

VARIOUS SYSTEMS OF MINES RESCUE & RECOVERY IN PAKISTAN

PAKİSTAN'DAKİ OCAK TAHLİSİYE VE TEDAVİ SİSTEMLERİ

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ÖZET

Tahlisiye ve tedavi hizmetleri dünyada A ve B sistemleri olmak üzere iki şekilde uygulanmaktadır. Merkez İstasyon, personel, bakım ve uçaklardaki solunum cihazlarının periyodik kalibrasyonlarını koordine etmektedir. Bu, sistem B' olarak bilinir.

Yazar, kurtarma ekibinin çalışmasını ve istasyondaki ekipmanların bakımını tartışmıştır. Pakistan'da kurtarma istasyonları A ve B sistemine dayalı olarak çalıştırılmaktadır.

ABSTRACT

Rescue & Recovery service is practiced on A & B Systems throughout the world. The Central Station coordinates with skelton staff and maintains and calbrates the breathing equipments periodically at the mines. This is known as 'B' System.

The author has discussed the working of Rescue Brigade and maintenance of essential equipment at the stations. In Pakistan, the Rescue Stations are being operated and maintained, on 'A' System and B System.

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HISTORY:

Mining Industry is many centuries old while Mines Rescue and Safety Service has been introduced during late nineteenth century. Rescue Station was first established in USA in 1910 in U.K, in the year 1902 and Australia in the year 1911. Having found the benefits of this service Mines Rescue and Safety Stations have now been established by all those countries which are actively in the Coal Mining business. Primarily the Mines Rescue and Safety Stations were established to meet emergencies of the Coal Mines. History tells that major accidents in mines always took place in Coal Mines on account of Fires. Gas Explosives and Dust Explosions claiming therein a lot of valuable lives of mine workers. The development of technology helped to manufacture such Mine Safety Equipment which could be used in Ambient mine atmospheres for doing work underground without any stress and fatigue.

STATUTORY PROVISION OF RESCUE STATION:

Finding the utility and benefits of Mines Rescue & Safety Safety Government of Pakistan have also established two such stations one at Sinjidi (Baluchistan) and the other at Khushab (Punjab) with the assistance of International Labour Organization during mid seventies. Additionally sub-stations were added by the respective Provincial Governments in Pakistan without any assistance during late eighties. Establishment of stations in Pakistan has been made under Section 30-A of the Mines Act, 1923. The Section says:-

"Power of (appropriate Government) to require rescue stations to be established. The (appropriate Government) may, by notification in the (Official Gazette) make (rules) under the Section:-

- a) requiring establishment of central rescue for groups of specified mines or for all mines in

a specified area, and prescribing how and by whom such stations shall be established.

- b) Providing for the management of central rescue stations and regulating the constitution powers and functions of and the conduct of business by the authorities (which shall include representatives of the owners and managers of and of the miners employed in the mines or group; of mines concerned) charges with such management;
- c) Prescribing the position, equipment, control, maintenance and functions of central rescue station.
- d) Providing for the levy and collection of a duty of excise [at a rate of not exceeding (three paisas) per ton] on coke and coal produced in and despatched from mines specified under clause (a) in any group or included under clause (a) in any specified area; the utilization of the proceeds thereof for the creation of a central rescue station fund for such group or area and the administration of such funds.
- e) Providing for the formation, training, composition, and duties of rescue brigades; and
- f) Providing generally for the conduct of rescue work in mines.

MINES RESCUE SERVICE:

These two stations are pioneer in this country. Two more such stations have been established, one at Makerwal District Mianwali while the other at Choa Saidan Shah, District Chakwal by the Government of Punjab. Also one Mobile Training Unit at Rawalpindi. Two sub-stations have been established, one at Narwar District Kalat and the other at Duki, District Loralai by the Government of Baluchistan. One station is being established at Khanote by Government of Sind and one Mobile Unit by the Government of NWFP has been established. All the three Rescue Stations in Punjab Province have been connected by wireless besides other mining areas.

Although these stations have been established primarily to deal with coal mine emergencies but the facility and help shall be

available to mine workers engaged in mines other than coal as well.
Common types of accidents encountered are:-

- 1) Fire spread underground;
- 2) Gas Explosion;
- 3) Dust Explosion;
- 4) Inundation;
- 5) Bumping or Rock Burst.

These are the major types of mine accidents claiming valuable lives while other types of accidents may not be dangerous and wide spread as are above. Events of an important accidents are given below for facility of information.

APPING COLLIERY EXPLOSION - Drager BG-174:

At approximately 11.00 p.m. an explosion occurred in K Panel of the mine. The panel was a three heading development in preparation for a further long wall face. The panel was in the process of a new ventilation conversion when a large accumulation of flammable gas occurred. The gas was inadvertently ignited from a source in proximity to the face of B heading on the right hand heading which had advanced some 50 meters further than the other two headings.

The explosive force extended to the adjacent longwall and 600 meters outby its source. The violence of the blast was evident in the disruption to roof supports, machinery, belt structures, blown out overcasts and brick stoppings. Fourteen men engulfed in the path of the explosion lost their lives.

The S.M.R.S. permanent staff attended the first explosion accompanied by the under manager of the colliery. Teams from other collieries were alerted as pertaining to the S.M.R.S. mutual assistance scheme. An F.A.B was established adjacent to the explosion area.

Priorities in the first search was mainly for evidence of existing fires and location of bodies. The presence of fires,

disruption to ventilation and the natural emission of gas presents a secondary explosion hazard in situations of this nature. It was fortunate no fires existed of any consequence.

Ensuing rescue team excursions recovered the bodies, restored temporary ventilation and recorded evidence of the destruction of K Panel.

COMMENTS :

It is worth recording that a group of men working in an adjacent longwall panel, felt the fringe of the blast, was engulfed in smoke, dust and fumes. These men were donned their CO filter self rescuers and effected their escape to fresh air and safety.

SYSTEM OF RESCUE & RECOVERY:

There are two systems known as A & B Systems. A system is one where the mines are concentrated and closely situated from each other. A Central Mines Rescue & Safety Station is established to serve the mines around this station. A full time brigade is maintained at the station. As soon as an incident takes place at any mine, the Central Mines Rescue Station is informed either through telephone or through wireless system. On receipt of information at the station a siren is sounded and the Rescue Van equipped with necessary Rescue and Safety Equipment moves alongwith the trained brigade within five minutes of the receipt of the information. The Check List should be as under:-

- 1) 6 Breathing Apparatus;
- 2) 6 Self Rescuers;
- 3) Colliery Maps (if available);
- 4) Stretcher;
- 5) First Aid Equipment;
- 6) Fire Extinguishers;
- 7) Spare Cartridges of Breathing Apparatus;
- 8) Field Laboratory Equipment;
- 9) Ropes;
- 10) Telephone Cable for underground use and telephone set.

The Rescue Team reaches the mine of the accident within 30 minutes and while on way examines the underground map. The team moves into the mine underground to rescue the men after receiving 5 minutes briefing from the Mine Manager who acts as controller of the incident. As a supporting facility teams from other stations and mines are called to the site of incidence. In this system the mine managements totally depend upon the help of the Central Mines Rescue and Safety Station.

The other system is known as 'B' System. Although there is a Central Mines Rescue & Safety Station but no permanent Rescue brigade is maintained. Instead small Rescue Stations are maintained by the individual mining companies at their mines. Mine Workers are trained in Rescue work throughout the year and on call those men are drawn from the mine and put to Rescue Work as and when required. Assistance is secured from nearby mining companies. Such Rescue Station under Scheme 'B' simply helps in imparting training to the mine workers in the Rescue and Recovery discipline and periodically check their Rescue equipment and callibrate them according to the standards. Normally big mines and situated wide apart are advised to practice 'B' System.

In Pakistan, the service being novel and new, it has been allowed to work on the combination of both A&B Systems means 'C' system. Here the Central Station has been established where a whole time brigades are available. The stations train mine workers of different mines in the discipline of Rescue and Recovery while the mining firms shall equip themselves with Rescue & Recovery equipment thereby becoming independent and self-supporting. The stations are rendering the following services :-

- 1) Meet emergencies on call;
- 2) Hold training courses regularly and refresher courses periodically;
- 3) Test and callibrate safety equipments of its own and other mines;
- 4) Conduct Tests of Trainees and award Certificate to the competent trainees.

DOUES OF RESCUE BRIGADES:

A rescue Brigade comprises of 5 Crewmen fully trained to use the self contained Breathing Apparatus. One of the Crewmen acts as a leader. Before proceeding to the site of the incident the leader shall check individual Crewman equipped with the Apparatus. He shall especially check the relief valve and the bye-pass. The last man shall check the Apparatus of the leader in turn. Then on signal, such as horn or bell from the leader, the Crew shall keep on checking the gas concentration while the other shall check the roof and sides. Two men shall carry the stretcher with a spare Breathing Apparatus thereon while the fifth man carries the telephone cable and keep the same spreading. On signal from the leader, the team shall make short breaks and perform the duties assigned to individuals. On signal they shall proceed further to the point of incident. The leader shall keep marking the route with the help of chalk etc; and also keep studying the underground map and record his findings on the map.

On reaching the site of incident the leader shall ensure its safety and meanwhile the relevant data of gas concentration, roof support shall be collected and recorded. The condition of the victims shall be examined. The one alive shall be worn the Breathing Apparatus to restore normal breathing and transported alongwith the team to the Control Station/Fresh Air Base Station. In case there are more than one victim the same shall be transported one by one.

CONTROL OF OPERATIONS:

Emergency Operations shall be required to be carried out under the Controller of the Operations no matter on what system the stations are working. Following arrangements are recommended to be made on hearing of an incident:-

Incident Control H.Q - to direct the operations of all surface workmen and organize the supply of equipment.

Underground Control - to direct the operations of all underground workmen and organize the supply of equipment.

Inbye Control - to direct the operations of rescue and other workers at the farthest point inbye.

Rescue Control - to supervise the work of rescue teams.

Normally the Manager is recommended to be the incharge of incident Control H.Q. An Incident Committee comprising of Mine Officials and Rescue Station is constituted to advise on point to point basis.

**BRIEF HISTORY OF BREATHING APPARATUS
(With Particular Relations to the NSW Mines Rescue Stations).**

The first practicable self contained breathing apparatus «as developed by an English Marine Engineer. Henry Fleuss in the late 1870s.

Fleuss patented his invention in 1879 and commercial manufacture was commenced by Messers Siebe Gorman and Co; the same year. Siebe Gorman were at the time engaged in the manufacture of submarine diving suits and equipment.

The breathing apparatus was tested under practical conditions when worn by the inventor and others in afterdamp to explore Seaham Colliery (UK) following the 1880 explosion when 164 lives were lost and again in irrespirable atmosphere at Killingworth Colliery (UK) in 1882 following another explosion.

Fleuss also wore the apparatus under-water in the Severn Tunnel flooding in 1882. In 1897 two sets of Fleuss apparatus were imported into N.S.W. by the Mines Department for instructional purposes following the loss of life among members of the rescue parties at Stockton Colliery the previous year.

These sets were available (but apparently not actually used) during the rescue and fire fighting following the Dudley Colliery explosion in 1898.

In England, the first Mines Rescue Station was set up at Tankersley Yorkshire by the local Coal Owners Association in 1902.

By 1907 the original Fleuss apparatus had been improved by the inventor in conjunction with Dr. Hill and Mr. R. Davis of Siebe Gorman, the outcome was known as the fleuss Davis Apparatus and marketed by Siebe Gorman under the trade name "Porto".

Establishment of Rescue Stations and the training of men was made obligatory in the U.K. in 1913 under the terms of the Mines Rescue Regulations.

In Australia, the Ipswich Ambulance Station established as an adjunct a team of trained mines rescue volunteers using "Porto" apparatus this was the genius of the Queensland Mines Rescue Brigade and was established in 1911.

About this time the N.S.W. Mines Department also imported two sets of "Meco" Breathing Apparatus" for evaluation and instruction purposes. These were on hand during the exploration at the Killingworth Colliery (NSW).

Following the fire and subsequent explosion at Standard Merthyr Colliery in 1905 there was some local pressure to set up a Mines Rescue Organization in the South Maitland Coalfield where the coal was liable to spontaneous ignition.

The strongest recommendation came from T.W. Edgeworth David in his report on the field and by 1912 the proposal has been developed to set up two stations, one at Wallsend and one at Kurri, land was set aside, a committee of managers established and the Deputy Chief Inspector of Coal Mines travelled to the U.K. to inspect and report on Rescue Stations and "apparatus.

Before any further action could be taken. World War I intervened and the matter was shelved.

During this war, however, the Allied armies made considerable use of "Porto" breathing apparatus and in fact the British Army set up a large scale Mines Rescue Organisation to service the tunnelling operations on the Western Front.

As many of the mining men from N.S.W. who enlisted served in the Tunnelling Company, a considerable number of trained men returned to Australia after the Armistice.

The fire and explosion at Bellbird Colliery, 1923, was followed by further activity from the proponents of a Rescue Station and the Corner's Jury added a rider to their verdict calling for the

establishment of Mines Rescue Stations in N.S.W.

Before the necessary legislation could be introduced the Bellbird Colliery recovery work was commenced using breathing apparatus under the Colliery Manager Mr. Mathieson. The teams were trained by an ex-serviceman himself trained in Trance.

Apparatus for the work was purchased new as well as borrowed from the Mines Department and metal mining companies.

In years between 1910 and 1920 the metalliferous mines at Broken Hill and Cobar and breathing apparatus ("Proto") and their trained teams fought several major fires.

Drager Apparatus from Germany was available from the Melbourne agents and was used by some Victorian gold mines. Drager apparatus was also taken to Tasmania and used in the Mount Lyell Copper mine fire in 1912 with the saving of many lives.

The recovery of Bellbird Colliery lasted some nine months and was done without any untoward incident, the team engaged there also attended the explosion at Tothbury Colliery (where one man was rescued alive) and the inundation at Lilly Rose Colliery, Wallsend.

With the promulgation of the Mines Rescue Act in 1925, the four district Committees were elected, and was selected and Superintendents appointed. Presently the Bellbird recovery team and their equipment was made available to cover the Newcastle and Cessnock Coalfields, until other men were trained.

The Abermain and Newcastle Rescue Stations were opened at about the same time, the other two following soon after in 1926.

Proto apparatus was used at all four stations being first supplanted by Drager sets at Bellambi in 1962.

In 1963 Aerolox sets replaced the Proto sets at Newcastle, they in turn were supplanted by Drager LOX 120 sets in 1973.

South Maitland Station changed from Proto to Drager BG-174 in 1963 and Lithgow in 1970.

A sub station was constructed at Doyalson attached to the Newcastle Station in 1970 and a similar sub-station at Liddel attached to Ambermain Station was opened about 1968. Gunnedah Sub Station served by Newcastle Station following in 1976.

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1. ZERO THE TESTER. THEN CONNECT BREATHING TUBES TO THE TESTER.
2. POSITIVE LEAK TEST: INSERT PLUG INTO VENT PORT. SET TESTER FOR POSITIVE PRESSURE, PUMP BAG FULL TO 80 TO 100 MM H₂O SET KNOB TO LEAK TEST, DROP TO 70 SET TIMER (SHOULD NOT DROP MORE THAN 10M H₂O IN ONE MINUTE).
3. RELIEF VALVE TEST: REMOVE PLUG FROM PORT. (SET FOR POSITIVE PRESSURE, PUMP SLOWLY EVENLY TILL RELIEF VALVE VENTS THROUGH THE PORT BETWEEN 14 - 40MM H₂O).
4. NEGATIVE LEAK TEST: SET TESTER FOR NEGATIVE PRESSURE, PUMP DOWN TO 80 TO 100MM H₂O, SET KNOB FOR LEAK TEST, DROP PRESSURE TO 70MM H₂O SHOULD NOT DROP MORE THAN 10MM H₂O IN ONE MINUTE).
5. OPEN MAIN BOTTLE VALVE:
6. PREFLUSH TEST: OBSERVE PREFLUSH ACTION, BREATHING BAG SHOULD FILL.
7. DOSAGE TEST: SEAL VENT PORT WITH PLUG, SET TESTER FOR POSITIVE PRESSURE, PUMP BAG FULL, TURN TO DOSAGE TEST, NEEDLE SHOULD COME TO REST AT 1.5 LPM BETWETN 1.4 AND 1.7 LPM.
8. DEMAND VALVE TEST: REMOVE PLUG FROM PORT, SET FOR NEGATIVE PRESSURE, PUMP BAG EMPTY TILL HISS CAN BE HEARD, (DEMAND VALVE OPENING), SHOULD BE BETWEEN 15 TO 40 MM H₂O.
9. BYPASS VALVE TEST: DEPRESS BYPASS VALVE AND OBSERVE BREATHING BAG FILLING.
10. NATIONAL DRAGER ONLY: WHISTLE SHOULD SOUND AT ABOUT 5760 PSI OR AT 20-25% OF THE BOTTLE PRESSURE (BOTH WHEN MAIN VALVE IS OPENED, AND WHEN THE VALVE IS CLOSED AND THE PRESSURE DROPS DOWN).