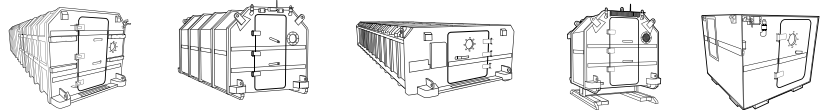


MineARC® Systems

Coal Mine Refuge (The CoalSAFE®)

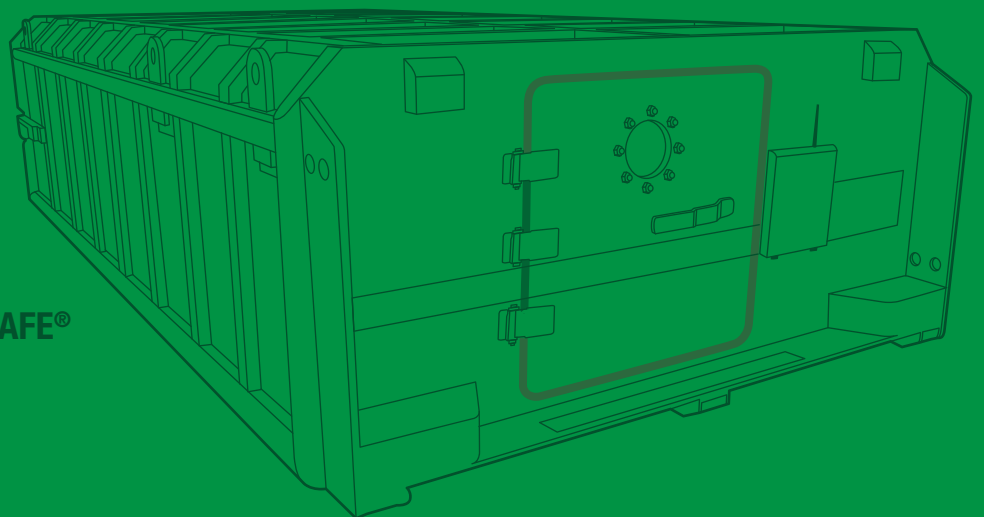
Designed to provide a refuge or 'safe-haven' for miners suddenly trapped in a hazardous or toxic environment.



The world's leading manufacturer of emergency life saving refuge
Mining Safe. MineARC®.



MineARC® CoalSAFE®





MineARC® Systems Company Profile

MineARC Systems is the global leader in the manufacture and supply of emergency safe-refuge to the underground mining, tunneling, and petrochemical industries.

With over 15 years experience in the industry, our dedication to ongoing research and development has kept us at the forefront of safe refuge technology.

MineARC Refuges have been successfully used around the world in multiple mine and tunneling emergencies to save lives.

MineARC has offices and manufacturing facilities in Perth, Western Australia, Pretoria in South Africa, Santiago, Chile, Fushun in China and Dallas in the United States, as well as a strong distribution network worldwide.

MineARC manufactures refuges for operations in over 25 countries around the world.

All MineARC Refuges comply with the highest international industry regulations and guidelines.

MineARC's CoalSAFE Refuges are approved in the United States by the West Virginia Office of Miners' Health, Safety & Training and are built to the Mine Safety & Health Administration (MSHA) federal regulations '30 CFR Refuge Alternatives for Underground Coal Mines'.

MineARC CoalSAFE Refuges are currently undergoing testing for Chinese MA Certification and MSHA Certification for the MARCis Scrubbing and Cooling System.

The CoalSAFE has been tested and refined with actual human testing. Multiple independent tests of the refuge's life support systems have verified that the CoalSAFE can successfully operate under a range of operating conditions.

MineARC is the only refuge manufacturer in the world with an ISO 9001 Quality Rating.

www.minearc.com



WV Office of Miners' Health, Safety & Training Approval



Built to MSHA 30 CFR Parts 7 and 75



IHST, Inc. Independent Human Testing



WJE, Inc. Independent Blast and Structural Analysis



MineARC® Team Based Risk Assessment Testing



Bureau Veritas ISO 9001:2008 Quality Management Systems



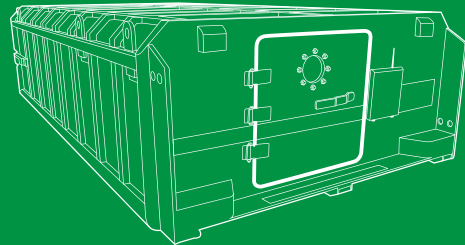
CoalSAFE® Refuge Series

MineARC® Systems designs and manufactures a range of CoalSAFE® Refuge models to suit different underground mines and mining conditions.

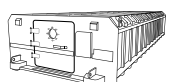
Standard CoalSAFE® CS-54119

The Standard CoalSAFE model is designed for underground coal mines with a minimum seam height of 56" (1.4m).

The unit can be custom-designed to client specifications, but typically features 8, 12, 16 and 20 person configurations.



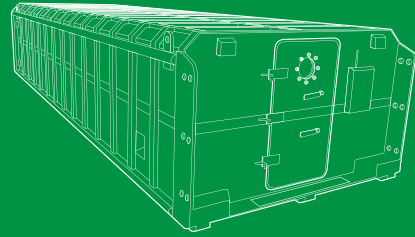
Model	Occupancy	Height	Width	Length	Weight
CS-08-54119	8	1.3m (4'6")	3m (9'11")	4.4m (14'5")	11,340 kg (25,000 lbs)
CS-12-54119	12	1.3m (4'6")	3m (9'11")	5.6m (18'5")	13,150 kg (29,000 lbs)
CS-16-54119	16	1.3m (4'6")	3m (9'11")	6.8m (20'5")	14,970 kg (33,000 lbs)
CS-20-54119	20	1.3m (4'6")	3m (9'11")	8m (26'4")	16,330 kg (36,000 lbs)



High Seam CoalSAFE® CS-72119

The High Seam CoalSAFE model is designed for underground coal mines with a minimum seam height of 74" (2.2m).

The unit can be custom-designed to client specifications, but typically features 12, 16, 20 and 24 person configurations.



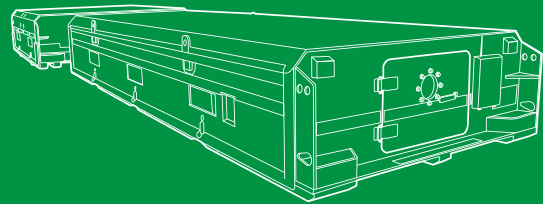
Model	Occupancy	Height	Width	Length	Weight
CS-12-72119	12	1.8m (6' 0")	3m (9'11")	5.6m (18' 5")	14,970kg (33,000lbs)
CS-16-72119	16	1.8m (6' 0")	3m (9'11")	6.8m (22' 5")	16,780kg (37,000lbs)
CS-20-72119	20	1.8m (6' 0")	3m (9'11")	8m (26' 4")	18,600kg (41,000lbs)
CS-24-72119	24	1.8m (6' 0")	3m (9'11")	9.2m (30' 4")	20,410kg (45,000lbs)



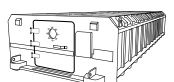
Low Seam CoalSAFE® (44") CS-44119-ECB

The Low Seam CoalSAFE model is designed for underground coal mines with a minimum seam height of 46" (1.4m). The unit can be custom-designed to client specifications, but typically features 12, 16, 20 and 24 person configurations.

Due to the height restrictions of low seam operations, the Low Seam CoalSAFE features a secure, separately transportable External Cylinder Bay (ECB) to house the oxygen and liquid CO₂ cylinders required to power the refuge's internal life support systems.



Main Refuge Model	Occupancy	Height	Width	Length	Weight
CS-12-44119	12	1.1m (3' 8")	3m (9'11")	4.1m (13' 5")	7,711kg (17,000lbs)
CS-16-44119	16	1.1m (3' 8")	3m (9'11")	5.3m (17' 5")	9,072kg (20,000lbs)
CS-20-44119	20	1.1m (3' 8")	3m (9'11")	6.5m (21' 5")	10,430kg (23,000lbs)
CS-24-44119	24	1.1m (3' 8")	3m (9'11")	7.7m (25' 5")	10,890kg (26,000lbs)
ECB	Occupancy	Height	Width	Length	Weight
CS-12-44119	12	1.1m (3' 8")	3.6m (11' 10")	3m (10' 0")	7,711kg (17,000lbs)
CS-16-44119	16	1.1m (3' 8")	3.6m (11' 10")	3.6m (11' 10")	9,072kg (20,000lbs)
CS-20-44119	20	1.1m (3' 8")	3.6m (11' 10")	4.1m (13' 7")	10,430kg (23,000lbs)
CS-24-44119	24	1.1m (3' 8")	3.6m (11' 10")	4.4m (14' 6")	12,250kg (27,000lbs)

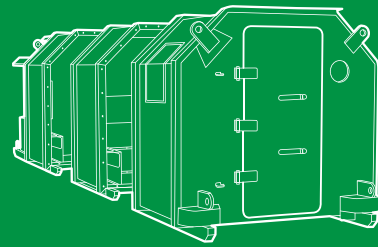


Modular CoalSAFE® (for underground assembly) CS-MOD

The Modular CoalSAFE refuge model is designed specifically for narrow shaft underground coal mines where transporting whole units down the shaft can be problematic.

The Modular CoalSAFE can be split into any number of separate compartments, each one being of customisable dimension. Once all modules have been transported underground the Modular CoalSAFE can be assembled and suitably positioned to form one whole refuge unit.

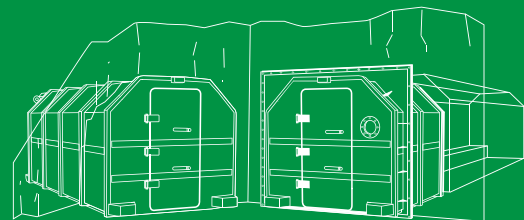
All occupancies and dimensions can be custom designed to client specifications.



Permanent CoalSAFE® CS-PERM

The Modular CoalSAFE can be adapted to suit permanent underground refuge bays/areas. A Permanent CoalSAFE model consists of a primary refuge bay/area secured by a bulk head air-lock entrance, and separate secure cylinder bay/area.

All occupancies and dimensions can be custom designed to client specifications.

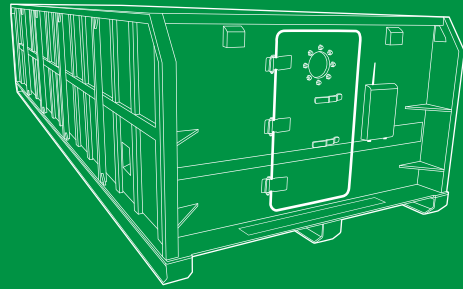


Custom CoalSAFE® CS-CUSTOM

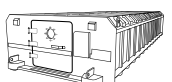
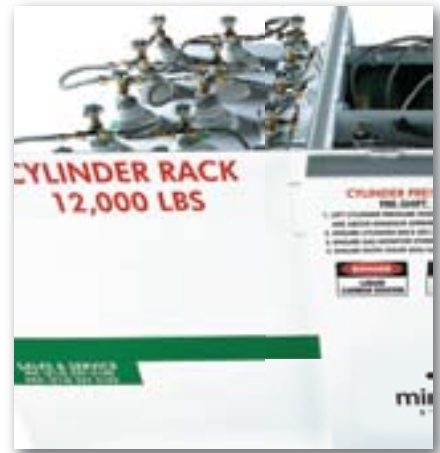
Any CoalSAFE Refuge is a fully integrated system that provides a flexible and effective solution to underground refuge requirements.

MineARC offers a custom design service that removes all problems associated with the design, installation, service, and maintenance of refuge chambers in underground environments.

MineARC has the capability to custom design a unit that meets the individual site-specific requirements. Through MineARC each client's mine layout, transport and handling, emergency response procedures, and risk management needs are thoroughly investigated.



Design drawings and models are generated and reviewed in consultation with each client prior to fabrication. All of this ensures that the product is used to its full potential and that the client's goals and objectives are met.





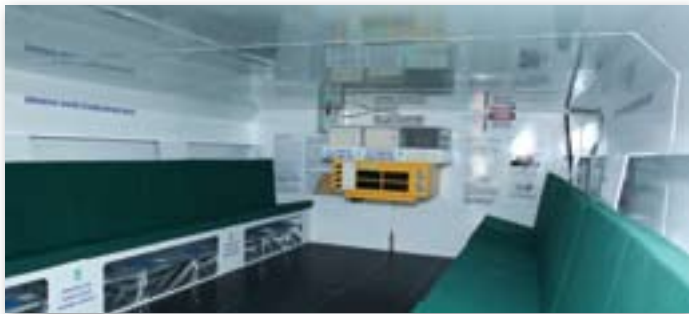
Construction

The CoalSAFE has been meticulously designed and engineered to ensure ease of transport and a robust design. Constructed from explosion resistant steel plate with external support wraps and surround package as standard, the refuge can withstand in excess of 15psi (103kPa) overpressure with no permanent damage. The refuge's floor plate is constructed from 3/4" (1.9cm) steel plate with tubular skids. Push points and towing and lifting eyes are provided top and bottom on front and rear.



Air-Lock

The CoalSAFE features an integrated airlock with automatic pneumatic flushing. The airlock features simple push-button operation and predetermined flushing times. The airlock also provides storage for items such as first-aid, stretcher, human waste disposal, lighting, and emergency food rations. The airlock becomes usable space once all occupants have entered the refuge.



Main Chamber

The CoalSAFE's internal chamber features durable high grade material seating on both sides, with ample under-seat and behind-seat storage for chemicals and drinking water.

As an optional feature the CoalSAFE internal walls can be fitted with a thermal insulation barrier to help limit external heat transfer to the internal environment, and can withstand temperatures in excess of 900°F (500°C).



Service and Maintenance

MineARC CoalSAFE Refuges are easy to inspect and maintain, requiring minimal preventative maintenance. The CoalSAFE has a low ongoing cost of ownership with consumables having an extended shelf-life. MineARC Systems has a dedicated service team with the capacity to undertake all your servicing requirements as well as accredited training programs for customers to perform their own servicing.

Cylinder Rack and Storage

High pressure cylinders used to power the CoalSAFE's life support systems are stored in a separate cylinder rack / bay. Depending on the model configuration, the cylinder rack is either inserted into the rear of the refuge (Standard and High Seam models), or in a separate External Cylinder Bay (ECB) (Low Seam and Permanent / Modular models).

MineARC's unique design allows cylinder racks to be interchanged underground and without difficulty allowing for minimal downtime. Pre-shift inspection of the refuge and cylinder racks can be performed without entering the main refuge.





- ▶ **CO & CO₂ Scrubbing**
- ▶ **Breathable Air**
- ▶ **Air Conditioning**
- ▶ **Flushing Airlock**
- ▶ **15 PSI** Explosion Proof
- ▶ **100 hrs** Safe Entrapment



Features Summary

MineARC® CoalSAFE® Refuge

STANDARD FEATURES

- ✓ **Intrinsically Safe Design**
- ✓ **Breathable Air System**
- ✓ **Carbon Dioxide (CO₂) and Carbon Monoxide (CO) Scrubbing**
- ✓ **Pre-Packaged Chemical Cartridges**
- ✓ **Powerless Cooling and Dehumidifying**
- ✓ **100 Hours Minimum Life Support**
- ✓ **Push Button Airlock Flushing**
- ✓ **15 PSI Explosion Proof**
- ✓ **Explosion Proof Viewing Portals**
- ✓ **Internal and External Gas Monitoring**
- ✓ **Secure, Removable Cylinder Rack**
- ✓ **Fire Resistant**
- ✓ **Communication Ports**
- ✓ **Ergonomic Designed Seating**
- ✓ **Emergency Repair Material**
- ✓ **Surround Package (reinforced construction)**
- ✓ **Lifting and Towing Eyes**

- ✓ **External Toilet Disposal System**
- ✓ **First-Aid Kit**
- ✓ **Non-Slip Flooring**
- ✓ **Fire Extinguisher**
- ✓ **Cyalume® Light Sticks**
- ✓ **MSHA Approved Flashlight**
- ✓ **Secured Internal Storage Area**
- ✓ **Reflective Signage**
- ✓ **Long Life Water and Food**

OPTIONAL FEATURES

- ✓ **MSHA Approved Strobe**
- ✓ **Towbar**
- ✓ **Emergency Escape Hatch**
- ✓ **Fire Proof Structure**
- ✓ **Reinforced Attachment Points to Aid Maneuverability in Vertical Shafts**
- ✓ **58cm (23") Wheels**
- ✓ **Lifting Eye Shackles**

Through innovative design, the CoalSAFE provides both a powerless carbon dioxide / carbon monoxide scrubber, as well as a powerless air conditioning system - The MARCis (MineARC Air Refuge Chamber *intrinsically safe*).

The MARCis®

Carbon Dioxide & Carbon Monoxide Scrubbing

MineARC's patented carbon dioxide (CO₂) and carbon monoxide (CO) scrubbing system does not require any electrical power to operate. The active chemical scrubbing system is designed to clean the air of these harmful gases and toxins that build up over time within a sealed, occupied environment. MineARC developed the technology to provide the occupants with ease of use and extended time periods between chemical change outs.

MARCISORB CO₂ and CO Chemical Cartridges provide proven chemical scrubbing capabilities and are easy to handle. Sealed in a barrier film bag, the cartridges will store efficiently for long periods of time without degradation or requiring any maintenance

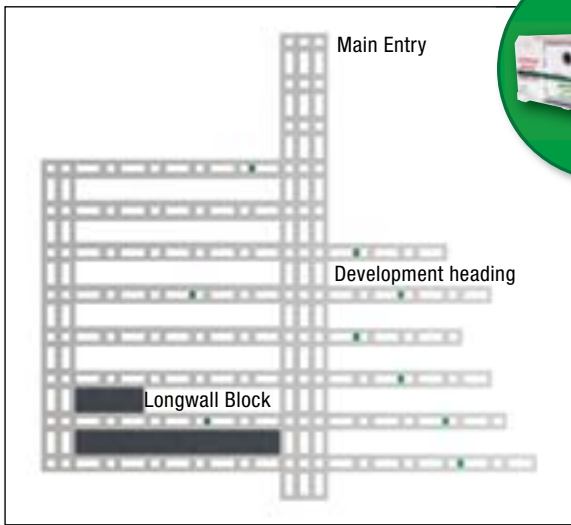
Intrinsically Safe Air-Conditioning

Independent testing has verified that a cooling system is essential for combating the potentially fatal effects of metabolic heat buildup inside the refuge. To maintain the internal atmosphere of the CoalSAFE, The MARCis incorporates a non electrical air conditioning system that both cools and dehumidifies the refuge.

US and Chinese regulators state that manufacturers must specify the maximum mine air temperature under which the refuge is designed to operate when fully occupied, whilst maintaining an internal apparent temperature of 95°F. The CoalSAFE has been successfully tested in ambient external temperatures above 80°F.



Longwall Configuration



Refuge Chamber Positioning

Refuge forms an integral part of an underground mine's wider Emergency Response Plan (ERP). Refuges should be deployed throughout the mine to create a refuge 'network' accessible to all underground personnel on foot.

Guidelines and legislation differs in different parts of the world. Legislation in the US mandates that refuges be located within 1,000ft (300m) of the face and locations where personnel cannot exit the mine within 1 hour.

Operating Procedure

The CoalSAFE Refuge is uncomplicated and fast to operate in an emergency. Utilizing a sequential numeric operating procedure, the refuge's life support systems can be activated in less than 60 seconds.

MineARC's comprehensive operational and maintenance train-the-trainer program includes hands on training as well as virtual reality software. This ensures optimal use of training time and maximum retention.





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