

CENTRAL COLLIERY - REFUGE CHAMBER

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INTRODUCTION

Central Colliery was the first underground coal mine in Queensland to install underground explosion proof refuge chambers.

The initial concept of refuge chambers was investigated because of the intention to seal the bleeder roadways. This resulted in the necessity to provide an alternative system of ventilation for a single entry heading (eg. behind the retreating longwall face), together with the requirement for personnel to work in a single entry heading.

LOCATION

Two refuge chambers have been constructed at Central Colliery. One chamber was developed as an extension to 22 c/t in 306 T/G. The second chamber was formed as an extension to the 206 T/G. The location of the chambers are shown in Figure 1.

REFUGE CHAMBER

To ensure all possibilities regarding the design, construction and methods of evacuation from the mine were considered, a risk assessment of people working in a single entry heading was performed. This was facilitated by an independent body and included representation from a cross-section of the workforce.

The risk assessment identified the most appropriate solutions, in terms of the design and construction of the refuge chambers, together with the provision of a second means of egress from the refuge chamber. The chambers have been designed as an explosion proof stand alone shelter, capable of supporting 10 people for an indefinite period of time. The risk assessment process considered various scenarios to determine the maximum number of persons likely to work in a single entry heading at any one time.

CONSTRUCTION OF REFUGE CHAMBERS

Both the 306 and 206 refuge chambers are located in dead end stubs. The layout of the refuge chambers is shown in Figure 2.

Explosion Proof Walls

The explosion proof stoppings are constructed from 0.75m thick shotcrete walls, constructed using mesh blocks. These walls were installed by contractors and have been designed to withstand a pressure wave of 345Kpa.

The wall is 'keyed' into the roof, floor and ribs. Both refuge chambers are surrounded on three sides by coal.

Roof and Rib Support

In both refuge chambers the ribs have been either meshed and bolted, or bolted and shotcreted. This was dependant upon the condition of the ribs.

The roof of both chambers and areas directly outside the chambers have been meshed and bolted.

Chamber Access

Access to the chamber is via the explosion proof door, the tube passing through the shotcrete wall and an air lock.

Each door has two handles, and provide both a means of opening/closing the door, as well as locking.

On the inside of each refuge chamber access door is an air lock of approximate dimensions 3.5 * 2 metres. The air lock is constructed using Hollywell stoppings. These are designed to provide a buffer between the mine atmosphere and the chamber atmosphere

Ventilation

Fresh air is provided from a surface compressor. Air produced from the system meets Australian Standards for breathable quality air. A regulator on the compressed air line continually 'dumps' air into the chamber. A lightweight non-return valve and butterfly valve is used to provide a pressure relief system for the chamber.

Service Holes

Each explosion proof seal is fitted with 2 service holes (100mm diameter), above the non-access door. One hole is fitted with a non return valve and butterfly valve whilst the other hole is covered by a 100mm blank, through which communication lines pass to the mine. This hole has been back filled with grout.

Services Borehole

To maintain the refuge chambers stand alone capability, each chamber has a 300mm service borehole from the surface. Each borehole is lined with a 200mm casing. The casing was packed and fully grouted from the surface.

DESIGN AND CONSTRUCTION OF THE BLEEDER RAISE SHAFTS

Both shafts are 2.1m in diameter, and are directly adjacent to the refuge chamber. The shafts were sunk by drilling a pilot hole and raise bored, with the 306 shaft being 265m deep, and the 206 shaft 230m deep.

The lip of the base of both shafts has been cable bolted and shotcreted. Underground cage guides have been bolted to the lip of the shaft.

SURFACE FACILITIES AT SHAFTS

The fans installed at the top of each shaft have been designed to run between 0 and 50m³/s, but will nominally run at 15m³/s.

An emergency winder is available to be installed at the top of either shaft, and is capable of elevating a cage carrying three men. Cage guides have been installed at the top of each shaft.

Each surface plant consists of an air compressor / receiver system, a water separator, general particle filter and an activated charcoal high efficiency filter.

EQUIPMENT AND SERVICES

First Aid Equipment

A first aid kit and first aid drum are located on the shelves beside the airlock. Both have the standard first aid supplies as used at Central Colliery.

Breathing Apparatus

Eleven MSA positive pressure full face masks are provided in the chamber, one of which is kept as a spare mask in the supply box. Each mask is connected to a demand valve and breathing tube. Face masks are located around the chamber at roughly equal spacings. The masks are connected via 8 or 15 metre hoses to a 6mm stainless steel pipe network that is attached to bolts along the ribs. The MSA full face masks are intended as a short term source of fresh air and as such must be used whilst the refuge chamber atmosphere is irrespirable.

While the masks are being utilised, the chamber atmosphere is ventilated by a regulator. To complete the circuit, the butterfly valve on the service hole should be left open while the masks are in use. This allows air to pass from the chamber, through the non return valve and to outside the chamber.

Continual monitoring of the chamber atmosphere from the surface will allow those on the surface to determine when an acceptable chamber atmosphere is achieved. At this time, personnel in the chamber will be notified that masks can be removed.

In addition to this, 10 EBA's are supplied in each chamber.

Tool Board

A tool board has been provided within the chamber. This board holds all of the tools that were required to install, and are required to maintain, the components within the chamber.

Supply Box

Within the chamber, is a large metal supply box. This box contains all items necessary to sustain life (eg. food, fold up beds, blankets, spare breathing apparatus etc.).

Water Pump

Water may accumulate along the shotcrete explosion proof wall. A hand pump has been provided for the removal of water from the chamber.

Water should be expelled from the chamber via the attached half inch hose, which can be passed through the butterfly valve on the service hole.

Toilet Facilities

A standard chemical toilet has been provided in each chamber air lock. Toilet rolls can be found in the supply box.

Food

The chamber is stocked with some food. This is located in the supply box. Provision is made for the supply of additional food to the chamber via a pipe in the services borehole.

It is important that during an emergency procedure the food within the refuge chamber is conserved. This will ensure sufficient food in the chamber should the supply line from the surface become blocked.

Water

There is no stored supply of water in the chamber. Water is supplied via a pipeline in the services borehole. The pipeline is attached to a half inch water hose, the end of which is fitted with a standard water valve.

Additional half inch water hose is available to supply water to anywhere in the refuge chamber. The water from the pipeline is suitable for human consumption.

Borehole Services

The borehole within the chamber provides the following services:

- Fresh water
- Food
- Air
- Communication
- Atmosphere monitoring
- Electricity

There are two lights located within the chamber. These lights are operated from the surface and will be turned on once surface personnel are notified of the emergency, and the flammable gas content has been determined to be less than 1.25%.

The water line from the borehole provides potable water. Air is supplied to the chamber from the surface through a 63mm poly pipe, in the service borehole.

REFUGE CHAMBER ACCESS ROUTE

Figure 1 shows the access routes for both the 206 and 306 refuge chambers. The access route is marked with reflective signs at all turning points. This is the same for both 206 and 306 maingate travel roads.

The refuge chamber access door is marked with red and white reflective tape, combined with green and white lock / unlock stickers.

Future improvements to the system include highlighting the route to the refuge chambers with a life line system.

PROCEDURES FOR USE OF REFUGE CHAMBER

The refuge chambers form part of an emergency evacuation strategy. In the event of an emergency in which evacuation from the working area (ie. single entry heading) is not possible via the primary means of egress, the refuge chambers are

to be used in place of the second means of egress. From here arrangements would be made to evacuate personnel. Depending upon the circumstances this may be via the primary means of egress or via a cage, through the bleeder raise shafts.

Procedures have been developed for the use of the refuge chambers and include the following :

- Refuge chamber entry procedure
- Approaching and entering the chamber
- Initial procedure inside the chamber
- Procedure for use of face masks
- Short term procedure (with face masks)
- Long term procedure (without face masks)
- Use of air lock
- Communication :
 - › Standard communication procedure
 - › Procedure in the event of voice communication failure
- Evacuation of refuge chamber
 - › primary means of egress
 - › secondary means of egress (ie. bleeder raise shafts)
- Shaft evacuation procedure

Copies of these procedures are maintained within the refuge chambers and at various locations at the mine.

SERVICING SCHEDULE AND TESTING

Regular maintenance of components ensures correct functioning of equipment if required.

Maintenance and testing of face masks is carried out according to manufacturer's guidelines. In addition a monthly inspection will be carried out to guard against the ingress of dirt and dust.

To ensure the maintenance of the chambers in suitable working order, inspections of the chambers by deputies is carried out weekly. During these inspections the deputies inspect the condition of the chambers, equipment and services provided therein.

Servicing of the surface plant will be carried out according to the manufacturers maintenance schedule. An additional visual check of the air filter indicator and oil level is carried out every 100 hours.

TRAINING OF MINE PERSONNEL

TRAINING

Training for the Central Colliery Refuge chamber consists of 3 learning outcomes.

LEARNING OUTCOME 1

At the completion of this module the learner's are able to locate the refuge chambers and also locate and interpret information relevant to the design, construction, contents and the use of the refuge chamber.

LEARNING OUTCOME 2

At the completion of this outcome the learner's are able to identify the routes to the chambers and the various procedures to be followed.

LEARNING OUTCOME 3

At the completion of this outcome the learner's are able to competently enter the refuge chamber and effectively use the equipment located in the refuge chamber.

The learner is also able to locate the surface installations of 206 and 306 raise bores.

Learning outcomes 1 and 2 were theory based instruction, with learning outcome 3 being the practical component of actually inspecting the refuge chamber and its contents. This also included an inspection of the surface facilities.

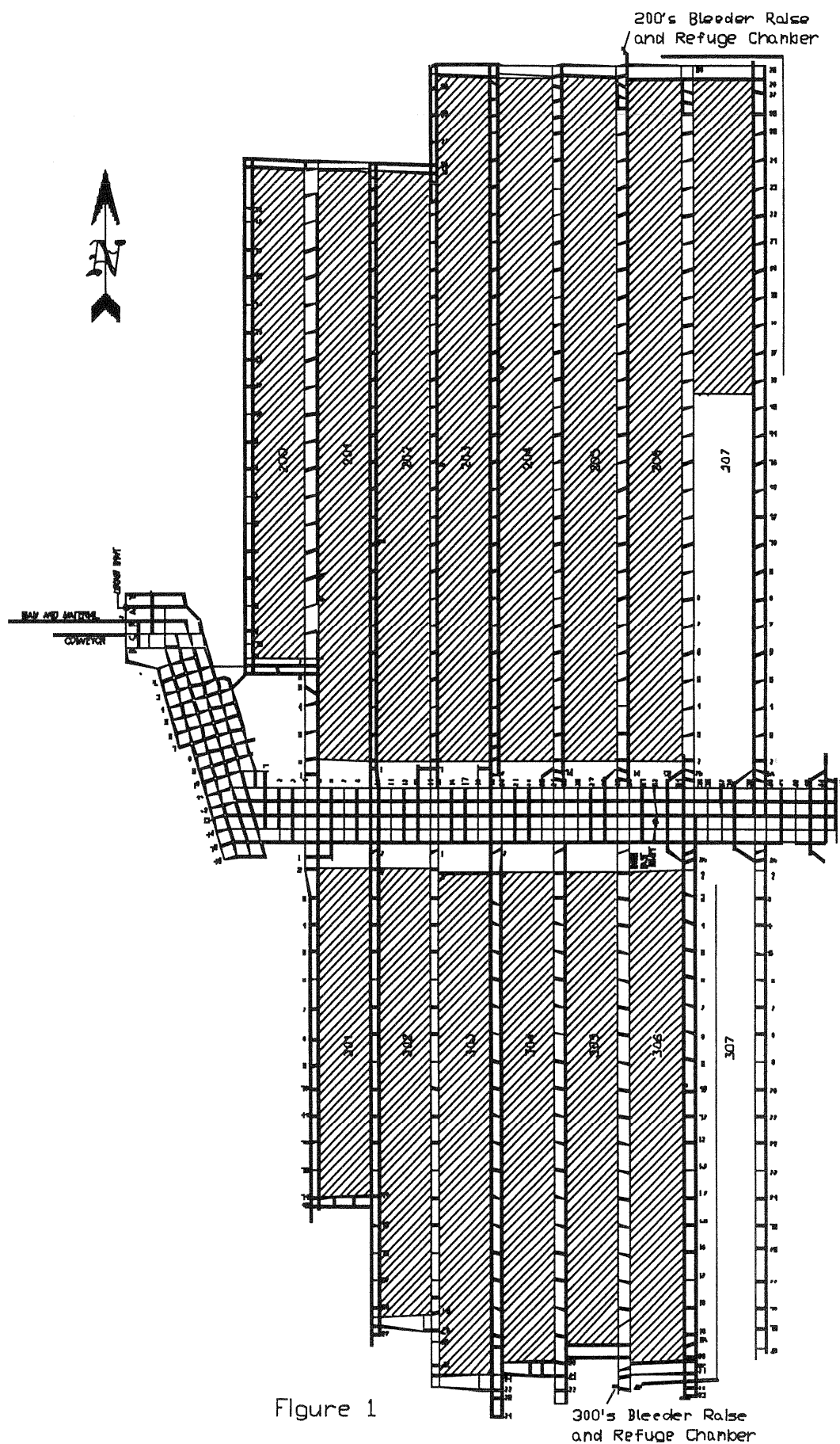


Figure 1

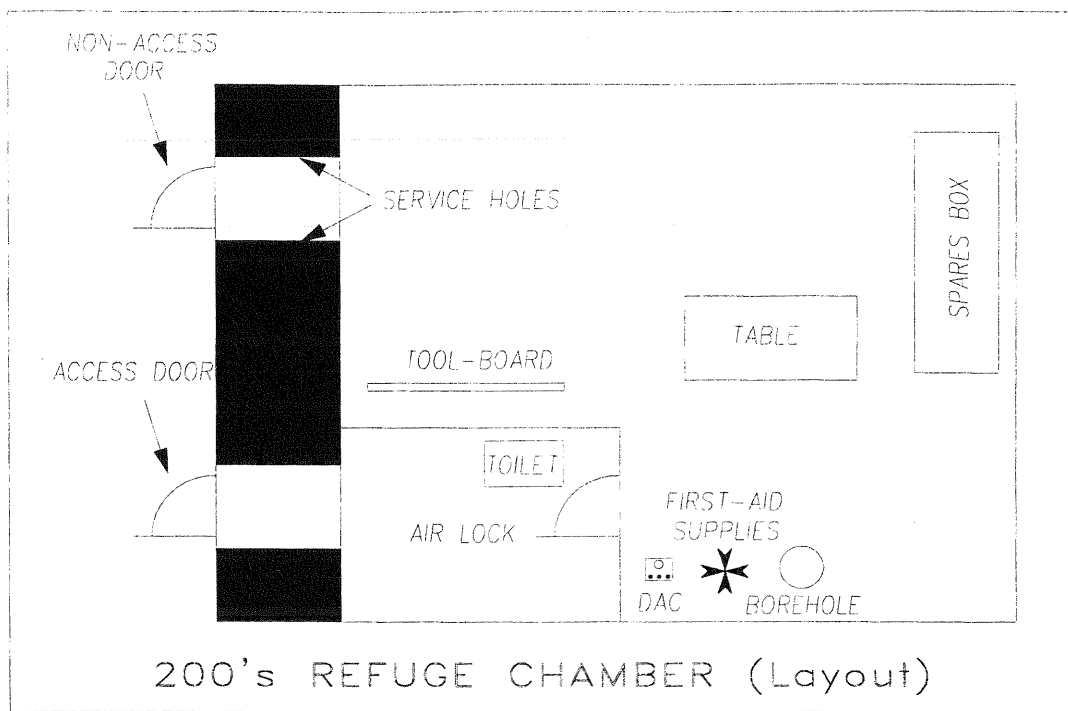


Figure 2