination is to establish whether the applicant is physically fit for work in the pits (Decree of April 9, 1959, Section 648). The examination includes thorough clinical examination; additional examinations may be prescribed by the Mines Inspectorate, in addition to which the Ministry may require, by order, that men to be assigned to jobs demanding special physical and psychical qualities in particular types of mines and quarries shall undergo a psychotechnical as well as a medical examination. The nature of the jobs in question and the form to be taken by the psychotechnical examinations for them are to be specified by the Ministry of Industry after consultation with the Industrial Medical Inspectorate.

Miners are subsequently re-examined annually to check whether they are still fit for their particular jobs.

D. NETHERLANDS

1. The pre-entry medical examination is designed, firstly, to ascertain the applicant's state of health, and secondly, to establish whether he is generally fit for employment at the mines. With regard to the second aspect, a distinction is made between prospective underground and prospective surface workers The General Regulation governing medical examinations requires that to be accepted for employment below ground the applicant must be passed as fit for all underground occupations. It is, of course, always possible thereafter to assign him to an occupation which will in fact not demand such a testing standard of physical fitness.

   Where a surface worker is transferred to underground duties, he has to undergo a second examination.

2. All workers, underground and surface, undergo an X-ray examination at intervals of 16-17 months.

3. Workers on jobs involving special hazards or demanding special physical qualities undergo additional examinations.

E. BELGIUM

1. Mineworkers have to undergo

   a) a pre-entry medical examination;

   b) yearly or twice-yearly re-examinations;

   c) where appropriate, special selective examinations for specific jobs.

2. The pre-entry examination is designed to test the applicant's fitness for all types of underground work : the examining doctor may, however, grade him as fit only up to a point, i.e. fit for some underground jobs but not for all.

3. The object of the periodic check-ups is to detect any symptoms of certain diseases such as tuberculosis and silicosis, and to establish whether the subject is still fully fit, or, as the case may be, whether he is fit for particular types of work below ground, with a view to reclassifying him in a more suitable occupation.

4. Some collieries arrange selective examinations for men whom it is planned to appoint to supervisory or safety posts. Such examinations always take place quite a considerable time after first employment, since only miners of some seniority are so appointed.

5. Some medical services conduct psychotechnical or psychological tests as part of the selective examination. Some also have apprentices and trainees from the mining colleges so tested when they start at the colliery.

F. UNITED KINGDOM

1. The only medical examination required by statute is the pre-entry examination of all young miners under 18 years of age. Those accepted are classified either as fit for any employment at a mine or as fit for specific types of work only; cases in the latter grade may be reviewed after a few months for possible upgrading.

2. The National Coal Board also arranges pre-entry examinations for new entrants over 18, though this is not obligatory.

3. Similarly, all miners are offered a periodic chest X-ray examination, at about five yearly intervals; about 95% of them respond.

4. Annual examinations are also conducted for purposes of silicosis research : the subjects, all volunteers, number some 35,000.

Pre-entry examinations are always carried out with an eye to the particular type of work for which the entrant has applied; the medical officer's assessment may vary considerably according to the job concerned.

Where a man changes his job and the new assignment may involve a risk to others, he may be asked, to undergo a further examination. This may also be done during the training period (which extends over several months) if the instructor considers that the man is not up to the standard of fitness required. Such examinations are compulsory, but those refusing them will not be given any new assignment involving a risk to others.

IV

MINERS REQUIRED TO UNDERGO EXAMINATION

A. GERMANY

All applicants for employment at collieries must undergo the pre-entry medical examination prescribed by the Oberbergämter (Divisional Mines Inspectorates).

All mineworkers also undergo the periodic health checks (under-18s yearly; adults at intervals fixed by the medical officer concerned up to a maximum of three years). These are actually statutory only in the case of underground workers and specified categories of surface workers, including more particularly men whose duties have to do with tar, coke-oven masons and screenman; regular medical examination of other surface personnel is required by the collieries' own regulations.

Workers (and applicants) cannot be compelled to undergo these examinations, but anyone refusing would be dismissed (or not engaged).

In the Saar all colliery personnel, underground and surface, are medically examined every two to three years.

B. FRANCE

The examination provided for by law (see I above) are compulsory for all mineworkers and would-be mineworkers, both underground and surface. Any person refusing examination would be dismissed, or would not be considered for employment, as the case might be.

C. ITALY

Since January 1, 1960, the position has been the same as in France.

D. NETHERLANDS

Pre-entry medical examination is compulsory for all; periodic check-ups are compulsory for all underground and some surface workers. This regulation is not as yet statutory, but stems from the collieries' own decision not to engage or continue employing any person refusing examination.

E. BELGIUM

Pre-entry medical examination is compulsory for all workers whom it is planned to employ below ground, and for all those under 21,wherever they are to work. Examination for certain occupational diseases is also compulsory for the particular workers concerned.

F. UNITED KINGDOM

Applicants for work at collieries declining to undergo the pre-entry examination would be refused employment.

Miners refusing the periodic check-ups (chest X-ray examination) are not penalized in any way; no action is taken unless they are actually a danger to others, as for instance in cases of tuberculosis. If a man applies to the national insurance authorities claiming to be suffering from silicosis and his claim is accepted, the National Coal Board is notified and may insist that he be medically examined.

V

NUMBER OF DOCTORS EMPLOYED

A. GERMANY

The medical services in the Ruhr and Aachen coalfields employ one full-time medical officer for about 4,000 underground workers. Some small collieries have the regulation pre-entry examination performed by doctors working for them part-time.

In the Saar, where the colliery labour force numbers 54,000 (39,000 underground workers and 15,000 surface), there are three full-time medical officers, 21 part-time colliery doctors and 14 doctors working part-time on preventive silicosis radiography.

B. FRANCE

The Nord/Pas-de-Calais medical services employ 43 doctors for a total of about 120,000 workers; with a few exceptions, however, these doctors deal purely with the occupational side proper. The proportion in fact works out much the same as for the Ruhr and Aachen coalfields.

C. ITALY

Since January 1, 1960, all collieries employing more than 100 workers on the main shift have been required to run medical services of their own (usually on a part-time basis).

Collieries employing more than 200 workers on the main shift or more than 500 living permanently in the immediate neighbourhood may be required by the Industrial Medical Inspector to have their doctor also living permanently near by, which may result in their setting up a full-time medical service.

D. NETHERLANDS

The Dutch coalmining industry has a full-time medical staff of 18 for a total of 60,000 workers (divided more or less equally between underground and surface duties); of these, 11 are general practitioners and 7 specialists, including 4 lung specialists. It also has four part-time consultant specialists.

The bigger collieries also have psychological services for the examination of all applicants for employment.

The proportion is thus one full-time doctor for about 3,300 workers.

E. BELGIUM

Considerable differences exist between the Campine and the coalfields in the south of the country. The latter are worked by a large number of independent collieries, most of which do not have a medical officer actually on their staff : no valid comparison is therefore possible between the number of doctors employed in their medical services and the numbers indicated for the Campine and the other countries surveyed.

The Campine has 7 large collieries employing a total of some 40,000 men. Their regular medical staff consists of 11 doctors employed full-time, including 3 surgeons and 2 specialists, together with 9 doctors employed part-time, whose combined services represent approximately the work of three full-time medical officers. The proportion thus works out at one doctor for about 2,800 workers.

F. UNITED KINGDOM

The National Coal Board employs 80 full-time doctors for preventive medical work only, for a total labour force of over 600,000 : the average is thus one doctor for 8,000 workers.

As regards curative medical treatment, all mineworkers are on National Health Service panels; no National Health Service doctor is allowed to accept more than 3,000 panel patients.

VI

MATERIAL MEANS PROVIDED FOR DOCTORS

The particulars on this subject are in the nature of the case very difficult to summarize. To give specialists the opportunity to compare their own various items of equipment with those used elsewhere, these would have to be described in great detail. The Working Party feels it preferable to confine itself to a more general account, further details to be obtained by on-the-spot inspection.

Comparison is rendered still more difficult by the differing extents to which colliery medical services are able to make use of equipment available in or near the mining areas or to refer to consultants possessing the requisite equipment themselves, and also the fact that in some cases outside doctors are allowed the use of medical equipment primarily provided for the benefit of the collieries.

Colliery medical services have, moreover, to be equipped in accordance with the laws and regulations in force, with local conditions, and with the special requirements of the individual collieries.

A. GERMANY

1. Routine occupational medicine

a) Ruhr and Aachen coalfields

Every colliery of medium or large size (employing 3,000 - 10,000 men) has a health-service block, comprising

- offices keeping very comprehensive records (X-ray files and a card-index with health-record card for each worker);
- changing-rooms;
- examination rooms;
- X-ray equipment for large-format radiographs (36 1/2 x 36 1/2 cm., i.e. not for the radiophotographic process);
- a laboratory for the standard blood, urine and excreta analyses;
- a diagnosis section for functional exploration, more particularly by means of electrocardiograms.

The collieries in these areas do not have psychotechnical departments of their own, but there is close co-operation between them and the psychotechnical departments of the social-insurance organizations.

They also maintain close relations with the research centres run by the social-insurance institutions, especially with the Silicosis Research Centre in Bochum, and also with research centres dealing with dust and its prevention and suppression.

b) Saar

The Saar collieries do not have these special health-service blocks. Each pit has a dressing-station with an examination room and equipment for carrying out the standard tests and analyses, but no laboratory or X-ray equipment.

There is a mobile X-ray unit with a 10 x 10 cm. camera and a mobile medical unit equipped with radiography electrocardiography and laboratory facilities.

There is also a central psychotechnical service; psychotechnical tests are, however, prescribed only for winding enginemen.

2. First aid

All districts below ground have first-aid posts, at which the necessary dressing and bandaging kit, together with splints, blankets and stretchers, must be permanently available. Men specially trained by the colliery medical officers have to be on hand on every shift to give first aid and get casualties to the surface when necessary. Every pit has a dressing-station at the surface; the extent of the equipment depends on the number of miners employed.

The rule is that the dressing-stations are staffed by full-time medical-room attendants : these must either be registered male nurses or have completed a three-month training course at a Bergbau-Berufsgenossenschaft hospital.

The dressing-stations have all necessary first-aid equipment, ans also artificial-respiration apparatus.

The Ruhr and Aachen collieries also have their own ambulances to take casualties to hospital; in the Saar injured miners are transported in ambulances belonging to the social-insurance institutions.

Surgical cases are treated in the Bergbau-Berufsgenossenschaft's own hospitals or in hospitals under contract to it.

Minor casualties who are able to continue at work, or need only to take it easy for a few days, are treated in the colliery's dressing-station or health-service wing. The medical wings also have physiotherapy departments, with balneotherapy and ray-treatment sections attached, and with a staff of masseurs and masseuses, for the treatment of casualties who are still fit for work. In the Saar there are no such arrangements : physiotherapy is carried out at the local hospitals.

In the Ruhr rehabilitation of major casualties is mostly effected at hospitals of the Bergbau-Berufsgenossenschaft or the social-insurance institutions. Some work is, however, also done in this connection in collieries' own health-service blocks, which have very sizeable physiotherapy departments for this purpose. In addition, the collieries organize occupational therapy in cases where the patient's condition permits.

The smaller Ruhr and Aachen collieries have no medical installations of their own, all arrangements in this connection being made by neighbouring hospitals. The hospitals have the necessary equipment for carrying out the regulation pre-entry examinations and periodic check-ups, and for treating casualties.

B. FRANCE

The following is an account of the position in the Nord/Pas-de-Calais coalfield, which is taken as a typical example.

1. Routine occupational medicine

Each colliery group in the coalfield has one or more "medical and social-welfare centres". These vary in size and number according to the geographical distribution of the pits within the group and the number of men they employ.

In addition to their administrative and records offices, the centres have

- waiting-rooms and cubicles for changing;
- consulting-rooms equipped with all necessary medical appliances, including radioscopic apparatus;
- a central X-ray department for standard-size films, as required by the decrees on prevention, and also for tomography, enlargement and other specialized processes;
- a functional-exploration department for testing the respiratory function at rest and during effort;
- an electrocardiograph department.

Most groups have laboratories at which all the standard biological and bacteriological investigations can be made.

The psychotechnical services do not form part of the medical services, but can be consulted by them at any time.

At coalfield level, there is the Mining Medicine Research Centre, which though primarily concerned with research does also carry out routine examinations. Among other things, it is responsible for carrying out X-ray examinations for the entire coalfield : once a year all personnel are so examined, by a mobile unit consisting of a van equipped with radiophotographic apparatus including a mirror-reflex camera taking 2 3/4 x 2 3/4 in. films, which are then developed by the Centre. The results are read and interpreted by the colliery groups, to enable decisions to be taken as quickly as possible.

The Centre also has laboratories in which, quite apart from research, it is able to carry out sometimes very highly specialized investigations in connection with biology, bacteriology and morbid anatomy, which could not be performed in laboratories of the ordinary kind.

In addition, the Centre compiles the dust survey for the coalfield : to it are channelled all the results of dust sampling done in the workings of each colliery group in the coalfield.

2. Curative medical treatment

All necessary first-aid equipment, including artificial-respiration apparatus, is available in the workings.

All supervisory personnel now receive first-aid training; in addition, each team of miners includes one or more highly-trained rescue men.

At every pithead there is a dressing-station, in the charge of a qualified hospital attendant, or failing that, of a man specially trained for this duty by the colliery medical service.

There is of course also an ambulance service. Practically every group has its own hospital; one group has two. The two groups which are not so provided are both situated close to a large city, and have special agreements with municipal hospitals under which sections are reserved exclusively for mining casualties.

Each group has one or more clinics at which minor surgery not necessitating hospitalization can be performed.

The hospitals and clinics in question have rehabilitation departments for the less seriously injured, who do not actually need to be hospitalized at a rehabilitation centre proper. These departments also begin the rehabilitation of more serious cases in the ward, when the partient's condition does not allow him to be transferred to a specialized centre.

The hospitals and clinics also have physiotherapy departments, whose services include electrotherapy and all the various other kinds of physical treatment. In addition, they have thoroughly up-to-date operative and X-ray equipment.

There are a number of burns sections which take cases of medium gravity and cases not in a condition to be moved to the ultra-specialized burns units. (Other cases are flown by the Air Force to specialized units, such as those at Lyons, Paris and Merlebach). There are four burns sections, all attached to colliery hospitals; they are so located that one or other of them can be reached quickly from any point in the coalfield.

A rehabilitation centre was opened in 1950 : it can take 90 patients, and has treated since its inception a total of approximately 2,000 cases.

C. ITALY

The medical facilities at the larger collieries are usually as follows :

1) a waiting-room;

2) the secretariat of the colliery medical service, which is responsible for assembling all data and keeping each worker's medical file up to date. The file comprises the card recording the man's pre-entry medical examination, a register of his periodic check-ups, and the cards indicating the results of his X-rays examinations.

   In the secretariat, the medical officer makes out certificates and compiles the accident and sickness returns. Some enterprises have a system of health record books showing all details of the worker's pre-entry clinical and radiographical examination, the findings of his annual check-ups, and a chronological summary of his accidents and illnesses;

3) a changing-room and bath or shower, sometimes necessary for purposes of medical examination;

4) a surgery with a separate room for chemico-microscopic analyses and X-ray equipment for performing the various supplementary examinations in connection with the pre-entry examination and subsequent check-ups;

5) a first-aid room for casualties, with operating facilities and all necessary first-aid equipment, including artificial-respiration and oxygen-therapy apparatus;

6) a sick-bay to accommodate casualties pending removal to a hospital of the social-insurance institutions;

7) an ambulance to take major casualties to hospital as quickly as possible.

These big health service blocks are sometimes the size of a small hospital; the medium-sized collieries, however, have only a first-aid station with surgical facilities and usually with a waiting-room and consulting-room attached. Small collieries have a first-aid post with waiting-room.

All casualties, from above or below ground, go or are taken to the medical block or to the first-aid station. Underground casualties who cannot walk are first taken by stretcher to one of the first-aid posts which are located at various points below ground : these have medical kit and collapsible stretchers available, with a qualified or at any rate a trained first-aid man in charge. Where the medical officer himself is needed below ground, he goes accompanied by a medical-room attendant who brings with him a case containing the necessary emergency instruments and drugs.

Many collieries have organized panels of blood donors, so that they are able not only to have serum and human plasma permanently available, but to perform blood transfusions more quickly.

In addition to these health service blocks, which are found at all collieries, and are in the charge of a doctor assisted by not less than three medical-rooms attendants, the group of pits owned by the Montecatini Company has mobile teams equipped for radiological examinations and functional tests of the cardio-circulatory and respiratory systems, for measuring and analysing gases and dusts below ground, and recording temperature, humidity and so on. These teams, which are made up of specialists in industrial medicine, chemists and doctors, co-operate with the collieries' technical departments and safety and health committees in organizing their periodic medical check-ups and inspections of working conditions.

As was explained earlier, after first-aid has been provided by the employer the care of both sick and injured miners is the responsibility of the State social-insurance authorities, who arrange for the patients to be given the necessary treatment in the hospitals to which they have been sent.

D. NETHERLANDS

The colliery medical services do not provide curative treatment; they are, however, equipped with the following facilities :

- waiting-rooms;
- first-aid rooms with sterilizing facilities;
- rooms set aside for minor surgery;
- X-ray equipment which must meet specified requirements (among other things, it has to be powerful enough to take side exposures);
- a kinesi-therapy apparatus, which is particularly valuable in rehabilitation.

Blood transfusions and oxygen therapy can also be provided.

Very bad casualties which cannot be dealt with at the colliery are sent to hospitals in the district. The general hospital at Heerlen, with 824 beds, has a main section for accident victims, which is under the Mines Medical Service. The hospital has all the facilities for full specialist treatment of injuries (by neurologists, neural surgeons, etc.). It also has a health department, one of whose main functions is audiometry, and which is accordingly provided with soundproof rooms.

For purposes of silicosis prevention, periodic X-ray examinations are carried out with a 70 mm. camera mounted on a Philips-Monza attachment. This apparatus can be quickly dismantled and reassembled in a special room provided for the purpose at every colliery; by this means it is possible to effect a much larger number of examinations in a given time than with the same equipment installed in a van (150 examinations an hour).

All data concerning silicosis prevention and preventive examinations are assembled at the medical centre at Heerlen, and all films are developed there. These duties are performed by a single team, in order to avoid possible differences in interpretation such as might occur if larger numbers of investigators were employed.

The medical centre also examines miners suffering from silicosis to establish whether they are fit to work. These examinations are thus the responsibility of the industry's medical service and of the Rijksverzekeringsbank;however , only the latter decides as to the granting of any disability pension.

The medical centre also examines for allergies, to check how the individual patient reacts to silicosis.

Finally, the centre is equipped to investigate the curative potentialities of the treatment of miners suffering from lung complaints, and to ascertain which complaints are in fact silicotic in character and which, though not actually silicotic, are akin to silicosis or caused by the subject's occupation. Aerosols and other equipment are available.

E. BELGIUM

1. Routine occupational medicine

Colliery health blocks include a laboratory for the analysis of stools to check for hookworm; in most cases the laboratory is also equipped with a standard-type spirometer. If fuller spirometric exploration is necessary, the subject is sent to one of the research establishments which conduct comprehensive examinations (analysis of blood gases, respiration tests at rest and during effort). This is done, in particular, at the Institut d'Hygiène des Mines in Hasselt, which is at the service of all colliery medical officers.

For X-ray examinations, practically all collieries have either radiophotographic equipment or radiographic apparatus for taking large-format films. In the Liége area, however, most collieries confine themselves to radioscopic examinations, without taking films, though some do have radiophtographic equipment, and others practise large-format radiography.

Most of the radiophotographic installations consist of G.E.C. cameras producing 10 x 12 cm. films, the largest small-format film on the market. The present trend, however, is towards the employment of the 70 x 70 mm. mirror-reflex camera, or better still the 100 x 100 mm.

Some medical centres also conduct psychological examinations, but not systematically; these have not yet become standard usage.

Some centres make it their regular practice to have audiometric tests effected as part of the pre-entry medical examination and periodic health checks, to ascertain whether the men's hearing is being affected by conditions on their particular jobs.

Belgium's main pneumoconiosis research centre is the Hasselt institut d'Hygiène, which possesses the very latest equipment and is under the supervision of a team of University professors of medecine. Its co-operation is always available to colliery doctors.

2. Curative medical treatment

As a general rule, curative treatment of the sick is at the expense of the social-security institutions, and is not given by the colliery medical services : the latter are thus to all intents and purposes required only to give first aid to accident casualties.

Below ground there are always rescue men and rescuer's mates trained to give the elements of first aid.

At the surface every colliery has a sick-bay with all facilities for the treatment of injuries and for first aid. Casualties are then sent to a surgical centre either run by the colliery or serving several collieries simultaneously. These are traumatological centres with orthopaedic surgeons in charge. The majority of them have a rehabilitation section staffed by masseurs and kinesi-therapists, and equipped for the provision of any necessary physiotherapy.

F. UNITED KINGDOM

1. Routine occupational medicine

The coalfields of the United Kingdom are divided into eight main Divisions with approximately 100 collieries in each.

The medical centre in each Division is in the charge of a Divisional Medical Officer. Equipment includes fixed X-ray apparatus and mobile units taking large-format films. There are also filing-cabinets in which all the X-ray films are kept.

The Divisional centre works in co-operation with the hospitals and Universities. Centres are responsible only for carrying out pre-entry medical examinations and keeping records; no medical treatment is given.

Each centre covers several Areas; these are under Area Medical Officers, and each is equipped to perform medical and clinical examinations, but not X-rays or laboratory analyses.

Each colliery has its medical block, the equipment at which varies according to the number of miners employed. At collieries employing 800 men or more the medical block consists of 5-7 rooms; a State Registered Nurse is in charge, and there are consulting-rooms for the Area Medical Officers. There is no X-ray apparatus, equipment for physiological examinations, electrocardiograph or laboratory.

The National Coal Board carries on extensive medical research : by mobile X-ray units, one major project now in hand involves the annual X-ray examination of some 35,000 miners at 25 representative collieries in all parts of the country, and the collection of detailed records, in particular on the conditions under which each man has been working (dust concentration, etc.). This research is to extend over at least 10 years.

Research on occupational diseases is also in progress; in addition, the Coal Board makes substantial funds available for this purpose to the Universities and to various private organizations.

2. Curative medical treatment

All collieries employing 100 or more persons below ground are required by statute to have a medical block with a specified minimum equipment.

On all underground shifts there must at all times be at least one first-aid man to every 50 miners; each first-aid man must be provided with a case containing dressings and first-aid kit.

Fixed first-aid posts have also to be provided every 100 yards or so; at each there must be one or more stretchers, blankets and first-aid equipment, and also a supply of morphine.

The Coal Board in fact does a good deal more than the law actually requires; there are, however, no separate miners' hospitals or rehabilitation units. Rehabilitation is organized in the hospitals through the National Health Service; the appropriate facilities are always available within reasonable reach of every colliery in all the coalfields.

VII

MEASURES TAKEN TO ENSURE GOOD RELATIONS BETWEEN THE MEDICAL AND OTHER SERVICES OF THE COLLIERIES AND BETWEEN THE MEDICAL SERVICE AND THE WORKERS AND WORKERS' REPRESENTATIVES

We are not here concerned merely with casual but rather with organized co-operation.

A. GERMANY

1. - a) In the Ruhr and Aachen collieries contact is maintained between the management, the safety engineers, the medical service and the men's representatives. (The workers' representative body at enterprise level is the Betriebsrat, which consists exclusively of workers' delegates).

These contacts do not take the form simply of regular meetings, but also offer opportunities for investigationg all practical problems immediately they arise. However such consultations take place only when a problem has in fact arisen. For example, if the medical service advises the transfer of a worker, for reasons of health, to a different section, and the management transfers him without comment, the Betriebsrat does not have to be consulted; on the other hand, if the management takes the view that no suitable job is available for the man to be assigned to, the case is jointly investigated by a representative of the management and a representative of the Betriebsrat (the chairman or a member deputed to represent him).

If at all possible, the man is put on to work which will involve no decrease, or at any rate no appreciable decrease, in his earnings. Where this is not possible, the decrease may be made up by the social-insurance authorities.

In the last resort the worker may appeal to the welfare or labour tribunals, in which case he can secure through his union a legal and medical adviser. This procedure is, however, very seldom used.

b) In some very large enterprises, such as Dortmunder Bergbau A.G., there is also an Accidents Committee consisting of the colliery manager, the undermanager, safety engineers and workers' representatives; the colliery medical service is, of course, also represented. The Committee meets regularly to discuss all matters arising in connection with safety.

The trade unions are urging that this arrangement should be adopted at all enterprises.

c) In addition, union representatives take part in the examination of safety and health problems at a level above that of the individual colliery; instances are the fact trade union representatives sit on the Board of the Bergbau-Berufsgenossenschaft, and the co-operation between the unions and the Oberbergämter (Divisional Mines Inspectorates).

d) Both the employers' and the workers' representatives are agreed that the medical officer should enjoy the fullest professional independence.

2. The position is different in the Saar, where the part-time medical staff do not have the same close contact with the management and men.

B. FRANCE

No specific provisions are laid down in this connection, either by law, by regulation or by collective-bargaining agreement.

The medical service's relations with the other departments and with the workers and their representatives are generally good; this is, incidentally, favoured by the fact that most of the medical staff are employed full-time and play a real part in the colliery's affairs.

Periodic meetings are usually held with the board of the colliery group, with the underground manager and his staff, and with the personnel and welfare department (in ascending order of frequency). On specific cases there is daily contact between colliery engineers and medical officers. At coalfield level regular information and consultation meetings are held between representatives of the coalfield board and the chief medical officers of the different colliery groups.

Contact with the men is maintained through the miners' delegates, who are in almost all cases at the same time union representatives. The delegates can and do approach the medical service frequently both on particular and on general matters.

Disputes between workers and medical officers are very uncommon, as the men have learned from experience that an efficient medical service is in their own interest quite as much as in the colliery's.

Difficulties can, however, arise where the doctor finds a man unfit to continue his duties, or recommends that he be put on to different work. In such cases the worker has a number of safeguards. The colliery medical service usually asks the doctor handling the case for an opinion; the worker can demand that this shall be done, and under the social-security arrangements in force can be certain of the doctor's full co-operation.

There is always the possibility of appeal, by requesting a special examination and report with the agreement of the doctor in charge of the case. Where the disability in question could lead to the man's being actually discharged and his own doctor disagrees on the subject, the Miner's Code provides that an expert opinion must be obtained from a doctor designated by the dean of the nearest medical faculty (usually from among the members of the faculty itself) : his decision is final. Appeals of this kind are, however, exceptional, as the nationalized industry does its very utmost to find alternative employment itself for those of its personnel who cannot continue at their previous jobs.

In some coalfields, including in particular the Centre/Midi, reassignment committees have been set up, consisting of representatives of the colliery departments concerned -(the operations branch, the personnel department and the medical service) and of the unions. These meet monthly to discuss all problems arising in connection with regrading -- always a supremely awkward field. Their work has given entire satisfaction.

It should also be noted that union representatives sit on the coalfield boards, and that the administrative bodies of the friendly societies and their regional branches consist two-thirds of workers' representatives.

An all-important element is, of course, the quality of the medical officer himself, since he needs to be not only a very competent doctor but also a first-class psychologist.

C. ITALY

The medical service is responsible to the colliery management, and so has every opportunity for keeping in constant touch with it.

It is able to maintain similarly close relations with the workers through the colliery's safety and health committee, which in addition to the colliery manager, medical officer and technicians includes elected workers' representatives, and to which all health, hygiene and safety matters are regularly referred : the medical officer, in consequence of his position, carries a good deal of weight.

D. NETHERLANDS

There are quite a number of bodies representing the two sides of industry, through which the workers can make their views known : for the industry as a whole there is the Mijnindustrieraad, and at enterprise level the works council and the "ringen" (workers' representatives).

The terms of reference of these bodies are very comprehensive. Among other things, they give the workers the opportunity to raise general problems of health and safety, and hence, as a natural consequence, to express their opinions concerning the functioning of the colliery medical services.

The policy followed regarding job assignment and any individual problems arising in this connection (workers having to be certified unfit for particular jobs; selection for certain types of work) are always discussed between the workers' representatives, the management and the medical officer.

A special committee exists to deal with all matters connected with silicosis : both the employers and the workers are represented, and doctors sit in as experts. The committee has now been working for six or seven years, and has gone into all aspects of the subject very thoroughly and to the satisfaction of all concerned.

The medical officers are at the same time in very close contact with the management.

The professional contact maintained among the doctors themselves has also proved extremely valuable. First, there is the consultation within the medical services, and in particular with the specialists; then again there are the close relations with the medical practitioners in the mining areas; finally, there is the co-operation with the Rijksverzekeringsbank, which is responsible for the implementation of the Accidents Act and through its own medical service exercises some degree of supervision over the colliery medical services.

E. BELGIUM

Very little provision has been made in legislation up to now concerning relations between the medical services and other colliery departments and between the medical services and the workers' representatives. One enactment which may be mentioned is the Royal decree of April 29, 1958, concerning bodies responsible for safety, hygiene and amenities at workplaces in deep and opencast mines and underground quarries, which includes a provision to the effect that the medical officer, the nurse and the welfare worker of the medical service may attend meetings of the colliery safety and health committee in a consultative capacity.

The Belgian authorities are aware that the present state of the law is inadequate, in view of the rise in the number of disabled mineworkers.

An amendment of July 15, 1957, to the Mines Acts empowers the King to take all appropriate steps concerning the supervision, control and co-ordination of colliery medical services, which he may insist shall be instituted.

In this connection, the Industrial Medical Inspectorate is planning to stiffen the legal requirements concerning check-ups on miners' health, more particularly by arranging that these shall be done by doctors having less connection with the employers, and making it a responsibility of the trade unions to ascertain that the various examinations which will be provided for are being effectively carried out.

A number of collieries do insist on regular contacts between the medical service, the personnel department, the safety engineer and the welfare service. At some collieries a psychotechnical and psychological department is attached to the medical service to assist with job assignment, and more particularly with the selection of supervisory and safety personnel.

Disputes very seldom occur, since a miner refusing to take the medical service's advice (e.g. that he should change to a different job for health reasons) is not penalized in any way : the Government medical inspector does not intervene unless the man is a source of infection.

The Commission expressed the view that existing contact between the medical services and the workers' representatives was inadequate, and also that it was a pity that workers' representatives did not sit on the boards of the institutions concerned with industrial medicine.

F. UNITED KINGDOM

No statutory provisions exist in this connection.

In practice, contact between the workers and the employers, and between them and the medical staff, is satisfactory.

A miner's fitness to resume work after an illness or accident must be certified by his own (National Health Service) doctor. The colliery medical officer will not contest this decision as such, but may consider that the man is not fit for certain specific duties; if in consequence of his opinion the miner is not allowed to go back to work, the N.H.S. doctor duly supplies the latter with the certificate entitling him to national assistance.

The colliery medical officers maintain close relations with the national insurance doctors who conduct the initial and subsequent periodic examinations of miners suffering from silicosis, and with the Ministry of Labour doctors working at the rehabilitation centres.

VIII

STATUS AND TERMS OF EMPLOYMENT OF THE MEDICAL OFFICER AND OTHER MEMBERS OF THE COLLIERY MEDICAL SERVICES; ARRANGEMENTS ENSURING THEIR PROFESSIONAL INDEPENDENCE

Two points emerge from the foregoing with special clarity;

- the importance of the medical officer's personal qualities;
- the importance of his being able to enjoy complete freedom in his work.

We are here concerned to examine whether medical officers' terms of employment (conditions regarding engagement, conditions on the job, conditions as to dismissal) take proper account of these two factors.

A. GERMANY

1. - a) In the Ruhr and Aachen coalfields, colliery medical officers are appointed by the managements.

b) The management must, however, notify the Betriebsrat and the Government medical inspector, who may raise objections as regards either the qualifications or the character of the doctor designated. The Betriebsrat may also allege difficulty in co-operating with him. The management must make a careful assessment of such objections. This is the legal position: in practice, there is prior consultation.

In addition to each pit's own Betriebsrat, companies operating two or more pits have a central "Gesamtbetriebsrat", the chairman of which has to be consulted by the management before the final appointment of a medical officer for any particular pit. If he objects, efforts are first made to reach agreement, either by the chairman's re-examining and withdrawing his objections or by the selection of another candidate. If this proves impossible, the management may proceed, after notifying the Betriebsrat accordingly : the Betriebsrat can then stand on its rights under the collective bargaining agreements in force. In practice, however, this never happens.

c) Before he can undertake the statutory examinations (pre-entry, periodic and special), the colliery medical officer must, in addition, be officially authorized to that effect by the competent authority.

The regulations concerning such authorization are as follows:

1) To conduct pre-entry medical examinations, the doctor must have completed not less than three years' hospital training over and above the prescribed internship, viz.
   - at least two years on the medical side at a hospital dealing mainly with miners or workers from other industries where silicosis is liable to be contracted;
   - at least one year in surgery and/or orthopaedics.

2) To conduct pre-entry examinations and periodic check-ups, he must, in addition to the above, have
   - at least two years' practical experience of pre-entry examinations;
   - special training in silicosis detection, received at the teaching centre in Bochum and certified by a medical committee appointed by the regional mines inspectorate.

d) Colliery medical officers rank as executives, and as such enjoy adequate independence, material and otherwise. Their contracts cover all the usual items, i.e. salary, holidays, insurance, etc.

e) If a medical officer's appointment has to be terminated, the decision is taken by the management, subject to prior consultation with the Government medical inspector and to the agreement of the workers' representatives.

f) The other members of the medical staff come under the terms of the collective-bargaining agreements between the employers' and workers' associations.

2. - a) In the Saar, the position of the full-time colliery medical officers is much the same as in the Ruhr and Aachen coalfields.

b) Part-time medical officers have to be approved by the competent authority, and must fulfil certain requirements as to training. Their colliery appointments involve them in from 30 to 50 hours' work a month, for which they are paid a flat rate.

Part-time doctors doing X-ray work must have received special training for this.

B. FRANCE

Colliery medical officers are recruited and appointed by the Director-General for the coalfield.

There are no statutory requirements with respect to such appointments : in practice, candidates are expected to hold diploma in industrial medicine within the meaning of the Higher Education Act, preferably also testimonials concerning hospital experience and/or additional university qualifications, and if possible special training and a diploma in pneumo-phthisiology.

The doctors rank with the members of the executive staff, and are covered by the Miner's Code. Administratively, they come under the Director-General for the coalfield, but they are allowed the fullest independence in their professional work.

The medical auxiliaries are also covered by the provisions of the Miner's Code for their particular grade.

C. ITALY

No laws or regulations on the subject exist at present, but a Bill is in preparation.

Full-time medical officers are recruited and paid by the management of the colliery. Their terms of employment are fixed by a national agreement : they are counted as members of the executive managerial staff, ranking e.g. with "heads of divisions" or with "heads of sectors," according to their qualifications. The management may dismiss them only in accordance with the rules contained in the collective-bargaining agreements.

Part-time medical officers are recruited and paid by individual contract; their appointment may be terminated in accordance with the terms of the contract.

All colliery medical officers enjoy the fullest professional independence.

On engaging a medical officer, collieries must register his name with the competent authority, which is thus able to inform the management should he be deemed insufficiently qualified for the appointment (though no official definition has been issued of the necessary qualifications).

Male nurses, medical-room attendants and so on are graded according to their skill and competence; their rates of pay are laid down in their contracts of employment, in line with certain rules contained in collective-bargaining agreements.

D. NETHERLANDS

Colliery medical officers are employed full-time by the enterprise. Their appointment must be approved by the Rijksverzekeringsbank, which lays down certain requirements in this respect.

Section 80, b of the Accidents Act of 1921 contains various provisions for ensuring their professional independence. The employer must not interfere with the running of the officially-approved medical service, nor has he any say in the treatment given or recommended by it in respect of sick or injured workers.

Similar arrangements for ensuring the medical officer's independence are to be introduced with regard to regular health supervision and check-ups, and a general regulation is to be issued specifying the requirements to be fulfilled by colliery medical services.

E. BELGIUM

Colliery medical officers and other medical personnel are recruited by the management. There is no specific statutory provision concerning them. They usually have a contract of service with the enterprise, and their dismissal is subject to the normal legal provisions on the subject, so their professional independence is not actually safeguarded by law; in practice, however, it is respected.

It should be added, that the new amendments to the relevant legislation empower the King to lay down the duties of colliery medical services and the requirements they must fulfil, as well as to insist that such services shall be established. A new set of regulations on the subject is in preparation, which will (1) specify the professional qualifications to be required of doctors before they can be appointed to the medical staff of a colliery (they must be practising industrial medical officers or hold a degree in industrial health and occupational pathology), and (2) seek to promote co-operation between the management, the medical officer and the delegates of the safety, health and workplace amenities committee (on which the workers are represented). In particular, the medical officer will in future be appointed only following consultation with this committee.

F. UNITED KINGDOM

Colliery medical officers are appointed direct by the National Coal Board, which is not required to obtain the Ministry's approval. A high standard of professional attainment is demanded, and preference is given to candidates with some experience of work in industry. The terms of employment are much the same as in the National Health Service.

Medical officers are responsible in professional matters to their senior medical colleagues : their rulings are never contested by any non-medical person.

The terms of employment offered to nurses are fixed by an agreement between the National Coal Board and the Royal College of Nursing, and those for first-aid men by an agreement between the Board and the trade unions.

IX

OVERALL ASSESSMENT OF THE EFFECTIVENESS OF CONTROL OVER THE MEDICAL SUPERVISION OF WORKERS AND OF THE WORK OF COLLIERY MEDICAL SERVICES

The question has been asked to what extent the provisions concerning control over the medical supervision of workers are being implemented in actual practice.

The Belgian workers' representative who raised this question has made it known that, after studying the situation currently prevailing in the individual countries, he intends to move that the Commission should go into the problem of the type of measures to be proposed to ensure the maximum effectiveness of, and benefit from, the arrangements introduced.

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ANNEX D

DECISION [1]

CONCERNING THE TERMS OF REFERENCE

AND RULES OF PROCEDURE

OF THE MINES SAFETY COMMISSION

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1) See Journal Officiel de la Communauté Européenne du Charbon et de l'Acier August 31, 1957 (No. 28).

TERMS OF REFERENCE

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, and May 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,

(sgd.) J. REY

President.

RULES OF PROCEDURE

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

The Commission shall consist of 24 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.

U.K. PARTICIPATION

Article 5

Delegates appointed by the Government of the United Kingdom may attend the proceedings of the Commission as observers.

ORGANIZATION

(a) Restricted Committee

Article 6

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

Article 7

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

Article 8

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 9

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 three or more Governments.

b) Working Parties

Article 10

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

Article 11

The working parties shall decide their own modus operandi.

Article 12

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 13

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 four official languages of the Community.

WORKING PROCEDURE

Article 14

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

Article 15

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

The Chairman may allow advisers to speak.

Article 16

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 17

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 18

Sixteen 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 thirteen 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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ANNEX E

THE COMMISSION; THE RESTRICTED COMMITTEE;

THE WORKING PARTIES

MEMBERSHIP

MEETINGS HELD

A.- THE COMMISSION

a) Membership of the Commission

FEDERAL REPUBLIC OF GERMANY

Government representatives

Herr Ministerialrat GECK
Bundeswirtschaftsministerium
B O N N 11

Herr Ministerialdirigent Dr. Ing. HELLER
Ministerium für Wirtschaft und Verkehr
Land Nordrhein-Westfalen
D U E S S E L D O R F
am Karltor 8

Employers'representative

Herr C. ERLINGHAGEN
Bergassessor a.D.
Steinkohlenbergbauverein
E S S E N
Friedrichstrasse 2

Workers' representative

Herr Wilhelm BLUME
Industriegewerkschaft Bergbau
B O C H U M
Hattingerstr. 19

Technical advisers

Herr Oberbergamtsdirektor LATTEN
Ministerium für Wirtschaft und Verkehr
Land Nordrhein-Westfalen
D U E S S E L D O R F
am Karltor 8

Herr Walter GROSS
Bergwerksdirektor und Bergassessor a.D.
Ministerium für Wirtschaft, Verkehr
und Landwirtschaft
S A A R B R U E C K E N
Hardenbergstrasse

BELGIUM

Government representatives

Monsieur A. VANDENHEUVEL
Directeur Général des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Monsieur Georges LOGELAIN
Inspecteur Général à l'Administration des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Employers' representative

Monsieur DESSALLES
Administrateur des Charbonnages André Dumont
et de Houthalen
10, Avenue Reine Astrid
H A S S E L T

Workers' representatives

Monsieur Nicolas DETHIER +)
Secrétaire Général de la Centrale Syndicale
des Travailleurs des Mines de Belgique
24, rue Mathieu
BEYNE-HEUSAY
L I E G E

Monsieur Joseph DEDOYARD +)
Secrétaire Général de la Centrale Syndicale des
des Travailleurs des Mines de Belgique
201, rue de Gilly
C H A T E L I N E A U

Technical advisers

Monsieur Mathieu THOMASSEN
Président National de la Centrale
des Francs-Mineurs
36, Montoyerstraat
B R U S S E L S

Monsieur Lucien BOULET
Directeur Général du Fonds National
de Retraite des Ouvriers Mineurs
Ministère du Travail et de la
Prévoyance Sociale
6, Place Stéphanie
B R U S S E L S

+) M. Dethier was succeeded by M. Dedoyard with effect from March 15, 1960.

FRANCE

Government representatives

Monsieur J.N. PROUST
Ingénieur en Chef des Mines
Ministère de l'Industrie
97, rue de Grenelle
P A R I S VII

Monsieur COLAS
Chef du Service Hygiène et
Sécurité Minières
à la Direction des Mines
Ministère de l'Industrie
P A R I S VII

Employers' representative

Monsieur R. VEDRINE
Directeur Général-adjoint des Houillères
du Nord et du Pas-de-Calais
20, rue des Minimes
D O U A I (Nord)

Workers' representatives

Monsieur Florent LAMPIN +)
Fédération Nationale Force-Ouvrière des Mineurs
198, Avenue du Maine
P A R I S XIV

Monsieur CHAUVEAU +)
Fédération Nationale des Syndicats Chrétiens des Mineurs
88, rue Pernes
ST. PIERRE-LES-AUCHUL (Pas-de-Calais)

Technical advisers

Monsieur CHAUVEAU ++)
Fédération Nationale des Syndicats Chrétiens des Mineurs
88, rue Pernes
ST. PIERRE-LES-AUCHUL (Pas-de-Calais)

Monsieur Roger TOURET ++)
Force Ouvrière des Mineurs, Miniers et Similaires
Ingénieur de la Sécurité aux Houillères de Lorraine
M E R L E B A C H (Moselle)

+) M. Lampin was succeeded by M. Chauveau with effect from June 15, 1960.

++) M. Touret succeeded M. Chauveau as technical adviser with effect from June 15, 1960.

ITALY

Government representatives

Ing. Giovanni GIROLAMI
Ispettore generale delle Miniere
Ministero dell' Industria e Commercio
Via Veneto, 33
R O M E

Marchese Ignazio SANFELICE DI MONTEFORTE +)
Consigliere di Legazione
Servizio Stampa
Ministero Affari Esteri
R O M E

Dott. Italo PAPINI +)
Direzione Generale dell' Emigrazione
Ministero degli Affari Esteri
R O M E

Employers' representative

Prof. Mario CARTA
Istituto Arte Mineraria
Piazza d'Armi
C A G L I A R I

Workers' representative

Dott. Dionigi COPPO
Vice Segretario Generale della
C.I.S.L.
Via Po, 21
R O M E

Government adviser

Dott. Rosario PURPURA
Direttore Generale al
Ministero del Lavoro
Via Flavia, 6
R O M E

Technical adviser

Dott. Augusto PAROLI
Direttore di Divisione per la Sicurezza
e Igiene nel Lavoro del
Ministero del Lavoro
R O M E

+) Marchese Sanfelice was succeeded by Dr. Papini with effect from April 2, 1960.

LUXEMBOURG

Government representatives

Monsieur François HUBERTY
Ingénieur-Directeur du Travail et des Mines
Inspection du Travail et des Mines
19, Avenue Gaston Diderich
L U X E M B O U R G

Monsieur Léon SUTTOR
Conseiller de Légation au
Ministère des Affaires Etrangères
L U X E M B O U R G

Employers' representative

Monsieur Albert RAUS
Ingénieur en Chef de l'Administration Centrale
de l'ARBED
L U X E M B O U R G

Workers' representative

Monsieur Nicolas MANNES
Président de la Délégation Ouvrière
près ARBED/Mines
Cité Leesberg
E S C H - S U R - A L Z E T T E

NETHERLANDS

Government representatives

De Hoogedelgestrenge Heer
Ir. A.H.W. MARTENS
Inspecteur-Generaal der Mijnen
Staatstoezicht op de Mijnen
Dautzenbergstraat 46
H E E R L E N

De Hoogedelgestrenge Heer
Mr. L.G. WANSINK
Hoofd van de Directie Mijnwezen
Ministerie van Economische Zaken
Bezuidenhoutseweg 30
T H E H A G U E

Employers' representative

De Hoogedelgestrenge Heer
Ir. C.E.P.M. RAEDTS
Directeur Oranje-Nassau Mijnen
H E E R L E N

Workers' representative

De Heer J. PALMEN
Secretaris van de Ned. Katholieke
Mijnwerkersbond
Parallelweg 12
H E E R L E N

Technical adviser

De Heer H.L. GROND
Katholieke Vereniging
van Mijnbeambten
Schelsberg 202
H E E R L E R H E I D E (L)

UNITED KINGDOM

Government representatives

Mr. A.M. RAKE, C.B.E.,
Under-Secretary
Safety ans Health Division,
Ministry of Power,
Thames House South
7, Millbank,
L O N D O N, S.W. 1

Mr. T.A. ROGERS, C.B.E.
Chief Inspector of Mines
Ministry of Power
7, Millbank
Thames House South
L O N D O N, S.W.1

Employers' representative

Dr. H.L. WILLETT,
Deputy Director-General of Production,
National Coal Board,
Hobart House,
Grosvenor Place,
L O N D O N, S.W. 1

Workers' representative

Mr. Ted JONES
Vice-President of the National Union
of Mineworkers,
5, Westminster Bridge Road,
L O N D O N, S.E. 1

I.L.O. representatives

Monsieur Marcel ROBERT
Chef de la Division de la
Sécurité et de l'Hygiène du Travail
Bureau International du Travail
154, route de Lausanne
G E N E V A

Mr. J.E. WHEELER
Membre Principal de la Division
de la Sécurité et de l'Hygiène du Travail,
154, route de Lausanne,
G E N E V A

b) Meetings

The Commission met five times, on

1) April 7, 1959;

2) July 7, 1959;

3) December 1, 1959;

4) April 8, 1960;

5) December 20, 1960.

B.- THE RESTRICTED COMMITTEE

a) The Restricted Committee consists of the Government representatives on the Commission.

b) It met five times, on

1) April 6, 1959;

2) July 6, 1959;

3) November 30, 1959;

4) April 7, 1960;

5) December 19, 1960.

C.- WORKING PARTIES ON TECHNICAL PROBLEMS

I.- WORKING PARTY ON ELECTRICITY

a) The Working Party is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Herr Oberbergrat EPPING
Oberbergamt
D O R T M U N D

BELGIUM

Monsieur Georges LOGELAIN +)
Inspecteur Général à l'Administration
des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Monsieur STENUIT
Directeur Divisionnaire
à l'Administration des Mines
6-8, rue de la Science
B R U S S E L S

Monsieur COOLS
Directeur Divisionnaire
à l'Administration des Mines
6-8, rue de la Science
B R U S S E L S

FRANCE

Monsieur COEUILLET
Ingénieur en Chef au Service Exploitation
des Charbonnages de France
9, Avenue Percier
P A R I S VIII

Monsieur FLINOIS
Houillères du Bassin du Nord
et du Pas-de-Calais
Service Technique du Fond
20, rue des Minimes
D O U A I (Nord)

ITALY

Dott. Ing. Luigi VENTRELLA
Direttore dell'Istituto Italiano
del Marchio per i materiali e le
apparecchiature elettro-teniche
Via Misurata 61,
M I L A N

+) Sits as representative of the Restricted Committee.

LUXEMBOURG

Monsieur Albert RAUS
Ingénieur en Chef des Mines
à l'Administration de l'ARBED
L U X E M B O U R G

Monsieur Ed. MÜLLER
Ingénieur des Mines
à l'Administration des Mines
luxembourgeoises de l'ARBED
E S C H - S U R - A L Z E T T E

NETHERLANDS

De Weledelgestrenge Heer
Ir. A.F.P.H. BLOEMEN
Inspecteur der Mijnen
Staatstoezicht op de Mijnen
St. Antoniusweg 7
H E E R L E N

De Weledelgestrenge Heer
Ir. OMERS
Oranje-Nassau Mijnen
H E E R L E N

UNITED KINGDOM

Mr. J.E. COWAN,
H.M. Principal Electrical Inspector
of Mines and Quarries,
Ministry of Power,
Thames House South,
7, Millbank,
L O N D O N, S.W. 1

b) The Working Party has three Sub-Committees.

aa) Sub-Committee on Testing of Electric Cables for Non-Flammability.

FEDERAL REPUBLIC OF GERMANY

Herr Oberbergrat EPPING
Oberbergamt
D O R T M U N D

Herr Dr. Ing. BUSS
Felten und Guilleaume A.G.
KOELN - MUELHEIM

BELGIUM

Monsieur GOBBE
Chef de Service à la Division
Câblerie des ACEC
C H A R L E R O I

FRANCE

Monsieur NICOLAS
Ingénieur en Chef des
"Câbles de Lyon"
170, Avenue Jean Jaurès
L Y O N / R H O N E

Monsieur OSTY
Directeur Technique à la "SILEC"
Société Industrielle de Liaisons Electriques
64 bis, rue de Monceau
P A R I S VIII

Monsieur VIN
Ingénieur au CERCHAR
35, rue Sainte Dominique
P A R I S

NETHERLANDS

Ir. GOEDBLOED
Nederlandse Kabelfabriek
D E L F T

Ir. W.L. BAER
N.V. Hollandse Draad- en Kabelfabriek
A M S T E R D A M
P.O.B. 1013

bb) Sub-Committee on High-Tension Circuit-Breakers

Monsieur Georges LOGELAIN
Inspecteur Général à l'Administration des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Monsieur STENUIT
Directeur Divisionnaire
à l'Administration des Mines
6-8, rue de la Science
B R U S S E L S

Herr Oberbergrat EPPING
Oberbergamt
D O R T M U N D

Monsieur FLINOIS
Houillères du Bassin du Nord
et du Pas-de-Calais
Service Technique du Fond
20, rue des Minimes
D O U A I (Nord)

De Weledelgestrenge Heer
Ir. OMERS
Oranje-Nassau Mijnen
H E E R L E N

cc) Sub-Committee on Protection of Electric Networks Below Ground

Monsieur Georges LOGELAIN
Inspecteur Général à l'Administration des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Monsieur COOLS
Directeur Divisionnaire
à l'Administration des Mines
6-8, rue de la Science
B R U S S E L S

Monsieur COEUILLET
Ingénieur en Chef au Service Exploitation
des Charbonnages de France
9, Avenue Percier
P A R I S VIII

Herr Oberbergrat EPPING
Oberbergamt
D O R T M U N D

De Weledelgestrenge Heer
Ir. OMERS
Oranje-Nassau Mijnen
H E E R L E N

c) The Working Party and Sub-Committee met on the following dates:

1) January 20, 1959;
2) March 10, 1959;
3) March 24, 1959;
4) May 26, 1959;
5) September 29, 1959;
6) October 20, 1959;
7) November 24, 1959 (at the TREMONIA experimental pit, Dortmund);
8) December 17, 1959;
9) February 26, 1960;
10) April 26, 1960;
11) June 22, 1960 (at the CERCHAR headquarters, Verneuil);
12) May 31, 1960;
13) June 28, 1960;
14) September 27, 1960.

II.- WORKING PARTY ON FIRES AND UNDERGROUND COMBUSTION

a) The Working Party is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Herr Ministerialrat GECK +)
Bundeswirtschaftsministerium
B O N N II

Herr Dipl. Ing. Ernst BREDENBRUCH
Leiter der Hauptstelle für das Grubenrettungswesen
E S S E N - K R A Y
Dortmunderstrasse, 209

BELGIUM

Monsieur VANDENHEUVEL
Directeur Général des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Monsieur Georges LOGELAIN
Inspecteur Général à l'Administration
des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Monsieur STENUIT
Directeur Divisionnaire
à l'Administration des Mines
6-8, rue de la Science
B R U S S E L S

FRANCE

Monsieur CHAMPAGNAC
Directeur aux Houillères du
Bassin de Lorraine
M E R L E B A C H (Moselle)

Monsieur FOMBONNE
Directeur aux Houillères du
Bassin du Centre-Midi
2, Place Jean Jaurès
ST. E T I E N N E (Loire)

LUXEMBOURG

Monsieur François HUBERTY
Ingénieur-Directeur du Travail et des Mines
Inspection du Travail et des Mines
19, Avenue Gaston Diderich
L U X E M B O U R G

Monsieur LEINEWEBER
Contrôleur au Service de l'Inspection
du Travail et des Mines
19, Avenue Gaston Diderich
L U X E M B O U R G

+) Sits as representative of the Restricted Committee.

ITALY

Ing. Achille PELLATI
Miniera Ribolla
G R O S S E T O

Ing. Vincenzo BUSONERO
Direttore Miniera
Società Carbosarda
C A R B O N I A (Cagliari)

NETHERLANDS

Ir. D.J. KNUTTEL
Hoofdinspecteur der Mijnen
Staatstoezicht op de Mijnen
H E E R L E N
Dautzenbergstraat 46

Ir. de ZEE
Chef van de Veiligheidsdienst
van de Staatsmijnen in Limburg
H E E R L E N

UNITED KINGDOM

Mr. R. BELL,
Production Department,
National Coal Board,
Hobart House,
Grosvenor Place,
L O N D O N, S.W.1

b) The Working Party has a Sub-Committee on Spraying of Shafts

Herr Ministerialrat GECK
Bundeswirtschaftsministerium
B O N N 11

Herr Dipl. Ing. Ernst BREDENBRUCH
Leiter der Hauptstelle für das Grubenrettungswesen
E S S E N - K R A Y
Dortmunderstrasse 209

Monsieur CHAMPAGNAC
Directeur aux Houillères du
Bassin de Lorraine
M E R L E B A C H (Moselle)

Monsieur STENUIT
Directeur Divisionnaire
à l'Administration des Mines
6-8, rue de la Science
B R U S S E L S

Herr Dr.-Ing. RENNER
Forschungsstelle für Grubenbewetterung
des Steinkohlenbergbauvereins
E S S E N

Herr Dr.-Ing. GREUER
Forschungsstelle für Grubenbewetterung
des Steinkohlenbergbauvereins
E S S E N

c) The Working Party and Sub-Committee met on the following dates:

1. October 30, 1959 (at Bottrop);
2. November 17, 1959;
3. December 18, 1959 (at Essen);
4. January 22, 1960 (at the Tremonia experimental pit);
5. November 28, 1960.

d) Joint meetings with the Working Party on Co-ordination of Rescue Organizations

1. November 18, 1959;
2. January 28, 1960;
3. February 18, 1960;
4. March 17, 1960;
5. June 9, 1960;
6. July 8, 1960;
7. October 7, 1960.

e) Meetings of the Editorial Committee of the Working Parties on Fires and Underground Combustion and on Co-ordination of Rescue Organization

1. January 27, 1960;
2. April 28, 1960;
3. August 8/9, 1960;
4. November 14, 1960;
5. November 28, 1960.

f) The Working Party has an Expert Committee for the study of criteria for incombustible lubricants. The Expert Committee is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Herr Dipl. Ing. Ernst BREDENBRUCH
Leiter der Hauptstelle für das
Grubenrettungswesen
E S S E N - K R A Y
Dortmunderstrasse 209

Herr Dr. Chem. Hans Willi THOENES
m. Br. Technischer Ueberwachungs Verein e.V.
E S S E N
Steubenstr. 53

Herr Dr. Med. ZIMMERMANN
Hygiene Institut des Ruhrgebiets
G E L S E N K I R C H E N
Rotthauserstr. 19

BELGIUM

Monsieur Edgar DEMELENNE
Administrateur Directeur
de l'Institut National des Mines
P A T U R A G E S

FRANCE

Monsieur René LEFEVRE
Ingénieur à la Direction Générale
des Houillères du Bassin du Nord
et du Pas-de-Calais
20, rue des Minimes
D O U A I / Nord

g) The Expert Committee met on the following dates:

1) January 8, 1959;
2) February 26, 1959;
3) April 29, 1959;
4) June 19, 1959;
5) September 30, 1959;
6) November 26, 1959;
7) March 8, 1959;
8) April 13, 1960;
9) June 2, 1960;
10) September 20, 1960;
11) October 25/26, 1960 (at Pâturages);
12) October 27, 1960;
13) November 17/18, 1960 (at Essen).

III.- WORKING PARTY ON CO-ORDINATION OF RESCUE ORGANIZATIONS

a) The Working Party is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Herr Ministerialrat GECK (+)
Bundeswirtschaftsministerium
B O N N 11

Herr Carl von HOFF
ehemaliger Leiter der Hauptstelle für das
Grubenrettungswesen
E S S E N - K R A Y

Dortmunderstrasse 209

Herr Dipl. Ing. Ernst BREDENBRUCH
Leiter der Hauptstelle für das
Grubenrettungswesen des Steinkohlenbergbauvereins
E S S E N - K R A Y

Dormunderstrasse 209

Herr Alex VAN GEMBER
Erster Bergrat a.D.
Leiter der Grubensicherheitsabteilung
der Saarbergwerke A.G.
S A A R B R U E C K E N

Triererstrasse 1

BELGIUM

Monsieur Louis DE CONINCK
Directeur du Centre National Belge
de Coordination des Centres de Sauvetage
17, rue Puissant
C H A R L E R O I

Monsieur A. HAUSMAN
Directeur du Centre de Coordination
des Moyens de Sauvetage de Campine
Kempische Steenweg
H A S S E L T

FRANCE

Monsieur VANDERLEKEN
Directeur du Poste Central de Secours
des Mines du Nord et du Pas-de-Calais
Rue du Bois
L E N S (Pas-de-Calais)

Monsieur GRISARD
Charbonnages de France
9, Avenue Percier
P A R I S VIII

(+) Sits as representative of the Restricted Committee.

ITALY

Dott. Ing. Giorgio CARTA
Vice Direttore Generale
della Carbonifera Sarda
11, Via Napoli
C A R B O N I A (Cagliari)

LUXEMBOURG

Monsieur Albert RAUS
Ingénieur des Mines
Chef de Service à l'ARBED centrale
L U X E M B O U R G

NETHERLANDS

De Weledelgestrenge Heer
Ir. P.F. de ZEE
Chef van de Veiligheidsdienst
van de Staatsmijnen in Limburg
H E E R L E N

De Weledelgestrenge Heer
Dipl. Ing. F.A.F. SIEVERS
p/a Oranje-Nassau Mijnen
H E E R L E N

UNITED KINGDOM

Mr. W.F. RICHARDSON
Chief Safety Engineer
National Coal Board
Hobart House,
Grosvenor Place,
L O N D O N, S.W.1

b) The Working Party met on the following dates:

1) January 22, 1959	(inspection of Dutch mine rescue arrangements at Heerlen);
2) June 3/4, 1959	(tour of new central rescue station at Mansfield, Notts., and central rescue station at Doncaster, Yorks);
3) October 6/7, 1959	(tour of pits and inspection of rescue equipment and first-aid posts in the Sulcis coalfield, Sardinia);
4) December 8, 1959;	
5) March 4, 1960;	
6) May 3/4, 1960	(tour of the Compine rescue co-ordination centre at Hasselt and of the central rescue station at Charleroi);
7) June 10, 1960;	

8) July 26, 1960;

9) October 27/28, 1960;

10) November 30, 1960 (tour of new central rescue station at Merlebach, France).

c) It met jointly with the Working Party on Fires and Underground Combustion on

1) November 18, 1959;

2) January 27, 1960 (Editorial Committee);

3) January 28, 1960;

4) February 18, 1960;

5) March 17, 1960;

6) April 28, 1960 (Editorial Committee);

7) June 9, 1960;

8) July 8, 1960;

9) August 9/10, 1960 (Editorial Committee);

10) October 7, 1960;

11) November 14, 1960 (Editorial Committee);

12) November 28, 1960.

IV.- <u>WORKING PARTY ON WINDING ROPES AND SHAFT GUIDES</u>

a) The Working Party is made up as follows:

<u>FEDERAL REPUBLIC OF GERMANY</u>

Herr Dipl. Ing. Kurt DÜWELL
Leiter der Seilprüfstelle
der Berggewerkschaftskasse
<u>B O C H U M</u>
Hernerstrasse 43 - Postfach 392

Herr Dr. Ing. Richard MEEBOLD
Leiter der technischen Ueberwachungsstelle
Saarbergwerke A.G.
<u>S A A R B R U E C K E N</u>
Triererstrasse 1

<u>BELGIUM</u>

Monsieur Georges LOGELAIN
Inspecteur Général à l'Administration
des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
<u>B R U S S E L S</u>

Monsieur STENUIT
Directeur Divisionnaire
à l'Administration des Mines
6-8, rue de la Science
<u>B R U S S E L S</u>

<u>FRANCE</u>

Monsieur PICHOT
Ingénieur en Chef à la
Direction Générale des
Houillères du Nord et du Pas-de-Calais
20, rue des Minimes
<u>D O U A I</u> (Nord)

Monsieur Paul TEISSIER
Ingénieur en chef au Service Exploitation
des Charbonnages de France
9, Avenue Percier
<u>P A R I S VIII</u>

<u>ITALY</u>

Prof. Dr. Ing. Lelio STRAGIOTTI
Direttore dell'Istituto
di Arte Mineraria del Politecnico
di Torino
Via S. Quintino 24
<u>T O R I N O</u>

Prof. Dr. Ing. Carlo MORTARINO
Istituto di Meccanica applicata del
Politecnico
di
44, Corso Duca degli Abruzzi
T O R I N O

LUXEMBOURG

Monsieur Albert RAUS
Ingénieur en Chef de
l'Administration Centrale de l'ARBED
L U X E M B O U R G

Monsieur Ed. MÜLLER
Ingénieur des Mines
à la Division des Mines luxembourgeoises
de l'ARBED
E S C H / A L Z E T T E

NETHERLANDS

Ir. A.H.W. MARTENS +)
Inspecteur Generaal der Mijnen
Staatstoezicht op de Mijnen
Dautzenbergstraat 46
H E E R L E N

Ir. A.F.P.H. BLOEMEN
Inspecteur der Mijnen
Staatstoezicht op de Mijnen
H E E R L E N

Ir. SMULDERS
Laura en Vereeniging
E Y G E L S H O V E N (Limburg)

UNITED KINGDOM

Mr. A.E. McCLELLAND
Safety in Mines Research Establishment,
Portobello Street,
S H E F F I E L D

b) The Working Party has a Sub-Committee on Electromagnetic Testing of Winding Ropes

Herrn Dipl. Ing. Kurt DÜWELL
Leiter der Seilprüfstelle
der Westfälischen Berggewerkschaftskasse
B O C H U M
Hernerstrasse 45

Herrn Dipl. Ing. GRUPE
Seilprüfstelle der Westfälischen
Berggewerkschaftskasse
B O C H U M
Hernerstrasse 45

+) Sits as representative of the Restricted Committee

Monsieur STREBELLE
Association des Industriels de Belgique
29, rue A. Drouard
B R U S S E L S

Monsieur BURGUIN
Association des Industriels de France
14, rue de Londres
P A R I S IX

Monsieur SIDO
Association des Industriels de France
14, rue de Londres
P A R I S IX

c) The Working Party and Sub-Committee met on the following dates:

1) January 28, 1959;
2) April 11/12, 1959 (at the Rosenblumendelle colliery, Mühlheim, Ruhr, Germany);
3) April 25, 1959 (at the André Dumont colliery, Waterschei, Belgium);
4) May 14, 1959 (at the A.I.B., Brussels);
5) June 10, 1959;
6) June 21, 1959 (at the Freyming colliery, Merlebach, France);
7) September 17, 1959 (at Lens, France);
8) October 3, 1959 (at the Rosenblumendelle colliery, Mühlheim);
9) October 14, 1959 (at the rope testing station, Bochum);
10) November 4, 1959;
11) November 5, 1959;
12) December 15, 1959;
13) February 3, 1960;
14) March 25, 1960;
15) May 17, 1960;
16) July 5, 1960;
17) September 28, 1960;
18) October 25, 1960 (meeting of experts at Leicester).

V.- HIGH AUTHORITY COMPETITION FOR THE IMPROVEMENT OF SAFETY EQUIPMENT IN COALMINES

a) The panel of judges is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Herr Prof. Dr. Ing. E. LINSEL
Steinkohlenbergbauverein
E S S E N - K R A Y
Dortmunderstrasse 151

Herr LATTEN
Oberbergamtsdirektor
Ministerium für Wirtschaft und Verkehr
des Landes Nordrhein-Westfalen
D U S S E L D O R F
am Karltor 8

Herr Dipl. Ing. Ernst BREDENBRUCH
Leiter der Hauptstelle für das Grubenrettungswesen
E S S E N - K R A Y
Dortmunderstrasse 209

FRANCE

Monsieur CHERADAME +)
Directeur Général au CERCHAR
35, rue Sainte Dominique
P A R I S VII

Monsieur TERRIER
Directeur aux Charbonnages de France
Service de l'Exploitation
9, Avenue Percier
P A R I S VIII

Monsieur COLAS
Chef du Service Hygiène et Sécurité Minières
à la Direction des Mines
Ministère de l'Industrie et du Commerce
97, rue de Grenelle
P A R I S VII

BELGIUM

Monsieur Edgar DEMELENNE
Administrateur Directeur
de l'Institut National des Mines
60, rue Grande
P A T U R A G E S

NETHERLANDS

De Heer Dr. de BRAAF
Directeur van het Proefstation der Staatsmijnen
T R E E B E E K (Limburg)

+) Chairman of the panel.

ITALY

Ing. Paolo CERULLI
Ispettore Generale delle Miniere
Ministero dell' Industria e Commercio
33, Via Veneto
R O M E

b) The panel met on the following dates:

1) September 17, 1959;

2) October 22/23, 1959;

3) January 14, 1959;

4) March 18, 1960;

5) April 4/5, 1960 (at the Central Testing Station of the Netherlands State Mines, Treebeek);

6) June 23, 1960;

7) November 3, 1960.

D.- WORKING PARTIES ON HUMAN FACTORS

I. Restricted Working Party on Human Factors

a) The Restricted Working Party is made up as follows:

Government representatives

Mr. L.G. WANSINK +)
Hoofd van de Directie Mijnwezen
Ministerie van Economische Zaken
Bezuidenhoutseweg 30
T H E H A G U E

Monsieur Georges LOGELAIN
Inspecteur Général à l'Administration des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Dott. Augusto PAROLI
Direttore di Divisione per la Sicurezza
e Igiene nel Lavoro del
Ministero del Lavoro
R O M E

Employers' representatives

Herr ERLINGHAGEN
Bergassessor a.D.
Steinkohlenbergbauverein
E S S E N
Friedrichstrasse 2

Ir. C.E.P.M. RAEDTS
Directeur Oranje-Nassau Mijnen
H E E R L E N

Workers' representatives

Herr Wilhelm BLUME
Industriegewerkschaft Bergbau
B O C H U M

Monsieur CHAUVEAU
Fédération Nationale des Syndicats
Chrétiens de Mineurs
88, rue de Pernes
ST. PIERRE-lès-AUCHUL (Pas-de-Calais)

b) The Working Party met on the following dates:

1) April 22, 1959;
2) May 27, 1959.

+) Sits as representative of the Restricted Committee.

II.- WORKING PARTY ON MEDICAL PROBLEMS OF SAFETY POLICY

a) The Working Party is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Government representative

Herr Oberbergamt HUEBNER
Oberbergamt
S A A R B R U E C K E N
Am Staden 17

Employers' representative

Herr Dr. med. SCHAEPER
Dortmunder Bergbau A.G.
D O R T M U N D
Katharinenstrasse 9

Workers' representative

Herr Karl-Heinz VOLLMER
G L A D B E C K
August Bruststrasse 13

Medical expert

Herr Ministerialrat
Dr. med. DIERKES
Bundesministerium für Arbeit und Sozialordnung
B O N N

BELGIUM

Government representatives

Monsieur A. VANDENHEUVEL +)
Directeur Général des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Monsieur VAN MALDEREN
Ingénieur en Chef,
Directeur des Mines
à la Direction Générale des Mines
6-8, rue de la Science
B R U S S E L S

Employers' representative

Monsieur le Docteur VAN MECHELEN
Médecin-Chef de l'Institut
d'Hygiène des Mines
24, Marché aux Avoines
H A S S E L T

+) Sits as representative of the Restricted Committee.

Workers' representative

Monsieur L. GILLOT
Secrétaire National de la Centrale Syndicale
des Travailleurs des Mines de Belgique
8, rue Joseph Stevens
B R U S S E L S

Medical Expert

Monsieur le Docteur P. KISTERS
Inspecteur Général
Chef de l'Inspection Médicale du Travail
128, avenue de Broqueville
B R U S S E L S 15

FRANCE

Government representative

Monsieur COLAS
Chef du Service Hygiène et Sécurité Minières
à la Direction des Mines
Ministère de l'Industrie
97, rue de Grenelle
P A R I S VII

Employers' representative

Monsieur le Docteur AUPETIT
Médecin-Chef du Groupe d'Oignies
des Houillères du Bassin du Nord
et du Pas-de-Calais
20, rue des Minimes
D O U A I (Nord)

Workers' representative

Monsieur CHAUVEAU
Fédération Nationale des Syndicats
Chrétiens de Mineurs
88, rue Pernes
ST. PIERRE-lès-AUCHUL (Pas-de-Calais)

Alternate: Monsieur SAUTY
Fédération des Mineurs
10, rue Diderot
L E N S (Pas-de-Calais)

Medical expert

Monsieur le Docteur JARRY
Charbonnages de France
9, avenue Percier
P A R I S VIII

ITALY

Government representative

Dr. med. Carlo MICHELAZZI
Ispettore Capo del Lavoro
addetto alla Divisione Sicurezza
e Igiene del Lavoro
Ministero del Lavoro
R O M E

Employers' representative

Dr. med. Mario BARSOTTI
Società Montecatini
Via Turati, 18
M I L A N

Workers' representative

Sig. Ettore AZAIS
C.I.S.L.
Via Po, 21
R O M E

Medical expert

Prof. Pietro DIDONNA
Ispettore Generale del Lavoro
Capo dell'Ispettorato Medico del Lavoro
Libero docente di medicina del Lavoro
nell'Università di Roma
Via S. Basilio, 41
R O M E

LUXEMBOURG

No appointment.

NETHERLANDS

Government representatives

Mr. L.G. WANSINK
Hoofd van de Directie Mijnwezen
Ministerie van Economische Zaken
Bezuidenhoutseweg, 30
T H E H A G U E

De Weledelgeleerde Heer
H. ITALIE, arts
Medisch Inspecteur der Mijnen
Staatstoezicht op de Mijnen
H E E R L E N (Limburg)

Employers' representative

De Weledelzeergeleerde Heer
Dr. med. A.V.M. MEY
Directeur Geneeskundige Dienst der
Nederlandse Steenkolenmijnen
Horizonstraat 75
T R E E B E E K (Limburg)

Workers' representative

De Heer C. FEENSTRA
Voorzitter van de Protestant-Christelijke
Mijnwerkersbond,
Burg. de Hesselseplein 26
H E E R L E N

UNITED KINGDOM

Dr. J.M. DAVIDSON,
Safety and Health Division,
Ministry of Power,
Thames House South,
7, Millbank,
L O N D O N, S.W.1

b) The Working Party met on the following dates:

1) October 12, 1959;
2) November 27, 1959;
3) February 12, 1960;
4) March 29, 1960;
5) May 20, 1960;
6) November 16, 1960.

III.- WORKING PARTY ON PSYCHOLOGICAL AND SOCIOLOGICAL FACTORS IN SAFETY

a) The Working Party is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Government representatives

Herr Walter GROSS +)
Bergwerksdirektor und Bergassessor a.D.
Ministerium für Wirtschaft, Verkehr
und Landwirtschaft
S A A R B R U E C K E N
Hardenbergstrasse

Herr SANDERS
Leitender Oberbergamtsdirektor
Oberbergamt
D O R T M U N D
Goebenstrasse, 25

Employers' representative

Herr Bergwerksdirektor
Max OBERSCHUIR, Bergassessor a.D.
Ewald-Kohle A.G.
R E C K L I N G H A U S E N
Lessingstrasse, 49

Workers' representative

Herr Fritz POTT
Industriegewerkschaft Bergbau
B O C H U M
Hattingerstrasse, 19

BELGIUM

Government representative

Monsieur Georges LOGELAIN
Inspecteur Général à l'Administration des Mines
Ministère des Affaires Economiques
6-8, rue de la Science
B R U S S E L S

Alternate:

Monsieur COOLS
Directeur Divisionnaire à
l'Administration des Mines
6-8, rue de la Science
B R U S S E L S

+) Sits as representative of the Restricted Committee.

Employers' representative

Monsieur ROYER
Ingénieur en chef à la S.A.
des Charbonnages de Houthalen
H O U T H A L E N

Workers' representative

Monsieur E. van den DRIESSCHE
5, rue de Trazegnies
C O U R C E L L E S

FRANCE

Government representative

Monsieur DAUNESSE
Ingénieur en chef des mines
Rue Charles Bourseul
D O U A I (Nord)

Employers' representative

Monsieur VEDRINE
Directeur Général-adjoint des Houillères
du Nord et du Pas-de-Calais
20, rue des Minimes
D O U A I (Nord)

Workers' representative

Monsieur CHAUVEAU
Fédération Nationale des Syndicats
Chrétiens de Mineurs
88, rue Pernes
ST. PIERRE-lès-AUCHUL (Pas-de-Calais)

ITALY

Government representative

Dott. Augusto PAROLI
Direttore di Divisione per la Sicurezza
e Igiene nel Lavoro del
Ministero del Lavoro
R O M E

Employers' representative

Avv. Umberto CUTTICA
Dirigente della Società Nazionale Cogne
Via S. Quintino
T U R I N

Workers' representative

Prof. Nicola DE PAMPHILIS
C.I.S.L.
Via Po, 21
R O M E

LUXEMBOURG

Government representative

Monsieur François HUBERTY
Ingénieur-Directeur du Travail et des Mines
Inspection du Travail et des Mines
19, Avenue Gaston Diderich
L U X E M B O U R G

Alternate: Monsieur Léon SUTTOR
Conseiller de Légation au
Ministère des Affaires Etrangères
L U X E M B O U R G

Employers' representative

Monsieur Albert RAUS
Ingénieur en Chef de l'Administration Centrale
de l'ARBED
L U X E M B O U R G

Alternate: Monsieur Emile SCHMIT
Ingénieur principal pour la sécurité
à l'ARBED
L U X E M B O U R G

Workers' representative

Monsieur Nicolas MANNES
Président de la Délégation Ouvrière
près ARBED/Mines
Cité Leesberg
ESCH-sur-ALZETTE

NETHERLANDS

Government representative

Ir. Chr. PICKEE
Inspecteur der Mijnen
Staatstoezicht op de Mijnen
H E E R L E N

Employers' representative

Ir. C.E.P.M. RAEDTS
Directeur Oranje-Nassau Mijnen
H E E R L E N

Workers' representative

De Heer F.S. DOHMEN
Nederlandse Kath. Mijnwerkersbond,
Parallelweg, 12
H E E R L E N

UNITED KINGDOM

Mr. H.R. HOUSTON,
Safety and Health Division,
Ministry of Power,
Thames House South,
Millbank,
L O N D O N, S.W.1

b) The Working Party has a Sub-Committee consisting of the following:

Herr Walter GROSS
Bergwerkdirektor und Bergassessor a.D.
Ministerium für Wirtschaft, Verkehr
und Landwirtschaft
S A A R B R U E C K E N

Ir. C.E.P.M. RAEDTS
Directeur Oranje-Nassau Mijnen
H E E R L E N (Limburg)

Herr SANDERS
Leitender Oberbergamtsdirektor
Oberbergamt
D O R T M U N D
Goebenstrasse 25

Dott. Augusto PAROLI
Direttore di Divisione per la Sicurezza
e Igiene nel Lavoro del
Ministero del Lavoro
R O M E

Monsieur Emile VANDENDRIESSCHE
5, rue de Trazegnies
COURCELLES / Belgium

Monsieur Emile SCHMIT
Ingénieur principal pour la sécurité
à l'ARBED
L U X E M B O U R G

Monsieur CHAUVEAU
Fédération Nationale des Syndicats
Chrétiens de Mineurs
88, rue Pernes
ST. PIERRE-lès-AUCHUL (Pas-de-Calais)

c) The Working Party and the Sub-Committee met on the following dates:

1) October 16, 1959;
2) November 23, 1959;
3) January 11, 1960;
4) March 3, 1960;
5) April 27, 1960;
6) June 13, 1960;
7) June 14, 1960.

IV.- WORKING PARTY ON EFFECTS OF WORKING HOURS ON SAFETY, ESPECIALLY IN DIFFICULT OR UNHEALTHY WORKINGS

a) The Working Party is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Government representative

Herr Berghauptmann
Dr. FUNDER,
Oberbergamt
B O N N

Employers' representative

Herr Bergwerksdirektor
Heinrich MIDDENDORF, Bergassessor a.D.
Steinkohlenbergwerke Mathias Stinnes A.G.
E S S E N - W E S T

Workers' representative

Herr Wilhelm BLUME
Industriegewerkschaft Bergbau
B O C H U M
Hattingerstrasse 19

BELGIUM

Government representative

Monsieur van MALDEREN
Ingénieur en Chef
Directeur des Mines à la
Direction Générale des Mines
6-8, rue de la Science
B R U S S E L S

Employers' representative

Monsieur J. SAUCEZ
Attaché au Centre de Formation
Poste Universitaire pour
Ingénieurs de Charbonnages,
14, rue de l'Espinette,
Q U A R E G N O N

Workers' representative

Monsieur Frans BIJNENS
Torenveldstraat 10
B E R I N G E N

FRANCE

Government representative

Monsieur SERVANT
Ingénieur des Mines
Cité Administrative
2, rue de l'Hôpital Militaire
S T R A S B O U R G (Bas-Rhin)

Employers' representative

Monsieur BLACLARD
Chef du Service du Travail
et des Relations sociales
aux Charbonnages de France
9, Avenue Percier
P A R I S VIII

Workers' representative

Monsieur Florent LAMPIN
Fédération Nationale Force-Ouvrière des Mineurs
198, Avenue du Maine
P A R I S XIV

Alternate: Monsieur André AUGARD
Secrétaire Général-Adjoint
de la Fédération Nationale
Force Ouvrière des Mineurs
198, Avenue du Maine,
P A R I S XIV

ITALY

Government representative

Ing. Giovanni BULGARELLI
Capo del Distretto Minerario di Padova
Via Baiamonti, 1
P A D U A

Employers' representative

Prof. Mario CARTA
Istituto Arte Mineraria
Società Carbosarda
C A G L I A R I (Sardinia)

Workers' representative

Signore Giuseppe BACCI
U.I.L.
6, Via Lucullo
R O M E

LUXEMBOURG

No appointment.

NETHERLANDS

Government representatives

Mr. L.G. WANSINK +)
Hoofd van de Directie Mijnwezen,
Ministerie van Economische Zaken
Bezuidenhoutseweg 30
T H E H A G U E

Ir. D.J. KNUTTEL
Hoofdinspecteur der Mijnen
Staatstoezicht op de Mijnen
H E E R L E N

Employers' representative

Ir. F.W. FENNELL
Hoofdingenieur van de Staatsmijnen
in Limburg
p/a Staatsmijn Wilhelmina
T E R W I N S E L E N

Workers' representative

De Heer H.L. GROND
Katholieke Vereniging
van Mijnbeambten
Schelsberg 202
H E E R L E R H E I D E (Limburg)

UNITED KINGDOM

Mr. R. BELL,
National Coal Board,
Hobart House,
Grosvenor Place,
L O N D O N, S.W.1

b) The Working Party has an Editorial Committee made up as follows:

Mr. L.G. WANSINK
Hoofd van de Directie Mijnwezen,
Ministerie van Economische Zaken
Bezuidenhoutseweg 30
T H E H A G U E

Berghauptmann
Dr. FUNDER
Oberbergamt
B O N N

Herrn Bergwerksdirektor
Heinrich MIDDENDORF, Bergassessor a.D.
Steinkohlenbergwerke Mathias Stinnes A.G.
E S S E N - W E S T

+) Sits as representative of the Restricted Committee.

Monsieur Frans BIJNENS
Torenveldstraat 10
B E R I N G E N

Monsieur André AUGARD
Secrétaire Général-adjoint
de la Fédération Nationale
Force Ouvrière des Mineurs
198, Avenue du Maine
P A R I S XIV

Prof. Mario CARTA
Istituto Arte Mineraria
Società Carbosarda
C A G L I A R I (Sardinia)

c) The Working Party and the Editorial Committee met on the following dates:

1) October 27, 1959;
2) January 15, 1960;
3) May 16, 1960;
4) November 11, 1960.

V.- WORKING PARTY ON EFFECTS OF MODES OF PAYMENT ON SAFETY

a) The Working Party is made up as follows:

FEDERAL REPUBLIC OF GERMANY

Government representative

Herr Ministerialdirigent Dr. Ing. HELLER
Ministerium für Wirtschaft und Verkehr
Land Nordrhein-Westfalen
D U E S S E L D O R F

am Karltor 8

Employers' representative

Herr Ministerialrat a.D.
Walter LUESEBRINK
Märkische Steinkohlengewerkschaft
H E E S S E N / Westf.

Workers' representative

Herr Karl POSTHOFER
Industriegewerkschaft Bergbau
B O C H U M

Hattingerstrasse 19

BELGIUM

Government representative

Monsieur TONDEUR
Ingénieur principal divisionnaire des Mines
à la Direction Générale des Mines
6-8, rue de la Science
B R U S S E L S

Employers' representative

Monsieur LELOUP
Ingénieur en chef à la S.A. des
Charbonnages de WERISTER
BEYNE - HEUSAY

Workers' representative

Monsieur Joseph DEDOYARD
Secrétaire Général de la Centrale Syndicale
des Travailleurs des Mines de Belgique
201, rue de Gilly
C H A T E L I N E A U

FRANCE

Government representative

Monsieur DESTIVAL
Ingénieur des Mines
3, rue du Palais de Justice
CHALONS-sur-SAONE

Employers' representative

Monsieur MARSEILLE
Houillères du Bassin de Lorraine
M E R L E B A C H (Moselle)

Workers' representative

Monsieur LAMPIN
Fédération Nationale Force Ouvrière des Mineurs, Miniers et similaires
198,Avenue du Maine
P A R I S XIV

ITALY

Government representatives

Dott. Rosario PURPURA +)
Direttore Generale al Ministero del Lavoro
Via Flavia 6
R O M E

Dott. Raffaele ROSSANO
Ispettore Generale
Direzione Generale delle Miniere
Ministero dell'Industria e del Commercio
R O M E

Employers' representative

Avv. Luigi PUCCI
Dirigente della Società Montecatini
Via Turati no 18
M I L A N

Workers' representative

Sig. Francesco BIAGIOLI
C.I.S.L.
21,Via Po
R O M E

LUXEMBOURG

Government representative

Monsieur François HUBERTY
Ingénieur-Directeur du Travail et des Mines
Inspection du Travail et des Mines
19, Avenue Gaston Diderich
L U X E M B O U R G

Alternate: Monsieur Léon SUTTOR
Conseiller de Légation au Ministère des Affaires Etrangères
L U X E M B O U R G

+) Chairman appointed by the Restricted Committee.

Employers' representative

Monsieur Albert RAUS
Ingénieur en Chef de l'Administration Centrale
de l'ARBED
L U X E M B O U R G

Alternate: Monsieur Marcel WAGNER
Ingénieur adjoint au Chef
du Personnel ARBED
Avenue de la Liberté
L U X E M B O U R G

Workers' representative

Monsieur Nicolas MANNES
Président de la Délégation Ouvrière
près ARBED/Mines
Cité Leesberg
ESCH-sur-ALZETTE

NETHERLANDS

Government representative

Ir. A.H.W. MARTENS
Inspecteur-Generaal der Mijnen
Staatstoezicht op de Mijnen
Dautzenbergstraat, 46
H E E R L E N

Employers' representative

Ir. F.J.C. BIANCHI
Hoofdbedrijfsingenieur van de
Oranje-Nassau Mijnen
H E E R L E N

Workers' representative

De Heer J. PALMEN
Secretaris van de Ned. Katholieke
Mijnwerkersbond
Parellelweg 12
H E E R L E N

UNITED KINGDOM

Mr. R. BELL,
National Coal Board,
Hobart House,
Grosvenor Place,
L O N D O N, S.W.1

b) The Working Party has a Sub-Committee made up as follows:

Herr Dr. Ing. Hans WALTHER
Leiter der Gedingekommission
E S S E N
Lindenallee 21

Monsieur TONDEUR
Ingénieur Principal divisionnaire des Mines
à la Direction Générale des Mines
6-8, rue de la Science
B R U S S E L S

Monsieur MARSEILLE
Houillères du Bassin de Lorraine
M E R L E B A C H / Moselle

Dott. Ing. Giorgio CARTA
Vice Direttore Generale della Carbonifera Sarda
11, Via Napoli
C A R B O N I A (Cagliari)

Monsieur Marcel WAGNER
Ingénieur adjoint au Chef
du Personnel ARBED
Avenue de la Liberté
L U X E M B O U R G

Ir. A.H.W. MARTENS
Inspecteur Generaal der Mijnen
Staatstoezicht op de Mijnen
Dautzenbergstraat 46
H E E R L E N

c) The Working Party met on October 26, 1959.

+

+ +

ANNEX F

RECOMMENDATIONS, DIRECTIVES, OPINIONS AND REPORTS ADOPTED BY THE COMMISSION IN 1958, 1959 AND 1960

A.- Technical Aspects

a) "Electricity"

1) Recommendations regarding replacement of oil by other lubricants in electrical apparatus used below ground (Commission Report 1958, p. 7).

2) Opinion on use of non-flammable materials for the manufacture of electric cables and leads for underground use (Commission Report 1959-60, p. 5).

3) Recommendations for shotfiring leads (Commission Report 1959-60, p. 9).

4) Recommendations regarding protection of underground distribution networks against the danger of causing electric shocks (Commission Report 1959-60, p. 12).

b) "Fires and underground combustion"

1) Recommendations regarding fire prevention arrangements in shafts (Commission Report 1958, p. 11).

2) Directives on fighting fires in shafts by bringing in water (Commission Report 1959-60, p. 26).

3) Recommendations regarding sealing-off of mine fires and underground combustion by dams (Commission Report 1959-60, p. 53).

4) Report (for reference) on the establishment of criteria for fire-resistant hydraulic fluids and for tests of these (Commission Report 1959-60, Annex A).

c) "Mechanization and locomotives"

1) Recommendations regarding equipment of locomotives (Commission Report 1958, p. 20).

2) Recommendations regarding neutralization of diesel-engine exhaust gases (Commission Report 1958, p. 21).

B.- Rescue Arrangements

- Report on tour of Central Rescue Stations in the Community countries and Great Britain (Commission Report 1959-60, p. 62 and Annex B).

C.- Human Factors

- "Medical problems of safety policy"

1) Recommendations and Report on pre-entry, special and routine medical examinations (Commission Report 1959-60, p. 76).

2) Report on colliery medical services in the Community countries and Great Britain (Commission Report 1959-60, Annex C).

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x x

PUBLICATIONS DEPARTMENTS OF THE EUROPEAN COMMUNITIES
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