

Mines Rescue Services specialised equipment

Introduction

At the four Rescue Stations, an assortment of specialised equipment is housed to assist the mines and rescue teams during incidents and fires.

Carletonville Rescue Station

This station is responsible the training of rescue team members from primarily gold and platinum mines in the Gauteng, Rustenburg and Limpopo regions. Carletonville rescue station is situated approximately 75 km west of Johannesburg. This station also accommodates Mines Rescue Services Head Office at the same location.



Evander Rescue Station

This rescue station is situated in the heart of the coal fields and is ideally suited to respond to the coal mines in the Mpumalanga and Kwa-Zulu Natal region. Most of the mines serviced by this station are coal mines with a few other disciplines as members as well.



Steelpoort Rescue Station

Situated in the Limpopo province this station is responsible for the rescue and training in the northern sections of Limpopo province, catering for platinum, chrome, and other disciplines. An assortment of specialised rescue equipment is also housed at the station in the case of a fire or incident.



Welkom Rescue Station

Welkom rescue station is situated in the town and renders a service to the gold mines of that area as well as to Klerksdorp and Northern Cape regions. This means that there are other disciplines also involved in the Welkom field but is primarily gold.



MRS also manages unique emergency equipment for special circumstances which are housed at strategic locations around South Africa. Below is a breakdown of the specialised equipment available to member mines, with a short description of what it is used for, and some photos for better understanding.

Mines Rescue Service Fleet



All Rescue Stations – Fire cars and trailers

These trailers have an assortment of items necessary for the rescue team's members during a fire or incident, the replenishment of consumables used and for additional commodities normally required at such incidents.



Dräger BG 4 Breathing apparatus

The breathing apparatus is the most vital piece of specialised equipment issued to the rescue team members, without it no fires and other incidents can be successfully dealt with on the mines. It is a positive pressure breathing apparatus giving the rescue team member 4 hours duration in any hazardous or irrespirable environment where gases are present. Each team member has been assigned his own set which he is responsible for and ensures that it is ready at all time for fires and emergencies.



Long Duration Self-Contained Self-Rescuers

All the rescue teams are trained in the use and maintenance of the long duration self-contained self-rescuers used to transport victims of a fire through hostile environments, and to rescue persons trapped in refuge chambers behind the fire. These units will supply oxygen for a period of 1 hour at a breathing rate of 35 litres per minute.



Body cooling garments and Nomex Protective Clothing

Often in the underground situation the rescue teams must work and operate in a situation where the environmental conditions are adverse, with high temperatures and humidity. MRS uses a Heat Stress Index chart (HIS) to determine the amount of time a person can spend in these types of environmental conditions and sets time limits for exposure. In these circumstances MRS supplies body cooling garments to assist and protect the teams when working in these conditions.

Similarly, MRS has a supply of Nomex fire protective clothing should rescue teams be required to enter flammable gas atmospheres.



Radios - Sub strata radios

During a fire or incident, it is imperative to have good communications with the rescue teams and therefore need to have some form of radio communication to and from the affected area. Almost always post disaster, the normal communication system structure on the mine has collapsed and a need for an additional post disaster communication system exists. MRS supplies the sub strata radio system in the event of these circumstances.

Surface Console / Base Radio and Portable Radio



Radios – Gene Phones

MRS also has additional radio systems which can be used if necessary and teams are required to have a set of Gene Phones if they do not have a set of strata control radios to deploy immediately post disaster.

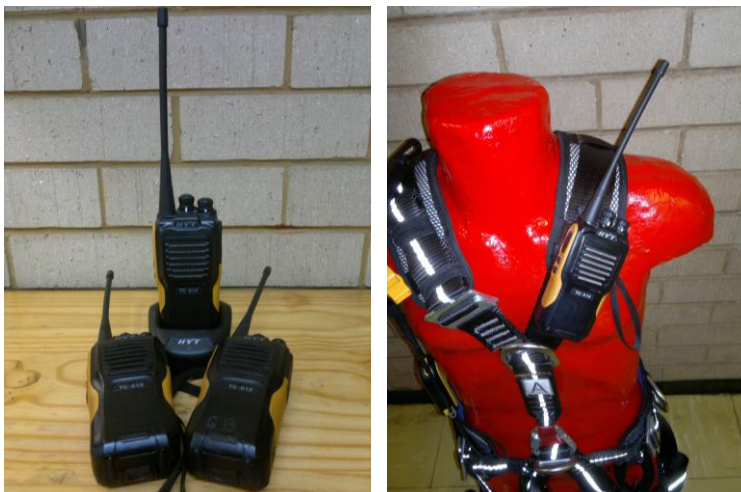
Limitations: only has communication when connected to the life line



Radios – Two Way Radios

During ore pass and shaft incidents a set of two-way radios can be used for communications between the incident commander and the rescuer. The rescue teams that have been trained in rope rescue will have a set of these radios in their kit for this purpose.

Limitations: requires line of sight



Gas detection instruments and detector tubes

Each rescue team has been trained to use hand held gas instruments for the measuring of gases especially during fires. At these incidents, it is imperative to have an adequate supply of gas detector tubes of the typical gases found in an underground fire. MRS maintains a supply of the necessary ranges of tubes used as well as access to other tubes to measure uncommon or rare gases sometimes found in these circumstances.



Water harnessing equipment

Water harnessing equipment necessary for combating and extinguishing fires are kept at all the rescue stations.

Turbex Foam Generator



Manifold and Twister Spray Nozzle



Seek and find kits

This is a special kit made-up of the items necessary when looking for possible fire in an underground environment.



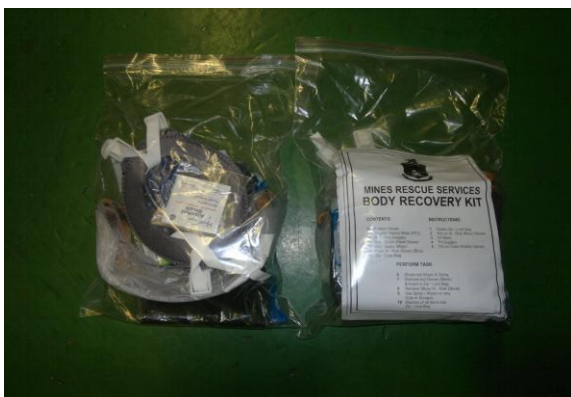
Fogtech

This piece of water harnessing equipment can create a fine mist or fog for cooling down and extinguishing fuel and vehicle fires. It has its own water reservoir of 500lt but can also be externally fed. The motor powers the hydraulic pump which generates the fine spray needed to assist the firefighting process.



Body recovery kits

On occasion, it is necessary to recover the bodies of persons that have succumbed to a fire or incident. In that case we carry a supply of the necessary protective equipment and body shields, as well as body bags to retrieve the deceased.



Sealing products (Vent Seal and V-Sheeting)

In the event of a fire or similar incident it is always necessary to use sealing products to reduce, divert or in most cases stop and starve an area of ventilation which is done by means of these products. At each of the stations these sealing products are held with access to additional items and products when necessary.



Lifting & cutting equipment

During fall of ground incidents or where people are caught behind major structures the lifting and cutting equipment is deployed to assist with the rescue and recovery activities. The lifting equipment is powered by compressed air where the cutting equipment is hydraulically driven, and these items are either used to lift heavy rocks and structures and to cut through steel pipes etc. to free the victims.

Pneumatic Regulator / Hoses & Lifting Bags



Hydraulic Pump / Spreader & Cutters



Thermal imaging camera

The thermal imaging camera is used in situations of extreme poor visibility. The camera is designed to pick up heat signatures through especially smoke to give the user visual identification of the objects in his way.



Metalliferous Mobile Rescue Winder

Housed at the Carletonville station is the 3100m mobile winder which is specifically designed to assist where mines have had a major incident with the winding plant or in the shaft, and people trapped underground. It has been developed to be adaptable to any surface vertical shaft, has its own power source and safety and back-up systems. It can raise or lower 6 persons to a depth of 3000m at speed of $\pm 1\text{m/s}$.

The main function of this winder is to be able to reach the workers underground or trapped in a shaft, to supply them with food and equipment, remove the injured and to ensure that they are not “trapped” underground.



1200m Emergency Lifting Machine (ELM)

The 1200m ELM is housed at the Carletonville station which can be used for various vertical surface applications. It has the capability to raise and lower two people at a time to the full distance at a speed of 0.75m/s . It also has its own gantry with a capacity of carrying a maximum of 500kg load from the sheave wheel, and can be adapted for many other situations. This ELM has also been modified to fit into a conveyance, or be slung down a shaft to apply the same attributes on a sub-level or bank. The ELM has been used successfully to save the lives of many mine workers as well as illegal miners.

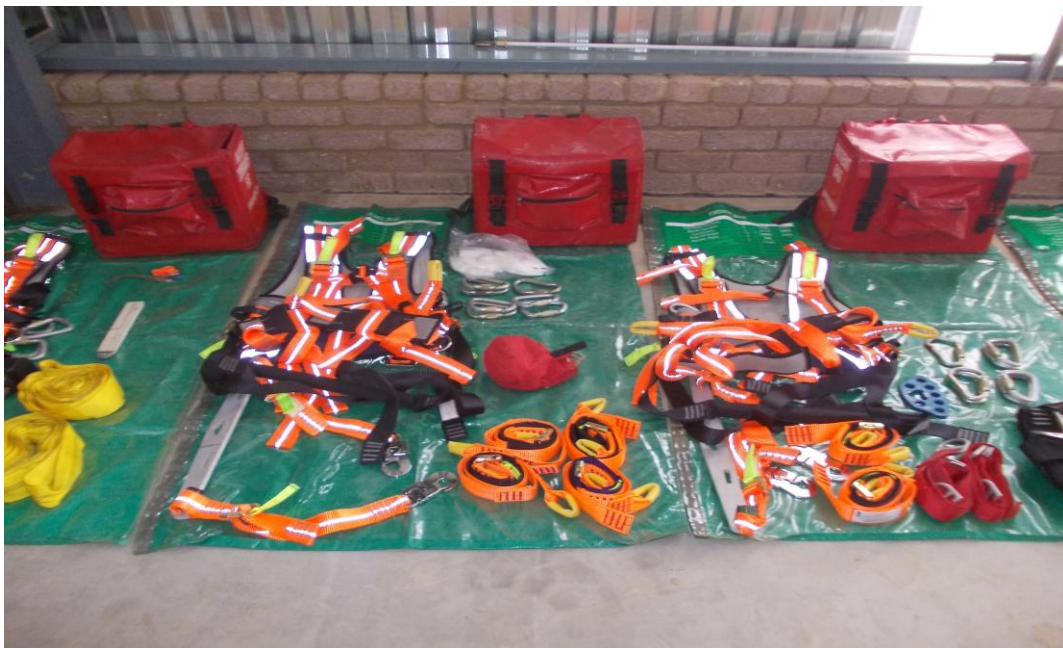


Gantry (A-Frame)



Rope Rescue Equipment

MRS trains current rescue team members with the skills to be able to use rope rescue equipment and techniques to rescue and recover persons trapped in ore-passes, shafts and at heights. MRS make use of the Griptech device which can raise and lower 2 persons to a depth of 100 meters.



500 Meter SkyJack

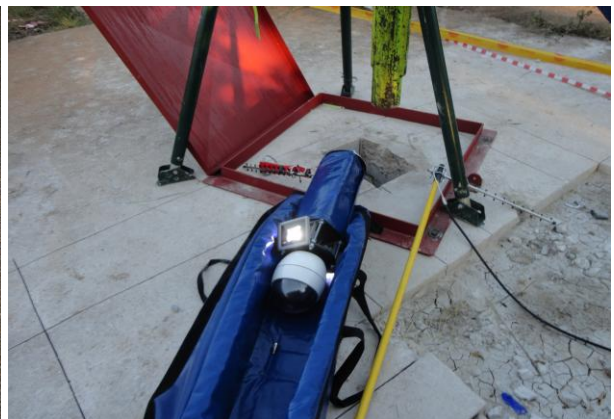
At each of the stations a motorised skyjack is kept for rescue purposes which is powered from a 220v supply operated from a console to raise and lower persons on a 9 mm steel wire cable to various depths up to 500 meters.

SkyJack with 9mm Steel Rope Reel



Cyclops F.I.R.E. Camera (Fully Integrated Remote Eye)

These cameras have been developed for use in shafts, raise bore holes and any vertical excavation. They can relay real time images back to a convenient viewing point via radio frequencies of the structure, condition and integrity of the shaft or vertical excavation. The footage is recordable and can be used for assessing the damage in a shaft or to decide on the rescue strategy in the event of an accident, incident. It can also be utilised as an additional medium to view the progress or activities whilst operating in the shaft or vertical operation.



Ore Pass Camera (Rover)

After the unfortunate loss of two rescue team members due to the conditions in an ore pass, a need arose to develop a means to evaluate the conditions in the ore pass and to identify if the person who has fallen down the ore pass is still alive or deceased. This is imperative to decide on the necessary actions and strategy to be taken as well as to decide on whether to perform a rescue or go into a recovery mode.



Trapped Person Location Device (TPLD) and CCTV cameras

The trapped persons locating device is an extremely sensitive listening device which picks up acoustic and seismic sounds made by people trapped from falls of grounds and structures. It can also be used to narrow the field of search and direct the rescuers to the trapped person or persons, provided they are still alive.



Assortment of other Equipment

An assortment of Hilti equipment is kept with a drill for large diameter holes, a rock breaker for medium size rocks as well a multipurpose circular saw to cut through small diameter steel and concrete sections.

Power Drill, AVR Breaker and Circular Saw



Colliery Rescue Drill Unit (RDU)

The Rescue Drill Unit comprises the Schramm T685 WS Probe Hole Drill Unit and the Schramm T130 Rescue Hole Drill Unit and several trailers that contain ancillary equipment such as compressors, drill rods and a mobile workshop. The T685 can drill a 165mm hole to a depth of 450m and the T130 can drill a 635mm hole to a depth of 300 meters. In a typical rescue situation, the T685 Drill will locate trapped personnel (if communication cannot be established with them via existing means) whilst the T130 drill will drill the main rescue hole through which the rescue capsule will be lowered to extricate trapped persons. The T685 drill will also be deployed where there is a major coal mine fire to drill probe holes into the affected area. This will be done to establish points from which Nitrogen can be pumped into the fire area and for monitoring purposes.

Schramm T685 WS Probe Hole Drill Unit



Schramm T130 Rescue Hole Drill Unit



Collieries Inertisation System (CIS)

The Colliery Inertisation System (CIS) is a system to produce inert gas (Nitrogen) used to extinguish underground coal mine fires. The system comprises two 18m mobile trailers that house a compressor unit and a Nitrogen generating plant (Floxa) together with a mobile 1500KVA diesel generator.

The operating principles of the system are as follows:

- During an underground fire, a means must be established to pump the inert gas to the fire area.
- In the absence of suitable piping or existing boreholes, new boreholes will be drilled from surface into the fire area using the Rescue Drill Unit or other drill contractor.
- While this occurs, the fire area must be sealed off and the total fire area volume should be kept to a minimum.
- The CIS unit will be transported to the intake area of the piping or at close proximity.
- The unit will be coupled and powered up with its own generator set or connected to a suitable power source provided by the mine.
- Piping will be laid from the unit to the intake piping underground.
- The unit will then continue to pump nitrogen into the fire area.

The technical data of the CIS unit is as follows:

- Floxal unit trailer:

18m including prime mover with a total weight of 42 tons

- Compressor unit trailer:

18m including prime mover with a total weight of 42 tons

- Generator trailer:

6 m container trailer

- Nitrogen flow rate at 1800 m³ per hour
- Purity 97% Nitrogen
- Pressure 9 Bar
- Generator rating 1500kVA, 50Hz, 400VAC
- Diesel consumption of generator at 75% load – 212lt per hour
- Diesel capacity on unit and 1200 litres (6 hours)
- Total piping length of 180 metres available with the unit. (In principle, the unit can deliver N2 gas up to 92 km from the CIS through 150mm piping.)
- Piping type 100mm PVC with clamp-on type coupling

Collieries Inertisation System

Floxal Unit and Compressors

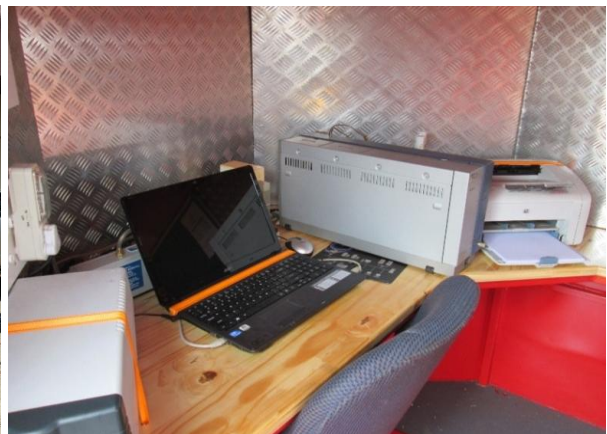


Generator and Diesel Bowser



Agilent 490 Gas Chromatographs

For analysing and interpreting gases from a fire primarily in the coal mines two Agilent 490 GC's are housed at Evander for this purpose. Both analysers are totally transportable and can be deployed to the sight or incident for real time up to date and accurate results. The GC's are also dedicated to the Collieries Inertisation System for monitoring the purity and progress of Nitrogen injection into a sealed off area to combat a fire or to reduce the risk of explosions and fires. The GC's are specially calibrated to accurately measure the gases commonly found during any fires to an accuracy of 1ppm.



Mobile Supply Winder

This unit is used for the supply of food and other items to trapped persons through the 165 mm hole drilled by the Probe hole Drill.



Borehole Camera

This unit is equipped with a 500 meter umbilical cord and is used to locate trapped workers by lowering the camera through the 165 mm probe hole.



Colliery Mobile Rescue Winder

A mobile rescue winder is available to the mines for the rescue of people trapped in shallow mines, behind a fall of ground or similar. This winder works in conjunction with a rescue capsule to rescue persons out of a rescue hole drilled from surface by the rescue drill unit housed at CTC in Witbank. Rescues can be done to a depth of 400 meters.





Mantella seals and trailer for the sealing of large excavations.

In the event of a fire in a coal mine it is of utmost importance to seal off the affected area as quickly and as efficiently as possible. It is also necessary to make the affected area as small as possible, and for these reasons. Mines Rescue team members at the Evander station are trained to install these seals where it is necessary to do so in irrespirable atmospheric conditions. In areas where it is safe for seals to be built Mantella also carries a large stock of these walls and a work force that can be used to install these seals in an emergency. Mines Rescue has a specially designed trailer which contains all the equipment necessary to erect 6 of these mantel seals at any given time.





Anti-static equipment

Special clothing, equipment and fire-retardant ware is available for the rescue team members when working in conditions where a static spark can cause an explosion.



General

All the above equipment is available to the South African Mines for Mines Rescue Service to fulfil their duty to save, reduce and minimise the loss of life and assets during fires and incidents.