Designed to provide a refuge or ‘safe haven’ for miners suddenly trapped in a hazardous or toxic environment.

MineARC Systems - Built for Safety.  www.minearc.com
MineARC Systems is the global leader in the manufacture and supply of emergency safe refuge solutions for the mining, tunneling, chemical processing and disaster relief industries.

With 20 years’ experience, our dedication to ongoing research and development is driven by our key focus to continually offer the best and most advanced safety solutions on the market.

Our team of qualified engineers, electrical designers and technical experts form a global network across seven international locations including:

- Perth, Western Australia
- Johannesburg, South Africa
- Dallas, Texas
- Santiago, Chile
- Beijing, China
- Barcelona, Spain
- Guanajuato, Mexico

This allows MineARC to provide 24 hour service and engineering support to our expanding list of clients in over 60 countries across the globe.

All MineARC Refuge Chambers and Safe Havens comply with the highest international regulations and recognised ‘world’s best practice’ industry guidelines. Our key focus on quality control and product advancement has meant that MineARC Refuge Chambers have successfully saved lives in multiple real life industrial emergencies around the globe.

www.minearc.com

Emergency refuge forms an integral part of an underground mine’s wider Emergency Response Plan (ERP). Fires, explosions, rock-falls, flooding, and the release of smoke and other forms of toxic gas are the types of incidents that occur all too frequently, despite the high levels of planning and the safety precautions in place.

In these types of emergencies, when evacuation is no-longer safe or practical, emergency refuge is designed to provide a safe and secure ‘go-to’ area for personnel to gather and await extraction. MineARC Refuges have been successfully used around the world in multiple mine and tunneling emergencies to save lives.

Refuge chambers should be deployed throughout the mine to create a refuge ‘network’ accessible to all underground personnel whilst on foot. Depending on the country/region, regulations usually state acceptable ‘safe distances’ between refuge chambers.
In consultation with the world’s leading mining companies and regional mining authorities, the MineARC MineSAFE Range has been continuously re-engineered and refined to create a safe-refuge alternative that is fully integrated with today’s modern underground mining environment.

The MineSAFE Compact Design (CD) is designed specifically for tight mining confines, such as single-entry development headings.

This small, compact, ultra-portable refuge chamber is easy to manoeuvre and position around site.

The Compact Design is designed for optimum autonomy. The chamber’s ‘extra-low-voltage’ control system means it can sit stand-alone for extended periods without requiring connection to mains (mine) power.

Ultimately a MineSAFE CD’s dimensions and its rated occupancy can be custom-engineered to site specifications, without compromising on safety or performance. Standard configurations are based on 4, 6 and 8 person occupancies, with a range of optional features.

In consultation with the world’s leading mining companies and regional mining authorities, the MineSAFE Compact Design Refuge Chamber can be taken virtually anywhere, anytime; providing personnel with a safe-refuge alternative, in every part of the mine. Personnel situated directly at the working face (e.g. drill operations), run the risk of being trapped behind a fire or other hazard further up the decline. The Compact Design has been engineered specifically for this type of scenario – providing a place of safe-refuge even in the most remote, inaccessible parts of the mine.

The exterior front represents the ‘face’ of the refuge chamber – designed primarily for easy identification, and quick, easy access during an emergency.

The emergency lighting systems, warning siren and reflective signage alert passers-by to the chamber’s location, whilst the rotating door handles provide simple, straight forward access to the safety of the interior.

For more information please visit www.minearc.com

Custom dimensions and occupancies available. Refuge dimensions are ultimately designed to client specifications.

Weights provided are Australian standard 36hr models. Indicative weights only. Custom variations will impact final refuge chamber weight.

Scoop Frame configuration is not available with Compact Design 8-Person due to weight restrictions.

Standard Dimensions

<table>
<thead>
<tr>
<th>Model</th>
<th>Occupancy (persons)</th>
<th>Height (m/inch)</th>
<th>Width (m/inch)</th>
<th>Length (m/inch)</th>
<th>Weight (kg/lbs)</th>
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<tbody>
<tr>
<td>MS-CD1-04-ELVP-36</td>
<td>4</td>
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<td>2 / 78.7</td>
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<td>2200 / 4900</td>
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<td>2 / 78.7</td>
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<td>2 / 78.7</td>
<td>3 / 118</td>
<td>2900 / 6400</td>
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<td>2 / 78.7</td>
<td>4 / 157.3</td>
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</tbody>
</table>

Standard Model

Blast Shield Model

Standard Model

Standard Model with IT Hitch

Blast Shield Model with IT Hitch

Standard Model with Scoop Frame

Blast Shield Model with Scoop Frame

Also Available: EnviroLAV Toilet System

The EnviroLAV is the latest innovation in self-contained, portable toilet systems – ideal for the use in underground mining.

Designed to be simple to operate and maintain, the EnviroLAV is a semi-permanent structure that can be used both above and below ground wherever there is access to compressed air or electricity. The EnviroLAV requires emptying just once every 12 months, based on standard usage in optimal conditions.

For more information please visit www.minearc.com
Inside a MineSAFE Compact Design Refuge Chamber, a number of vital life support systems combine to create a safe, ongoing environment for occupants.

Systems include primary and secondary oxygen supplies, air conditioning systems, positive pressure systems, electrical systems, gas detection and CO/CO₂ absorption systems (referred to as ‘scrubbing’ systems).

The MineSAFE Compact Design uses active chemicals and MineARC’s ELVP (extra-low-voltage-portable) Scrubbing System to ‘scrub’ the build up of harmful CO₂ (carbon dioxide) and CO (carbon monoxide) from the air inside the refuge chamber.

In high enough concentrations, both CO₂ and CO can cause serious injury leading to a loss of consciousness and eventually death. CO₂ and CO are expired by the occupants as part of their normal breathing activity. Carbon monoxide can also enter the main chamber via the compressed air intake (if it becomes compromised), and as occupants enter and/or exit the main entrance, making CO/CO₂ scrubbing a vital necessity.

**MARCISORB Chemical Cartridges**

The ELVP Scrubbing System uses pre-packaged MARCISORB chemical absorber cartridges. MineARC’s MARCISORB CO and MARCISORB CO₂ cartridges provide superior scrubbing capacity, are easy to load, safe to handle, and can store for long periods.

**Power Fluctuation Protection**

The controller interface is the operational hub of the refuge chamber. From here all power, lighting and scrubbing systems can be managed with the flick of a switch.

**Extra-Low-Voltage Controller Interface**

**Air Conditioning**

Air conditioning is vital to combat the potentially fatal effects of heat stress caused by a build up in occupants’ own metabolic activity, as well as any ambient (external) heat affecting the refuge chamber’s internal temperature.

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**GuardIAN Refuge Chamber Monitoring**

**Reduces Operational Costs:**
- Reduced servicing time
- Real-time troubleshooting, reducing maintenance staff downtime
- Advanced maintenance planning
- Extended calibration periods for gas monitoring
- Reduced gas sensor replacement costs
- Extended sensor life
- Faster and easier sensor replacement
- Lower energy costs through the optimisation of mine air usage
- Flood protection, eliminating costly chamber refurbishment
- Reduction in replacement parts due to theft
- Reduced service kit costs
- Streamlined purchasing process

**Improves Operational Safety:**
- Operational communication during emergency use
- Direct video and gas monitoring for evacuation planning
- Greater system automation for reduced risk of human error
- Centralised diagnostics and analysis of entire MineARC Refuge Chamber fleet via computer, tablet or smartphone
- Programmable push email notifications for important refuge chamber events
- Voice prompting gas monitoring for chemical change-out and oxygen regulation
- Air toxicity shut off prevents smoke and carbon monoxide ingress via the compressed airline
- Increased monitoring ensures all critical components remain in the chamber
- Reduced ‘out-of-service’ time for all refuge chambers
- Eliminates chamber misuse

**GuardIAN Refuge Chamber Monitoring System**

MineARC’s GuardIAN Refuge Chamber Monitoring System is an exciting new development in refuge chamber technology; enabling real-time monitoring, providing confidence that an operation’s fleet of refuge chambers are emergency ready at all times.

GuardIAN Refuge Chamber Monitoring is an on-board system that continuously diagnoses all vital refuge operating systems. During standby mode GuardIAN checks for component faults and monitors refuge chamber usage or entry to the chamber.

GuardIAN’s secure online interface is hosted on an internal server within the refuge chamber so that no client software installation is required. The responsive webpage is easily accessible from any computer, tablet or smartphone and features a summary of your entire refuge chamber fleet and overall operational status, with the ability to drill down to a detailed report of each chamber.

GuardIAN Refuge Chamber Monitoring System is an optional upgrade for the MineSAFE Compact Design.

**Aura-FX Digital Gas Monitoring Diagnostics**

MineARC’s new Aura-FX Digital Gas Monitoring System is a proprietary fixed gas monitoring unit, designed specifically for use in MineARC refuge chambers and safe havens. A vast improvement on current digital gas monitors (DGMs) on the market, Aura-FX provides a refuge chamber specific solution to gas monitoring. Aura-FX has the ability to individually monitor up to 11 gases via a series of user-friendly, digital screens. Audible voice alarms will prompt occupants to replace scrubbing chemicals or adjust oxygen supply levels in the refuge chamber as required.

Aura-FX provides real-time gas monitoring data and analysis via the GuardIAN Refuge Chamber Monitoring dashboard.

Aura-FX-CM (Compact Model) is a standard feature of the MineSAFE Compact Design and can monitor three gases at any one time.

**Compressed Air Management System Diagnostics**

The MineARC Compressed Air Management System (CAMS) is a dedicated air management unit designed specifically for use in refuge chambers. The unique air management system monitors and regulates compressed air flow into the chamber.

Vital information relating to the integrity of the internal refuge chamber atmosphere is communicated in real-time via the GuardIAN Refuge Chamber Monitoring dashboard. An increase in CAMS activity would indicate a breach of the refuge chamber seal, thus sending an alert to designated personnel that the chamber is compromised.

CAMS is a standard feature of the MineSAFE Compact Design.

**GuardIAN System Monitoring, Event Logging and Fault Diagnostics**

MineARC’s Digital Controller links directly to GuardIAN, streaming real-time system data to a surface control room(s). Data includes automated system checks, battery fault logging, system diagnostics, internal and external temperature measurements, and system actions such as scrubber activation.

System faults, events and scheduled service notifications can be sent to designated personnel as email alerts; notifying them of upcoming service requirements, potential emergencies or mal-use as they occur.

**The GuardIAN Intelligence Network**

The complete GuardIAN Intelligence Network is designed to provide site-wide integration; allowing real-time monitoring of the underground environment, site assets and personnel via any PC, tablet or mobile device. Featuring gas monitoring, directional lighting, personnel tracking & navigation, and the GuardIAN Refuge Chamber Monitoring System, the integrated network takes standards in industrial safety to the next level.

For more information please visit [www.minearc.com](http://www.minearc.com)
Chamber Exterior Rear

The rear of a MineSAFE Compact Design Refuge Chamber houses important air filtration, electrical and backup power supply systems. A secure cabinet at the base houses the refuge chamber’s UPS battery back up (Uninterruptible Power Supply). The UPS is a failsafe system that can power the refuge chamber’s internal life support systems for a minimum of 36hrs, should mine power become cut-off.

The Compact Design’s unique dual UPS battery bank configuration enables the chamber to sit standalone from mains power for extended durations. When on “standby” the refuge chamber’s external strobe lights and siren will still operate, alerting personnel to the refuge chamber’s position. When the chamber is used in an emergency situation, the “primary” battery bank is activated, powering the refuge chamber’s entire life support systems for a minimum of 36 hours.

Feature Summary

4/6/8 Person Occupancy

Breathable Air (O2) Supply

4/6/8 Person Occupancy

Ultra-Portable Design

Air Conditioning

5mm (1/4”) Steel Plate

36 Hours Battery UPS (minimum)

CO and CO2 Scrubbing

Extra-Low-Voltage Controller

Designed for Remote Areas and Single Entry Development Headings

Can Operate in Standby Mode

Special Transport Configurations Available

Comprehensive Battery Monitoring and Charging System

Standard Features

• 5mm (1/4”) steel plate construction
• CO & CO2 scrubbing
• Pre-packaged chemical cartridges
• Advanced extra low voltage control system
• 2 x sources of breathable air (O2) supply
  - CAMS
  - Medical oxygen cylinders

Optional Features

• Special dimensions and transport configurations available
  - I.T. Hitch or scoop frame
  - “Scoop available for 4/6 man only
• Fully flushing, pressurised airlock
• GuardIAN Refuge Chamber Monitoring
• Battery backup UPS upgrade

Optional: Compressed Air Retractable Reel

Further increasing the portability of the MineSAFE Compact Design is the optional Compressed Air Retractable Hose Reel.

Built into the rear of the refuge chamber, the compressed air reel allows for easy connection and disconnection to the main airline as the chamber is moved around the mine. The addition of the hose reel removes the need for transportation of a separate airline connection, and ensures that positive pressure is maintained within the refuge chamber during stand-by mode.

The CAMS air pressure sensor and a shut off valve allow air flow into the chamber to be regulated, automatically emitting periodic ‘bursts’ of compressed air into the refuge chamber when the pressure inside drops below 200Pa. This process optimises mine air usage and guarantees against over-pressurisation of the refuge chamber. Over a 12 month period this can equate to significant financial savings.

The system’s gas toxicity monitor automatically diverts mine air if oxygen levels in the airline fall below a set level (19% oxygen in free air), signifying air contamination. Additionally, the incorporated flood protection valve automatically shuts down mine air to avoid catastrophic damage due to ingress of water into the mine air or accidental hook-up to mine water.

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