

# Petrochemical Safe Havens

## The MineARC ChemSAFE Range

Designed to provide a 'safe-haven' for personnel in the petrochemical industry, suddenly trapped in a hazardous or toxic environment.



AirBANK Pressure System

ChemSAFE  
Standard Design 12-Person  
PS-SD2-12-SIV-12

# Company Profile

MineARC Systems is the global leader in the manufacture and supply of emergency safe refuge solutions for the mining, tunnelling, 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 several 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](http://www.minearc.com)



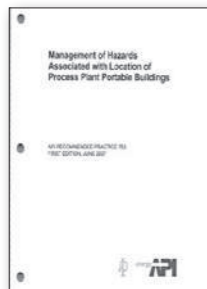
# ChemSAFE

## Blast Resistant Buildings

Engineered to withstand the hazards associated with working in a blast, toxic, or flammable zone.



TRC ISO 9001:2015 Quality Management Systems



API 753 Management of Hazards Associated with Location of Process Plant Portable Buildings



2009 ASCE Design of Blast Resistant Buildings in Petrochemical Facilities



BakerRisk Blast Assessment Third Party Testing



Voluntary Protection Programs Participants' Association



National Safety Council



Canadian Standards Association (CSA)



Quality Management System (QMS)



United States National Electrical Code



Global Supply Chain Risk Management Solutions



Contractor Management Services



Contractor and Supplier Management



Mine Safety and Health Administration

# ChemSAFE Blast Resistant Buildings

MineARC's ChemSAFE Blast Resistant Buildings are multi-use facilities designed to provide protection from an industrial hazard such as blast, toxic or flammable gas release. The open space pre-fabricated steel buildings can serve as work spaces, change room, or break rooms for general day-to-day use.

Fully customizable, MineARC Blast Resistant Buildings can be produced in a short period of time and a fraction of the cost of traditional ground up construction. Installation consists of simply electricity and water (if needed).

Additionally, all units meet ASHRAE standards for fresh air quality for day-to-day use but can rapidly isolate outside air to become a fully sealed environment - protecting occupants against a toxic or flammable gas cloud. The integration of true shelter-in-place functionality in a building is a first in the industry and a means of fully complying with **API RP 753.5 for buildings used for shelter-in-place.**



## Standard Features

- Engineered steel construction
- ISO container corner castings for transport (stackable)
- Severe environment finish paint
- UV resistant signage
- Closed cell spray foam insulation on all surfaces
- FRP laminated OSB panels for walls and ceiling

- Sealing doors with overpressure relief
- Split system air conditioning/heating system
- Fresh air intake with emergency isolation
- Exposed electrical with tamper proof fluorescent lighting
- Smoke detectors & fire extinguishers
- Aura-FX Gas Monitoring (CO2, O2, Toxic)
- Network Ethernet connections



PS-BR-9-12-12-1P



PS-BR-9-8-20-1P



PS-BR-9-12-40-1P



PS-BR-9-20-40-1P

## Standard Dimensions

Model	Rating (psi)	Height (ft/m)	Width (ft/m)	Length (ft/m)	Weight (lbs/kgs)
PS-BR-9-12-12-1P	1	9 / 2.75	12 / 3.65	12 / 3.65	13,700 / 6,300
PS-BR-9-8-20-1P	1	9 / 2.75	8 / 2.44	20 / 6.10	13,100 / 6,000
PS-BR-9-12-40-1P	1	9 / 2.75	12 / 3.65	40 / 12.20	29,200 / 13,300
PS-BR-9-20-40-1P	1	9 / 2.75	20 / 6.10	40 / 12.20	46,900 / 21,300

# ChemSAFE Blast Resistant Buildings

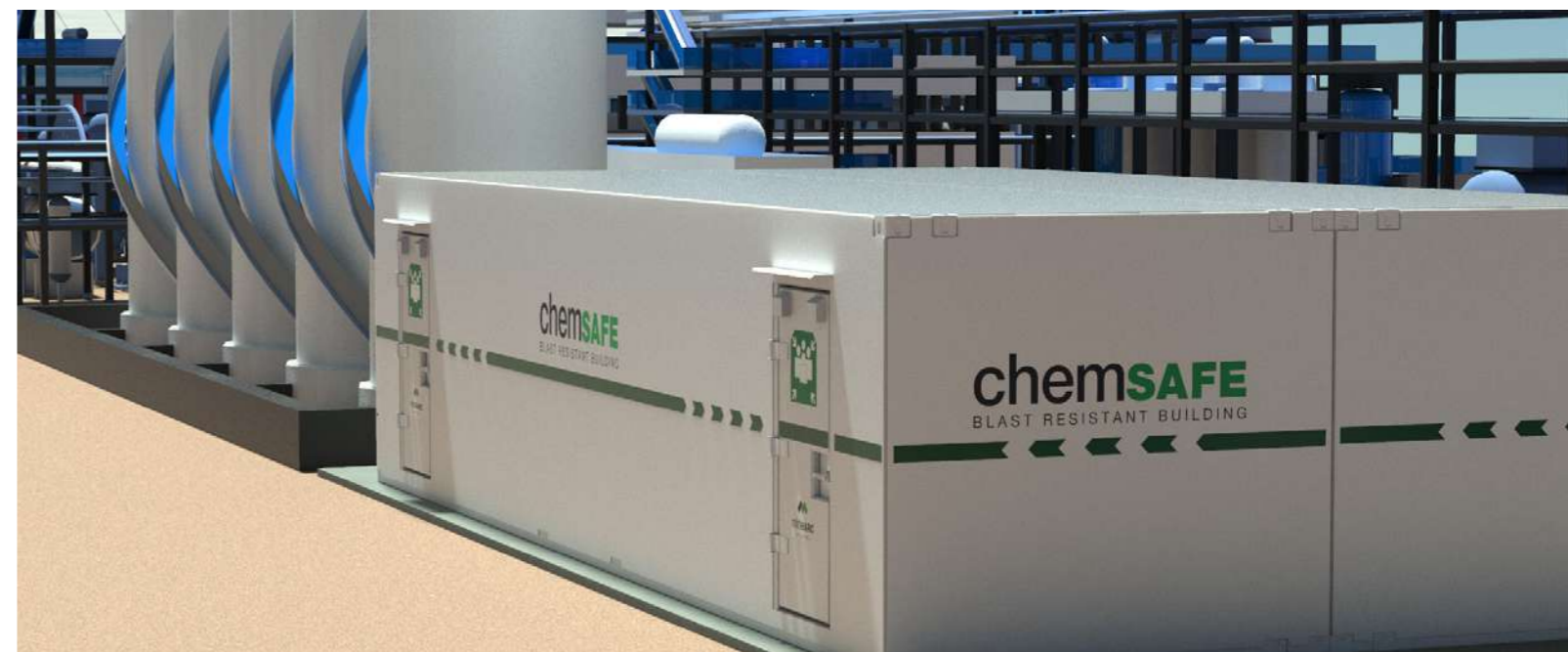
All MineARC Blast Resistant Buildings include Aura-FX Fixed Gas Monitoring as standard. Following an external gas release, the building is placed in emergency mode by isolating the fresh air intake. While sheltering-in-place, gas monitoring is critical in determining the amount of time occupants can safely remain inside the building. It is also used to determine if any external gases are potentially entering the sealed building following a blast.

A vast improvement on current digital gas monitors on the market, Aura-FX has the ability to individually monitor apparent temperature, oxygen, carbon dioxide, and toxic gases via a series of user-friendly, digital screens.

Audible voice alarms will prompt occupants to exit the building, replace scrubbing chemicals or adjust oxygen supply levels as required.

## Major Features

- Apparent temperature monitoring
- Oxygen (O2), carbon dioxide (CO2) and toxic gas (NH3, CL2 etc.)
- Graphical displays with trend lines
- Audible alarm and voice prompts
- Ethernet connectivity for remote monitoring (Optional Guardian)
- Yearly calibration
- Long sensor lives



# ChemSAFE Blast Resistant Buildings

MineARC understands the importance of blast protection for personnel working at a petrochemical facility. Third party testing has been performed by professional blast engineers, in accordance with ASCE: Design of Blast-Resistant Buildings in Petrochemical Facilities (2nd).

As part of their in-depth analysis, third-party blast engineers tested the performance of the MineARC Blast Resistant Building, taking into consideration the orientation of the unit with respect to the explosion source. Blasts that can impact either the long or short side of the structure, as well as both sides at an angle were tested.

The results of these studies show that MineARC's blast resistant structure can withstand a long-duration, free-field blast load of up to 10psi for 200ms.



PS-BR-9-12-40-10P

## Optional Features

- 10psi for 200ms blast resistant structure
- Blast resistant windows
- Extreme temperature applications (Hyper Heat, R45 insulation, energy recovery ventilation)
- Intrinsic safety for hazardous locations
- Fire resistance (1,100°F/600°C for 30 minutes)
- UPS battery backup on electrical
- External toxic/flammable gas monitoring
- External/Internal vestibule



PS-BR-9-12-12-10P



PS-BR-9-8-20-10P



PS-BR-9-12-40-10P



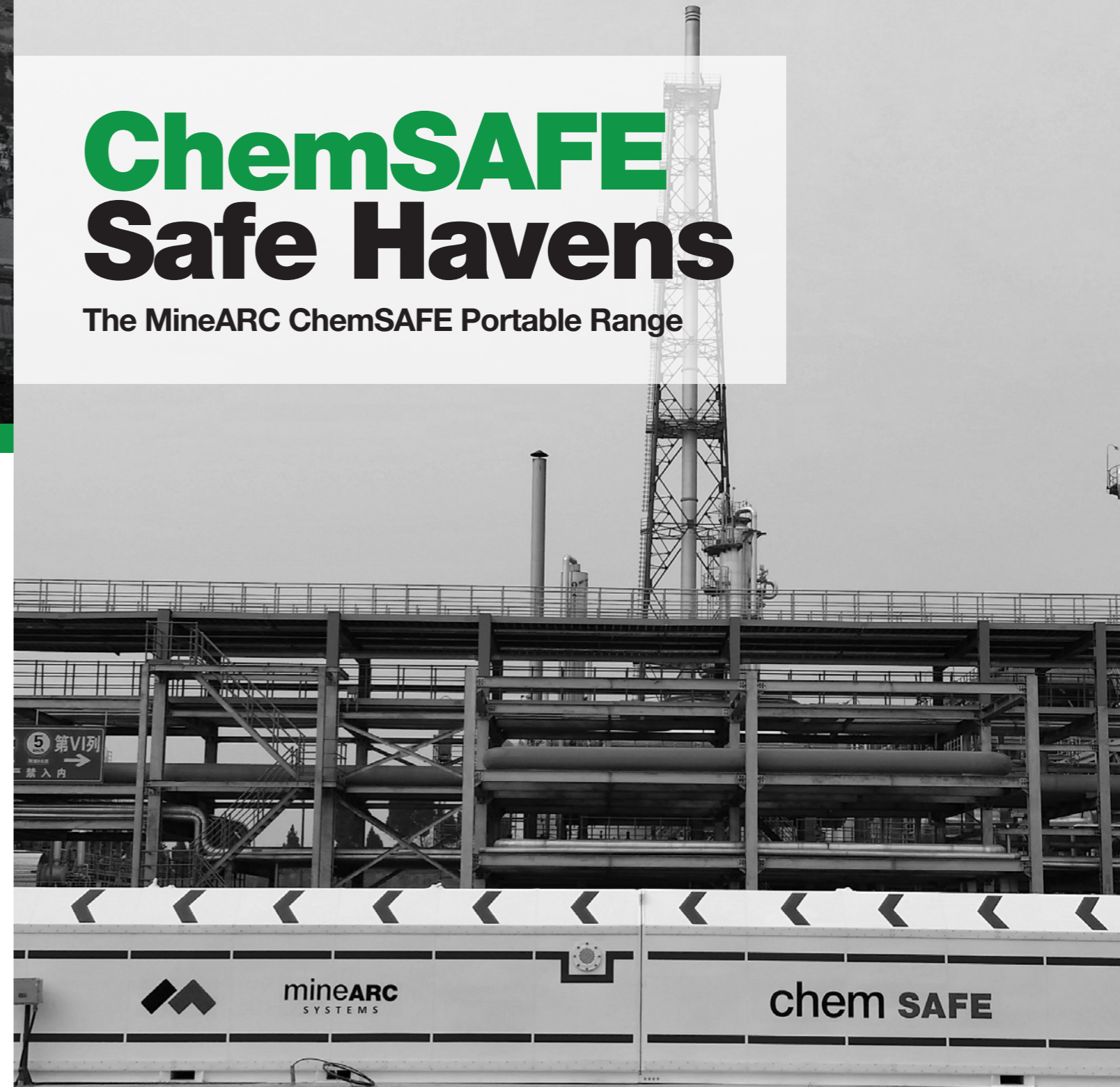
PS-BR-9-20-40-10P

## Standard Dimensions

Model	Rating (psi)	Height (ft/m)	Width (ft/m)	Length (ft/m)	Weight (lbs/kgs)
PS-BR-9-12-12-10P	10	9 / 2.75	12 / 3.65	12 / 3.65	21,000 / 9,600
PS-BR-9-8-20-10P	10	9 / 2.75	8 / 2.44	20 / 6.10	22,500 / 10,300
PS-BR-9-12-40-10P	10	9 / 2.75	12 / 3.65	40 / 12.20	49,900 / 22,700
PS-BR-9-20-40-10P	10	9 / 2.75	20 / 6.10	40 / 12.20	74,700 / 33,900

# ChemSAFE Safe Havens

The MineARC ChemSAFE Portable Range



# ChemSAFE Standard Design Safe Havens



Custom ChemSAFE with 12psi blast rating upgrade

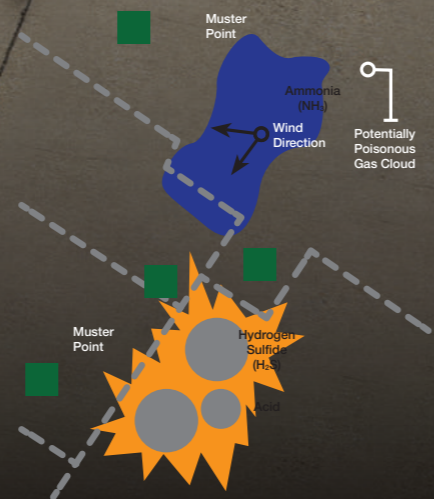
MineARC understands that emergency response requirements differ depending on a site's processing conditions, location of personnel, dangerous goods inventory and a host of other important factors.

Within the petrochemical industry, the common practice of modifying existing site buildings to function as shelter-in-place safe havens can often prove a timely and costly exercise, resulting in a non-flexible solution as site requirements shift over time. Building modification can also prove ineffective, with numerous air entry and exit points to consider, not to mention costly blast proofing if required.

In response, MineARC has developed a fully sealed, transportable and cost effective alternative to site building modification – the MineARC ChemSAFE Range.

MineARC ChemSAFE Safe Havens offer a safe and secure 'go-to' area for multiple personnel in the event of a toxic chemical release, fire, explosion or other hazardous emergency response scenario.

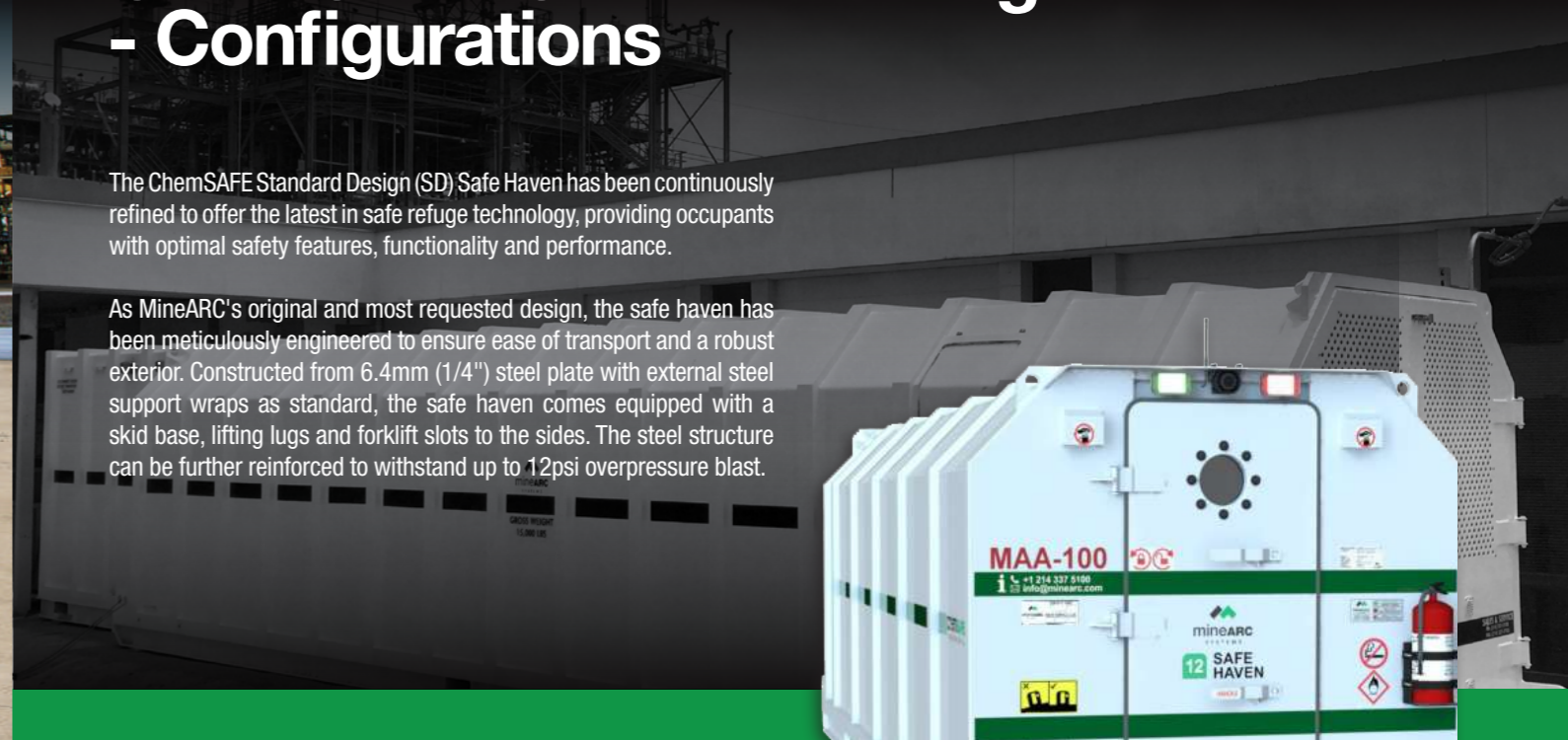
## Example Facility Hazard Scenario



# ChemSAFE Standard Design - Configurations

The ChemSAFE Standard Design (SD) Safe Haven has been continuously refined to offer the latest in safe refuge technology, providing occupants with optimal safety features, functionality and performance.

As MineARC's original and most requested design, the safe haven has been meticulously engineered to ensure ease of transport and a robust exterior. Constructed from 6.4mm (1/4") steel plate with external steel support wraps as standard, the safe haven comes equipped with a skid base, lifting lugs and forklift slots to the sides. The steel structure can be further reinforced to withstand up to 12psi overpressure blast.



PS-SD2-12-SIV-12

Standard configurations are available based on occupancy – from 8 to 30 people.

## Features

- Series IV Scrubbing System with pre-packaged CO<sub>2</sub> chemicals
- Blast rating: 5psi
- iVAN voice prompt system
- Aura-FX Digital Gas Monitoring System
- Positive Pressure Flushing System
- Air conditioning and dehumidifying
- Internal lighting / external warning lights and siren
- Communications connection
- 12 hr minimum backup power supply (UPS)
- Internal or external vestibule



PS-SD1-08-SIV-12  
(8 Person)



PS-SD2-12-SIV-12  
(12 Person)



PS-SD3-16-SIV-12  
(16 Person)



PS-SD4-20-SIV-12  
(20 Person)



PS-SD5-26-SIV-12  
(26 Person)



PS-SD6-30-SIV-12  
(30 Person)

## Standard Dimensions

Model	Occupancy (persons)	Height (m/inch)	Width (m/inch)	Length (m/inch)	Weight (kgs/lbs)
PS-SD1-08-SIV-12	8	2.21 / 87"	2.25 / 89"	4.19 / 165"	4990 / 11000
PS-SD2-12-SIV-12	12	2.21 / 87"	2.25 / 89"	4.80 / 189"	5443 / 12000
PS-SD3-16-SIV-12	16	2.21 / 87"	2.25 / 89"	6.02 / 237"	6350 / 14000
PS-SD4-20-SIV-12	20	2.21 / 87"	2.25 / 89"	7.23 / 285"	7031 / 15500
PS-SD5-26-SIV-12	26	2.21 / 87"	2.25 / 89"	8.44 / 332"	8165 / 18000
PS-SD6-30-SIV-12	30	2.21 / 87"	2.25 / 89"	9.64 / 380"	8618 / 19000

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

# ChemSAFE Standard Design

## - Exterior

### SIREN & STROBE LIGHTING

- 112 dBA motion activated
- Green & red LED

### AIR VENTS / CHECK VALVES

### PAINT

- Near-white blast cleaning
- Zinc based primer

### LIFTING LUGS (Not shown)

### AIR CONDITIONING

CONDENSER (Not shown)

### BATTERY UPS (Not shown)

- 12hr emergency backup power supply
- Further options available

### ENCLOSED REAR HOUSING

(Not shown)

### PORTHOLE WINDOW

- Blast resistant

### SEALING DOOR

- Outward opening
- Vacuum tested seal

### POSITIVE PRESSURE FLUSHING SYSTEM

- Push button and timed

### ROTATING HANDLES

- Double locking

### SKID BASE

- Forklift slots
- Front and rear mounted tow points

PS-SD6-30-SIV-12

The 'face' of the safe haven is designed primarily for easy identification and quick access during an emergency.

The strobe lighting, warning siren and reflective signage alert passers-by to the safe haven's location, while the rotating door handles provide simple, straight forward access to the safety of the interior.

An additional feature of the ChemSAFE Standard Design range is a fully pressurized vestibule, providing added protection against the

ingress of smoke and other harmful toxins. Vestibules are available as either an internal or external feature of the safe haven. See further on for additional information.

The rear of a MineARC ChemSAFE Standard Design houses important electrical and backup power supply systems. A secure floor-to-roof cabinet provides greater protection for these systems, unlike more basic designs.

The base of the cabinet contains the safe haven's UPS (Uninterruptible Power Supply) battery backup system. The UPS is a failsafe system that can power the safe haven's internal life support systems for a minimum of 12hrs, should mains power become cut-off.

Emergency shelter should always be considered within the broader context of an entire emergency response/management plan and in conjunction with a range of other important design and safety factors. MineARC engineers are on hand during the entire design process to

ensure the best possible safety solution is delivered for each and every project. Virtually all aspects of the ChemSAFE's design can be customized by MineARC engineers, including; dimensions, structural integrity, volume, occupancy, and minimum entrapment durations.

MineARC can also engineer the safe haven to double as a control room, workshop area or office space. See further on for additional information.

# ChemSAFE Standard Design

## - Interior



**OXYGEN SUPPLY #2:  
BREATHABLE OXYGEN CYLINDERS**

- Minimum capacity 303ft<sup>3</sup> (8,580L)

\*Breathable oxygen cylinders quoted separately.

**OPERATING PROCEDURES**

- Wall mounted + hardcopy manuals

**FIRE BLANKET  
UNDER SEAT**

**SEATING**

- Ergonomically designed
- Durable, hard wearing fabric

**NON-SLIP FLOORING**

- Raised, removable

**CAMERA**

**GUARDIAN REMOTE  
MONITORING &  
DIAGNOSTICS SYSTEM**

**OPTIONAL:  
AUTOMATED OXYGEN  
DELIVERY SYSTEM**

**CIRCUIT BREAKERS**

**BATTERY UPS  
ISOLATION SWITCH**

**7 MARCISORB CO<sub>2</sub>, 7 MARCISORB CO<sub>2</sub>, 7 MARCISORB CO<sub>2</sub>**

**SERIES IV DIGITAL  
CONTROLLER  
INTERFACE**

**MOTION SENSOR**

**AURA-FX DIGITAL  
GAS MONITOR**

**SCRUBBER  
FLOW AIR VENT**

**mineARC  
SYSTEMS**

**INTERIOR LIGHTING**

**AIR CONDITIONING  
RUN AT 86°F (30°C)  
ON BATTERY ONLY**

**EMERGENCY ESCAPE HATCH**

- Inward opening; Accessible internally & externally
- Neoprene memory seal

**AIR CONDITIONING SYSTEM**

- R410a refrigerant cooling
- Mitsubishi Split System

**MARCISORB CO<sub>2</sub> CARTRIDGES**

- Pre-packaged; no chemical handling

**AIR CON REMOTE  
DOCKING STATION**

**OXYGEN REGULATOR**

**STORAGE**

- Under seat + cabinet

Inside a MineARC ChemSAFE Standard Design Safe Haven, a number of vital life-support systems combine to create a safe, ongoing environment for occupants.

Systems include; air (oxygen) supplies, air conditioning and dehumidifying, positive pressure systems, electrical and communications, gas detection and CO<sub>2</sub> absorption (referred to as 'scrubbing' systems).

The digital controller interface is the operational hub of the safe haven. From here, all power, lighting and scrubbing systems can be managed with the push of a button.

### i.V.A.N.

Exclusive to MineARC, iVAN (Intelligent Voice Audio Navigation) represents a breakthrough in safe-refuge technology. iVAN is the on-board navigation assistant that guides occupants through operational procedures.

### Air Conditioning

Air conditioning is vital to combat the potentially fatal effects of heat stress. A continuous build up in heat is caused by the occupant's metabolic activity, as well as any ambient (external) heat affecting the safe haven internal temperature.

### Optional: Automated Oxygen Delivery System

The MineARC Automated Oxygen Delivery System (AODS) is designed to maintain a safe, breathable atmosphere within the safe haven.

Once the system is activated, the AODS disperses metered amounts of oxygen supplied by a compressed oxygen cylinder. The AODS maintains oxygen levels between 18.5% and 23% inside the safe haven without any required operator involvement.

\*Image shows custom unit. Some features do not apply to standard model.

# ChemSAFE Utility Design Safe Havens



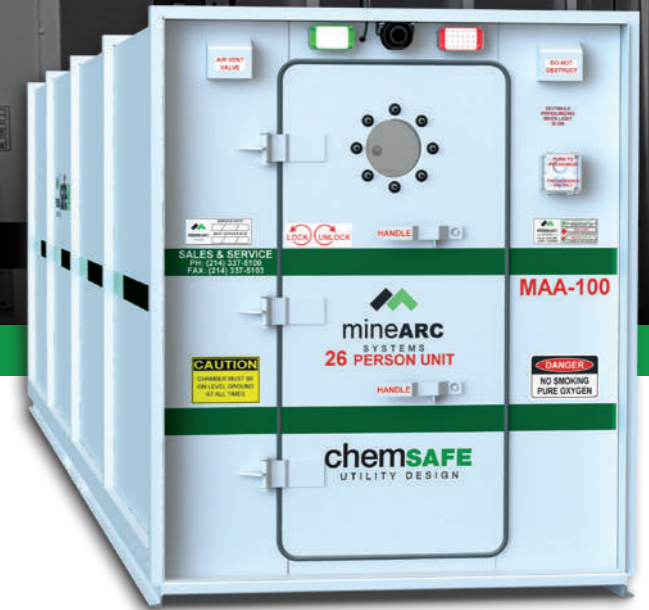
PS-UD5-26-ELV

The ChemSAFE Utility Design (UD) Safe Haven has been continuously refined to offer cost effective solutions for toxic gas protection. The Utility Design is equipped with the latest in safe refuge technology, providing occupants with optimal safety features, functionality and performance.

# ChemSAFE Utility Design - Configurations

The Utility Design features a narrow construction for space restricted applications, while still providing ample internal space for a range of occupancies - from 8 to 30 people. Constructed from robust 4.75mm (3/16") steel plate, the safe haven's portable design features lifting lugs and forklift slots, allowing easy maneuverability around site.

The steel structure is fully sealed, offering 0% air change per hour (ACH) for long term occupancy in a toxic gas release.



PS-UD5-26-ELV

## Features

- ELV Scrubbing System with pre-packaged CO<sub>2</sub> chemicals
- Breathable air (O<sub>2</sub>) supply
- Aura-FX Digital Gas Monitoring
- Positive Pressure Flushing System (PPFS)
- Air conditioning and dehumidifying
- Internal lighting / external warning lights and siren
- Communications connection
- Internal or external vestibule



PS-UD1-08-ELV  
(8 Person)



PS-UD2-12-ELV  
(12 Person)



PS-UD3-16-ELV  
(16 Person)



PS-UD4-20-ELV  
(20 Person)



PS-UD5-26-ELV  
(26 Person)



PS-UD6-30-ELV  
(30 Person)

## Standard Dimensions

Model	Occupancy (persons)	Height (m/inch)	Width (m/inch)	Length (m/inch)	Weight (kgs/lbs)
PS-UD1-08-ELV	8	2.24 / 88"	1.86 / 73.25"	3.73 / 147"	2,720 / 6,000
PS-UD2-12-ELV	12	2.24 / 88"	1.86 / 73.25"	4.34 / 171"	3,040 / 6,700
PS-UD3-16-ELV	16	2.24 / 88"	1.86 / 73.25"	5.55 / 219"	3,580 / 7,900
PS-UD4-20-ELV	20	2.24 / 88"	1.86 / 73.25"	6.77 / 266"	4,170 / 9,200
PS-UD5-26-ELV	26	2.24 / 88"	1.86 / 73.25"	7.98 / 314"	4,710 / 10,400
PS-UD6-30-ELV	30	2.24 / 88"	1.86 / 73.25"	9.19 / 362"	5,300 / 11,700

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



# ChemSAFE Utility Design - Exterior

**PAINT**  
• Near-white blast cleaning

SUVA™

**SIREN & STROBE LIGHTING**  
• 112 dBA motion activated  
• Green & red LED

**LIFTING LUGS (Not pictured)**  
• Top of safe haven

**ENTRY SHROUD**  
• Control room entrance to safe haven

**PORTHOLE WINDOW**

ENTRANCE →

← ENTRANCE

**EMERGENCY ESCAPE HATCH**  
• Inward opening; accessible internally & externally  
• Neoprene memory seal

mineARC SYSTEMS

mineARC SYSTEMS

chemSAFE  
UTILITY DESIGN

**HIGH TRAFFIC DOOR**  
• Panic bar  
• Sealing door

GROSS WEIGHT  
4,800 LBS

chemSAFE  
UTILITY DESIGN

**AIR CONDITIONING CONDENSER (Not pictured)**

**OPTIONAL: BATTERY UPS (Not pictured)**  
• 12hr emergency backup power supply  
• Further options available

An optional feature of the ChemSAFE Utility Design is a UPS (Uninterruptible Power Supply) battery backup system, contained within a secure rear cabinet. The UPS is a failsafe system that can power the safe haven's internal life support systems for a minimum of 12hrs, should mains power become cut-off.

# ChemSAFE Utility Design

## - Interior

Inside a MineARC ChemSAFE Utility Design Safe Haven, a number of vital life-support systems combine to create a safe, ongoing environment for occupants.

Systems include; air (oxygen) supplies, air conditioning and dehumidifying, positive pressure systems, electrical and communications, gas detection and CO2 absorption (referred to as a scrubbing system).

### Control System

The controller interface is the operational hub of the safe haven. From here, all power, lighting and scrubbing systems can be managed with the push of a button.

MineARC's ELV (Extra-Low-Voltage) System comes as standard with the ChemSAFE Utility Design. The ELV Control System is installed in conjunction with optional UPS battery backup that can power the system for a minimum of 12hrs, should mains power be cut off.

### Air Conditioning

Air conditioning is vital to combat the potentially fatal effects of heat stress. A continuous build up in heat is caused by the occupant's metabolic activity, as well as any ambient (external) heat affecting the safe haven internal temperature.

### Optional: Automated Oxygen Delivery System

The MineARC Automated Oxygen Delivery System (AODS) is designed to maintain a safe, breathable atmosphere within the safe haven.

Once the system is activated, the AODS disperses metered amounts of oxygen supplied by a compressed oxygen cylinder. The AODS maintains oxygen levels between 18.5% and 23% inside the safe haven without any required operator involvement.

\*Custom two-aisle seating arrangement shown in image.



INTERIOR LIGHTING

AIR CONDITIONING SYSTEM

- R410a refrigerant cooling
- Mitsubishi Split System

COMMUNICATION PORTS

OPERATING PROCEDURES

- Wall mounted + hardcopy manuals

MARCISORB CO2 CARTRIDGES

- Pre-packaged; no chemical handling

OXYGEN SUPPLY:  
BREATHABLE GRADE OXYGEN CYLINDERS

- Minimum capacity 303ft<sup>3</sup> (8,580L)

\*Breathable oxygen cylinders quoted separately.

INVERTER

SEATING

- Ergonomically designed
- Durable, hard wearing fabric

AURA-FX DIGITAL  
GAS MONITOR

NON-SLIP FLOORING

- Raised, removable

STORAGE

- Under seat + cabinet

# Safe Haven Blast Rating Upgrade

An optional feature of the ChemSAFE Safe Haven is blast rating upgrade up to 12psi.

MineARC utilizes highly specialized materials and engineering techniques to build safe havens that can withstand the concussive forces of extreme blasts and explosions within the petrochemical industry. Through careful analysis of a site's application and hazard assessment, MineARC can engineer a highly customized safe haven to meet their specific blast rating requirements.



- Increased blast rating to client specification
- Additional 4" x 2" (100mm x 50mm) upright stiffeners
- Additional lateral stiffeners
- Fully enclosed rear housing for componentry protection

PS-SD6-30-SIV-12  
(w/ 12psi Blast Rating & Flange for External Vestibule)

## Third Party Verification

MineARC has the engineering capabilities to perform in-house blast analysis calculations on all safe havens. In addition, third party testing has been performed by professional blast engineers, in accordance with ASCE: *Design of Blast-Resistant Buildings in Petrochemical Facilities (2nd)*.

As part of their in-depth analysis, third-party blast engineers developed building damage level (BDL) curves in order to test the performance of MineARC Safe Havens, taking into consideration the orientation of the unit with respect to the explosion source. Blasts that can impact either the long or short side of the structure, as well as both sides at an angle were tested.

Building Damage Level (BDL)	Summary of Potential Damage	Occupant Vulnerability (OV)
1.0 (Minor)	Walls sustain the onset of visible damage. Repairs are necessary for cosmetic reasons only.	Negligible
2.0 (Moderate)	Localized damage. Building can be repaired and reused.	Negligible
2.5 (Heavy)	Widespread building damage. Building repair may not be practical.	5%
3.0 (Major)	Walls facing the blast fail, others have compromised integrity. Building repair is not practical.	50%
4.0 (Collapse)	Primary and secondary structural members fail or sustain major damage. Building collapse.	100%

The results of these studies show that MineARC's blast resistant structure can withstand a **long-duration, free-field blast load of up to 12psi for 200ms, while sustaining no greater than a 'Moderate Building Damage Level' (BDL 2.0)**. See table opposite for BDL breakdown.

In addition to building damage curves, blast engineers also calculated the occupant vulnerability (OV); the percentage of safe haven population that could sustain fatal injuries at different levels of building damage. In the case of MineARC's BDL of 2.0, the corresponding OV is proven to be negligible. Refer to table opposite for full OV breakdown.

# Safe Haven Gas & Contaminant Scrubbing



## CO2 Scrubbing

The ChemSAFE safe haven uses active chemicals and MineARC's patented scrubbing system to remove the build up of harmful CO2 gas from inside the safe haven. The system continuously monitors and alerts occupants to internal and external levels of CO2, O2 and other gases within the air. Gas monitoring systems can be customized to on site standards.

The safe haven's scrubbing system uses pre-packaged MARCISORB CO2 absorber cartridges. MineARC's MARCISORB cartridges provide superior scrubbing capacity, are easy to load, safe to handle, and can store for long periods.



## Additional Scrubbing Options

MineARC offers various additional scrubbing solutions, designed to remove a range of breathing contaminants and atmospheric hazards from within the safe haven.

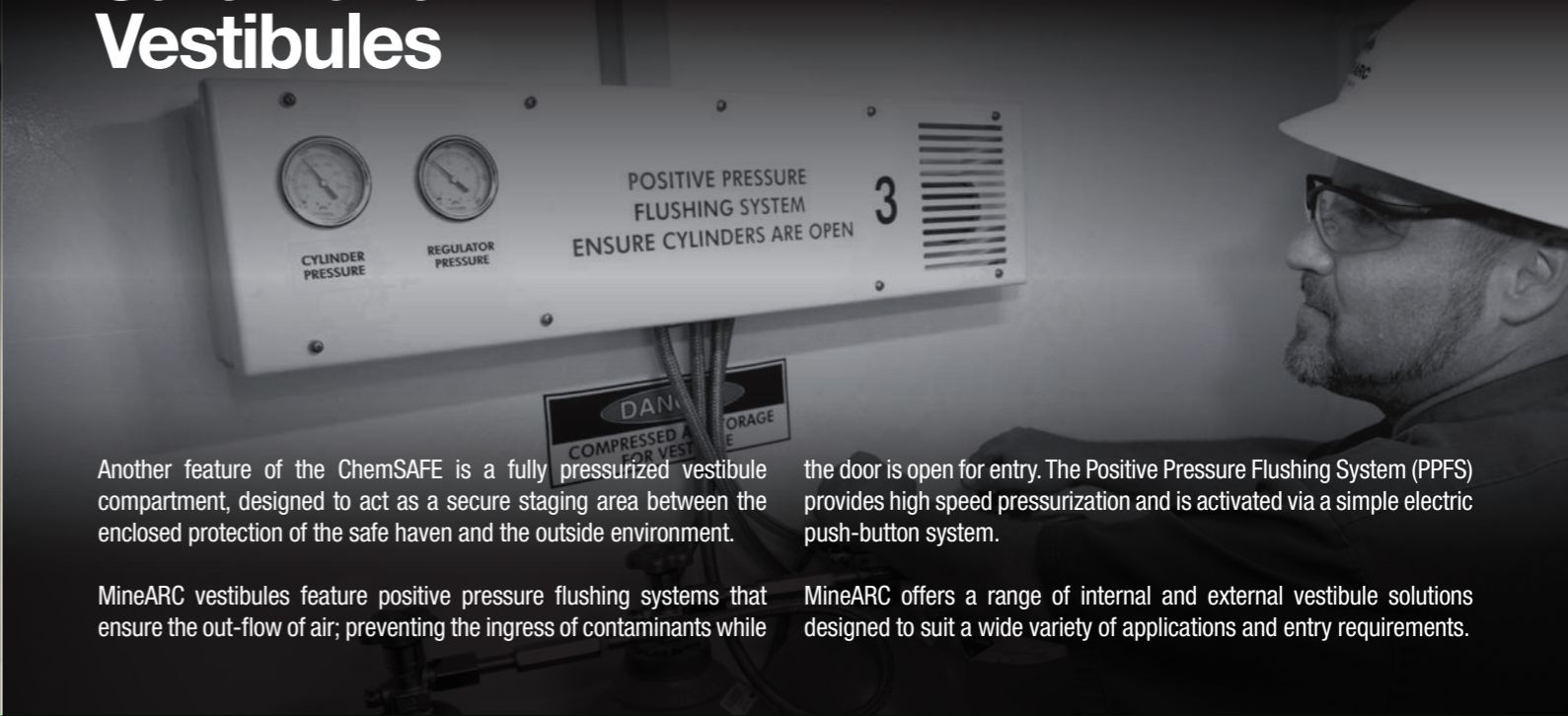
Contaminant	Product
Ammonia, Amines	High-grade impregnated activated carbon for removal of airborne ammonia and amines
Radioactive Iodine	High-grade impregnated activated carbon for removal of radioactive methyl iodide
VOC	High-grade virgin activated carbon for organic vapor adsorption
Acid Gases	High-grade impregnated activated carbon for removal of acid gases
Mercury	High-grade impregnated activated carbon for removal of airborne mercury vapor
Aldehydes	High-grade impregnated activated carbon for removal of aldehydes
HCN, Cl2, H2S	High-grade impregnated activated carbon for removal of acid gases including arsine, phosphine and hydrogen cyanide
Multi-gas (VOC, Acid Gases, Ammonia, Aldehydes, Inorganic gases)	High-grade impregnated activated carbon for removal of a wide spectrum of airborne gases and vapors
CBRN contaminants	High-grade impregnated activated carbon for removal of a wide spectrum of CBRN contaminants
Military agents	High-grade impregnated activated carbon for removal of a wide spectrum of military agents

# Safe Havens Vestibules



MineARC ChemSAFE Standard Design with custom engineered external vestibule for 20 persons per entry.

# Safe Haven Vestibules



Another feature of the ChemSAFE is a fully pressurized vestibule compartment, designed to act as a secure staging area between the enclosed protection of the safe haven and the outside environment.

the door is open for entry. The Positive Pressure Flushing System (PPFS) provides high speed pressurization and is activated via a simple electric push-button system.

MineARC vestibules feature positive pressure flushing systems that ensure the out-flow of air; preventing the ingress of contaminants while

MineARC offers a range of internal and external vestibule solutions designed to suit a wide variety of applications and entry requirements.

## Internal Vestibules

MineARC internal vestibules provide a neat, fully integrated airlock solution.

Designed as a structural modification to the ChemSAFE shell, the internal vestibule provides a seamless entry way into the main safe haven, while retaining portability of the unit as a whole. This also ensures coherent structural integrity and protection across the safe haven.



## External Vestibules



MineARC external vestibules are more suited to scenarios where direct access from an existing building door frame to the safe haven is required. The vestibule can be custom-made to measure, ensuring an air-tight access point for facility personnel to move safely between on-site buildings and the safe haven during an emergency without the risk of exposure to external atmospheric hazards.

MineARC external vestibules may also be retro-fitted to pre-existing safe havens upon request.

An optional feature of both the internal and external vestibule is a door activation locking system; enforcing that one door is locked shut at any one time during entry. This ensures no chance of accidental exposure to the external atmosphere whilst the main safe haven door is open.

MineARC offers a range of additional options and custom features, dependent on site specifications and requirements.

# GuardIAN Intelligence Network

## Reduces Operational Costs:

- ✓ Reduced servicing time
- ✓ Real-time troubleshooting, reducing maintenance staff down-time
- ✓ 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 compressed 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 Safe Haven fleet via computer, tablet or smartphone
- ✓ Programmable push email notifications for important 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 safe havens
- ✓ Eliminates safe haven misuse

## GuardIAN Refuge Chamber Monitoring System

MineARC's GuardIAN Refuge Chamber Monitoring System is an exciting new development in safe haven technology; enabling real-time monitoring; providing confidence that an operation's fleet of safe havens is emergency ready at all times.

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

GuardIAN's secure online interface is hosted on an internal server within the safe haven 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 to drill down to a detailed report of each chamber.

*GuardIAN Refuge Chamber Monitoring System is an optional upgrade for the ChemSAFE range.*



## GuardIAN System Monitoring, Event Logging and Fault Diagnostics

MineARC's Digital Controller links directly to GuardIAN, streaming real-time system data to a control room or remote location. 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.

# GuardIAN Intelligence Network

## Aura-FX Digital Gas Monitoring Diagnostics

MineARC's 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 safe haven as required.

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



## GuardIAN Live Video Monitoring and VOIP Video Phone

Live video streaming can greatly assist in evacuation planning during an emergency; providing the capability to determine the capacity of the safe haven and monitor the well-being of occupants. Internal video monitoring is provided by a remote controlled, motion activated GuardIAN IP camera. When activated, the camera will send out a live, recorded stream of the interior of the safe haven.

To assist occupants during an emergency or safety drill, GuardIAN also equips your safe haven with a VOIP video phone. This facilitates face-to-face communication between the safe haven and the control room; improving the psychological well-being of chamber occupants during an emergency, providing assistance to perform any difficult or technical procedures and facilitating face-to-face trouble shooting for service staff in order to reduce the need for multiple surface visits during a maintenance run.



## The GuardIAN Intelligence Network

The complete GuardIAN Intelligence Network is designed to provide site-wide integration; allowing real-time monitoring of the site 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)

# ChemSAFE Control Rooms

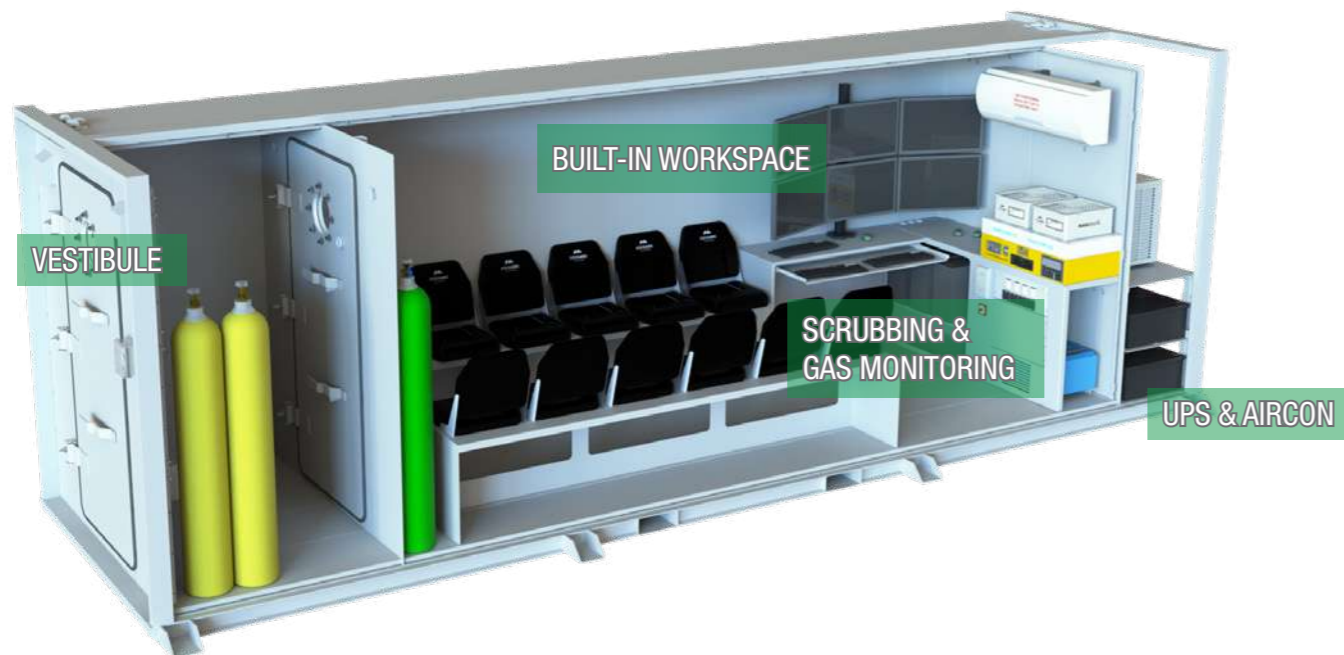
MineARC can custom engineer safe havens that can withstand the hazards and events commonly associated with the dangers of working in control rooms located within the process area of a facility. The design includes a dedicated work space that provides ergonomic visual display units (VDU) for the operators to continue to control the facility safely in an emergency situation.



MineARC has a multitude of designs and configurations available that will meet the requirements of each individual site's emergency operations procedures, whether it be an explosion, toxic release or weather related.

## Features

- Built-in, anchored workspace with recessed keyboard tray for operator workstation
- Thru-table monitor stand mounting
- Built-in plugmold multi-outlet distribution
- CPU workstations powered by Safe Haven's UPS battery backup system
- Turnkey installation



# Shelter-in-Place Options

Turn any existing shelter-in-place into a fully functioning safe haven facility

# Aura-RT Remote Gas Monitoring

The Aura-RT series is reinventing digital gas monitoring for industrial sites. The Aura-RT and GuardIAN have been adapted into robust, weather-proof enclosures to allow for reliable gas monitoring and clear alarming even on the busiest sites. The independent Aura-RT, GuardIAN and speaker/strobe enclosures enable maximum flexibility where gas sensing is critical and where personnel can benefit most from displayed information and alarms.

The Aura-RT audible alarms use voice guidance to direct workers of the necessary actions they should take during an emergency. The GuardIAN interface and visual alarms can be custom-configured to assist workers in navigating to the nearest safe haven through displayed graphics or directional lighting to reduce hesitation and confusion in an emergency.



## Aura-RT

The Aura-RT Remote has the ability to accurately monitor up to four gases at once via a series of user-friendly digital screens. The Aura-RT Remote provides real-time external gas monitoring data via the GuardIAN dashboard.

- NEMA 4X
- Multi-Gas Sensing; O<sub>2</sub>, CO, NO, NO<sub>2</sub>
- On-screen gas level monitoring
- On-screen alarm and pre-alarm status
- Alarm-indicating enclosure back-lighting



## Speaker/Strobe

The speaker and strobe combination is driven by built-in Aura-RT alarm outputs to provide clear indications during alarm and pre-alarm states. During alarm, the speaker will use voice prompts to announce the alarm and give instruction to those affected. Voice commands can be customized to suit site requirements.

- Remote mounting for best line-of-sight and audible placement near workers
- Audible alarms – Pre-alarm tone and voice-command alarm prompts
- 360° alarm strobe

## GuardIAN-Remote

The GuardIAN-Remote enables real-time monitoring that continuously displays gas and alarm status as reported by the Aura-RT. By utilizing the GuardIAN network, each GuardIAN-Remote display has access to information from all connected devices, including Aura-RT Remotes from different locations in the mine. The GuardIAN-Remote will provide confidence that the designated areas of interest are monitored and ready at all times.

- NEMA 4X
- 15" Rugged HMI with MineARC GuardIAN Interface
- 4-hour battery backup supporting Aura-RT Remote, HMI, and Speaker/Strobe
- Alarm-indicating enclosure back-lighting
- Information access to other monitoring locations on GuardIAN Network



# ChemSAFE Sealed Rooms (Shelter-in-Place)

Intended for facilities that do not have the physical space for a portable Safe Haven; ChemSAFE Sealed Rooms provide a convenient means of protecting personnel from a toxic gas release.

These modular constructed room are designed to have minimal air changes per hour (ACH). The incorporation of life support systems such as the MineARC AirGEN and AirMAX ensures occupants remain safe for the entire duration of the emergency.



## Features

- Customized modular construction
- ACH < 0.1
- 3" fiberglass reinforced plastic covered gypsum on exterior and interior with a polystyrene center
- Electrical package consisting of lights and outlets
- Integrated MineARC Life Support options



# AirBANK Pressure System For Shelter-in-Place

A critical requirement for any shelter-in-place location is maintaining internal positive pressure in order to prevent the ingress of toxic gases resulting from an accidental release. MineARC's AirBANK Pressure System offers a simple modular solution; ensuring occupants remain safe inside of a designated shelter-in-place for a specified duration.

AirBANK provides rapid pressurization, which is activated and maintained using the AirBANK CONTROL via a simple HMI touch screen. MineARC's integrated Aura-FX Gas Monitor ensures breathable air remains within acceptable limits. Alternatively, rooms can be fitted with supplementary oxygen and carbon dioxide scrubbing systems.



## AirBANK Pressure System

The AirBANK System is designed to store (11) 4,500psi or 6,000psi cylinders, and allows any number of cylinder racks to be daisy-chained as required. Each rack is leak protected by a check valve and electric solenoid, and features a panel mounted gauge to display the high and low pressure level of the unit.

- Stainless steel components throughout
- 71-3/4" [1822.45mm] x 40" [1016mm] x 32" [812.8mm]
- 4,000lbs [907kg]

## AirBANK Control

The remote activated AirBANK CONTROL is designed to maintain a life-sustaining environment via a differential pressure device. Contained in a wall-mounted NEMA-Rated enclosure, the unit features an HMI screen that monitors cylinder pressure levels; alarming when levels fall below the acceptable limit.

AirBANK CONTROL features an active by-pass of the system if internal gas levels are not within breathable air limits. The Aura-FX monitors and displays gas levels in real-time, including site-specific toxic gases if necessary.

- Regulated and silenced compressed air output.
- UPS battery backup for power loss.
- 120 or 240V input.
- 15.75" [400mm] x 16.69" [500mm] x 7.87" [200mm]
- 25lbs [11.3kg]



# AirBANK Pressure System For Shelter-in-Place



AirBANK cylinder rack housed externally to a 15 person shelter-in-place location to provide four hours of safe haven protection.



# AirMAX Life Support For Shelter-in-Place

Non-built-for-purpose buildings generally do not meet acceptable leak tightness for shelter-in-place. With ventilation shut down, a typical building can have up to five air changes per hour or higher depending on wind speed. Door operation as people enter can potentially bring additional contaminants from outside the shelter. As contaminated air infiltrates a building, the level of protection provided to the occupants diminishes with time.

A safer and more economical alternative is to seal smaller existing rooms within a larger building. There are cost-effective means to create a "very tight" room (<0.04CFM per square foot of floor space)

within a building by using specifically designed components such as clean room ceiling tiles, sealing doors, and vestibules. These tightly sealed rooms, however, cannot be occupied for long periods without the risk of occupants producing a high level of carbon dioxide and dangerously reducing oxygen levels.

The MineARC AirMAX combines two critical life support features. A Positive Pressure Maintenance System (PPMS) to keep toxic gases out and a supplemental oxygen delivery system. Optional Aura-FX Gas Monitoring ensures that external contaminants cannot enter the room, while alerting users to changes in gas levels.

# AirGEN Scrubbing & Oxygen For Shelter-in-Place

Depending on the designated occupancy of the shelter-in-place location and its volume, CO2 scrubbing and supplementary oxygen may be required.

Humans consume oxygen and expire carbon dioxide (CO2) as part of normal respiration. In high enough concentrations, CO2 can cause serious injury, leading to a loss of consciousness and eventually death. Removal of CO2 is therefore a vital necessity for any shelter-in-place location, especially where CO2 concentrations exceed one percent over the entrapment duration.

The MineARC AirGEN is a standalone air regenerative system that 'scrubs' the air inside of an enclosed location, effectively cleaning it so occupants can rebreathe it.

In certain cases, it is necessary to also provide supplemental oxygen. MineARC offers either compressed oxygen cylinders or sodium chlorate (oxygen) candles. The delivery of compressed oxygen cylinders can be automated based on established low and high limits.

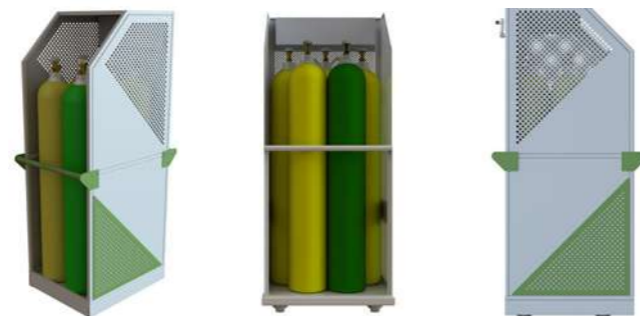


## Features

- Mobile design for easy relocation
- Oxygen and compressed air cylinder storage
- Oxygen Delivery System
- Positive Pressure Maintenance System (>0.14psi)
- 120/240V electrical connection
- Optional Aura-FX Gas Monitoring (NH3, CL etc.)

## Standard Dimensions

Occupancy:	<50 Person
Duration:	>4 Hours
Voltage:	120V or 240V
Depth:	36.25in (0.92m)
Width:	25.25in (0.62m)
Height:	76in (1.93m)
Weight (Est.):	1,100lbs (500kg)



## AirGEN Scrubber

The MineARC AirGEN is compact in size, stores for extended periods, and is easy to operate. The addition of a scrubbing system permits a shelter that is ventilated from the outside to be converted to a fully isolated environment, protected from external hazards.

- Simple single switch operation
- Easy fitment of chemical cartridges
- 18.75" [476mm] x 13.75" [349mm] x 22.6" [570mm]
- 90lbs [41kg]

## Oxygen Supply

MineARC scrubbers operate in conjunction with breathing grade O2 cylinders. Scrubbers are generally supplied with a primary and backup oxygen regulator as well as Latex Gloves for handling. To safely and securely house the O2 cylinders, MineARC manufactures secured cylinder racks.

- Breathable oxygen cylinders 303ft3 (8,580L)
- Medical grade oxygen regulator with flow selection from 1-30 persons. Supplied with rubber gloves for regulator handling

MineARC's oxygen candle is a compact source of oxygen that can be easily stored for long periods. The oxygen candle is approved for military use on submarines around the world, and provides 2,600L (92ft3) of pure oxygen upon ignition.

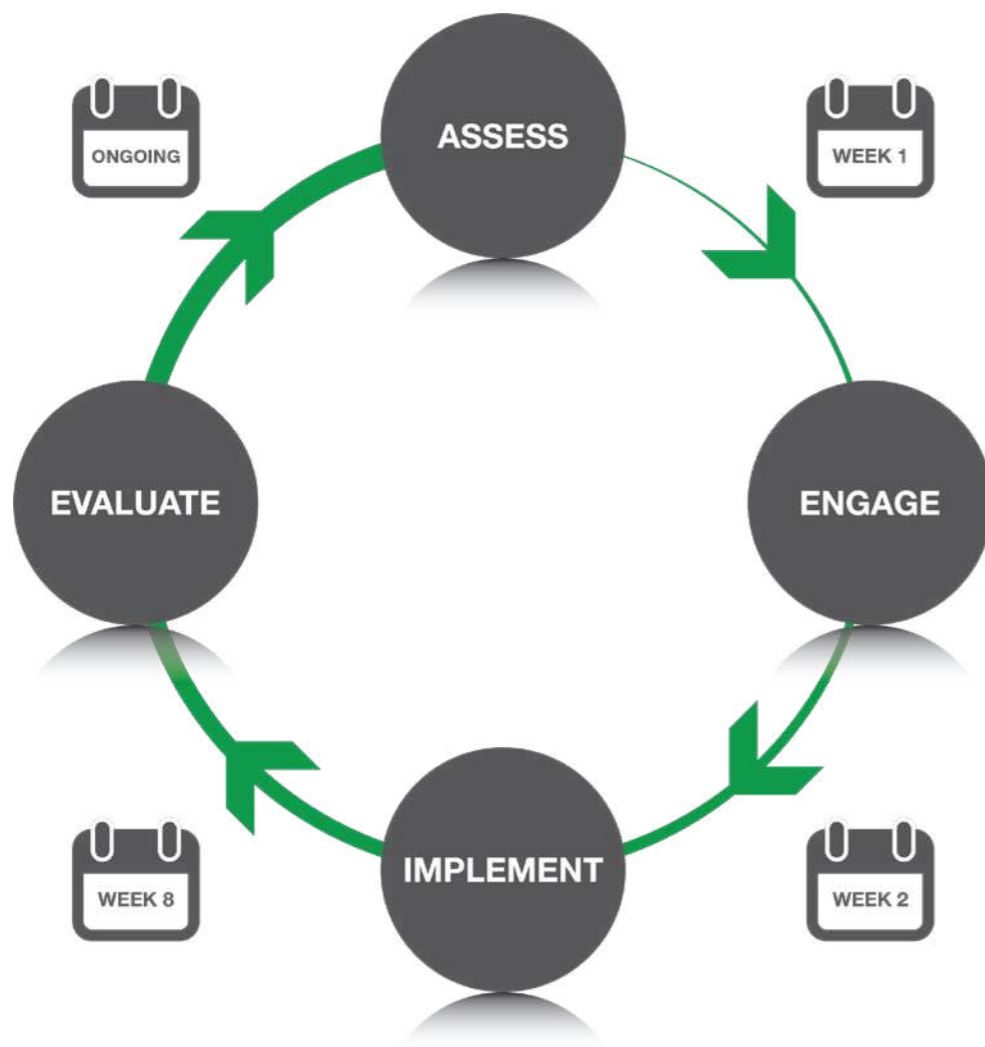
- Includes igniter, stainless steel stand, and Kevlar™ gloves.



# Turnkey Project Execution

MineARC Systems specializes in providing engineering, construction and commissioning of safe havens for existing and new facilities. Our commitment to technical excellence and innovative solutions, drives MineARC to provide the highest caliber "turnkey" execution available. We offer our customers a wide range of specialized services built

around our core belief of providing proven safe haven for personnel during an emergency situation. We strive to meet each customer's exact engineering, procurement and construction requirements and deliver a lump sum turnkey (LSTK) project with minimal impact to an operating facility's day to day business.



## All Aspects of Turnkey Project Execution are evaluated:

- ✓ Management
- ✓ Design
- ✓ Engineering
- ✓ Procurement
- ✓ Construction
- ✓ Testing
- ✓ Pre-Commissioning
- ✓ Commissioning
- ✓ Handover

MineARC foresees playing an active role in the petrochemical, refining & power generation industries, as a turnkey provider offering our comprehensive services. MineARC is contractor management certified with **Browz, Avetta** and **ISNetworld**, which connects qualified contractors, organizations and suppliers with expertise solutions.





MineARC Systems - Built for Safety.

[www.minearc.com](http://www.minearc.com)

