

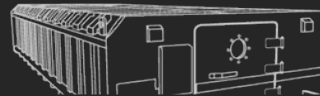
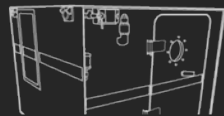


**The World's Leading Manufacturer of Emergency Life-Saving Refuge.**



# CoalSAFE® Refuge Alternative

**Presented by: JAMES RAU**  
**To: SEEK REFUGE SEMINAR**  
**Date: MAY 2010**



# MINEARC<sup>®</sup> SYSTEMS

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- Designing, manufacturing, and distributing emergency life-saving refuge systems since 1995.
- Supplier to metal/non metal mines, coal mines, tunnel boring projects, petrochemical facilities, nuclear waste facilities, offshore oil platforms, and wildfire prone regions.
- Manufacturing facilities in Dallas, Texas and Perth, Western Australia. Support offices in South Africa, Europe, and Chile.
- In excess of 700 refuge systems in more than 20 countries worldwide.
- Refuges used in real life emergencies to save lives at the Goldfields St Ives Mine (April 2006), Barrick Kanowna Belle Mine (October 2007), BHP Billiton Leinster Mine (June 2009), and Niagara Tunnel Project (April 2010).



# MISSION STATEMENT

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MineARC® Systems strive to meet our fundamental belief of providing the best quality underground safety and hygiene equipment possible. This also encompasses our belief that no business activity will come before the health and safety of our staff and customers.

We believe that through training, education, and availability of our products we can make a noted difference in the health and safety standards within the hard rock mining, tunnel boring, coal, and petrochemical industries.

Through our ongoing research and development program, we are confident that we can become the world leader in innovative safety and hygiene technology. We are always in pursuit of improvements and refinements of our existing products and practices.

We at MineARC®, will never compromise on the standards of our product due to price, or for the result of a sale.



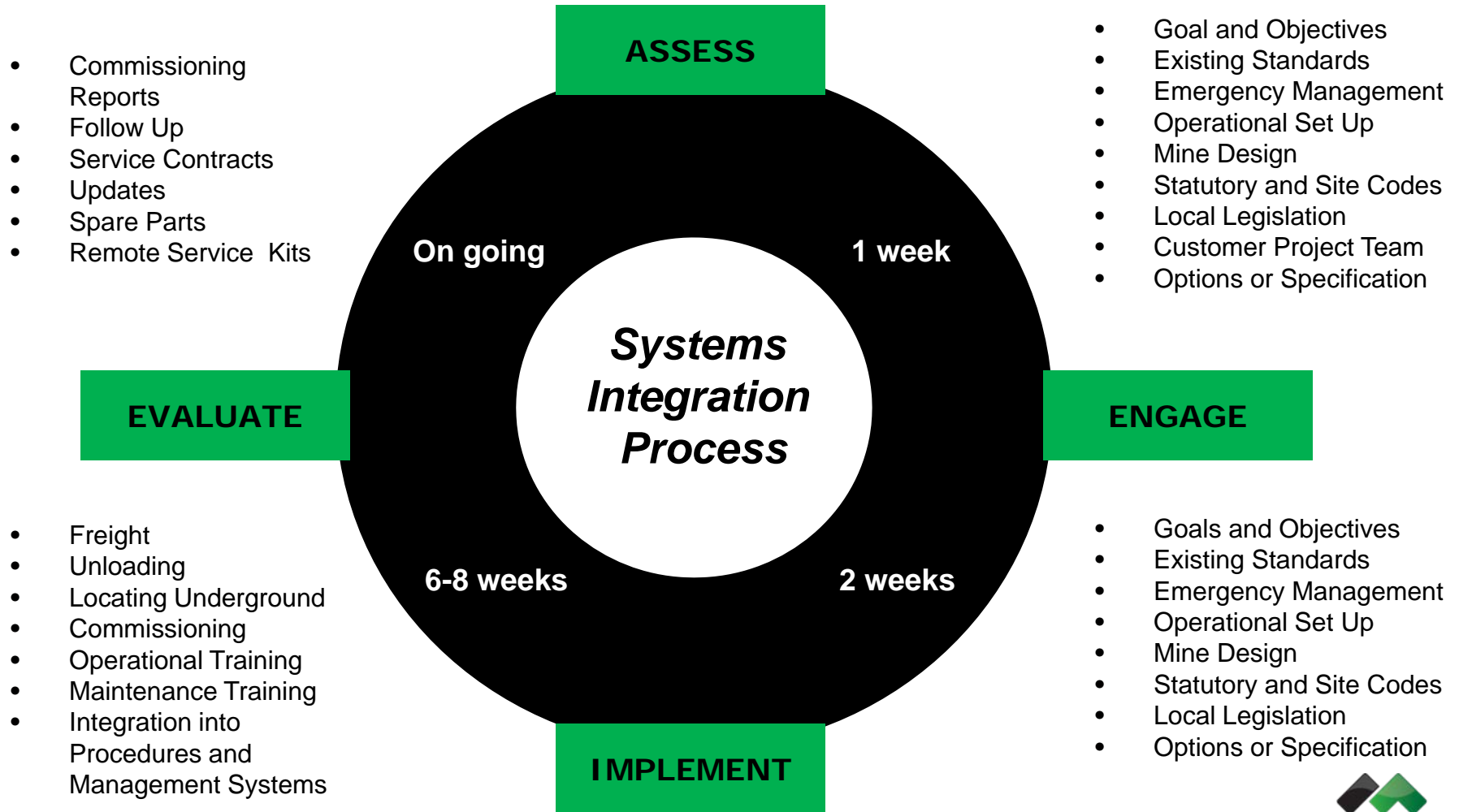
# DIFFERENTIATING FROM THE COMPETITION

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- Did not apply for West Virginia certification until December 2008 due to technology gap.
- Two years of developing and testing MARCis™ integrated cooling / scrubbing system.
- Independent manned testing for design verification and certification.
- Introduced the CoalSAFE (Secure-Area-For-Evacuation) to the coal market in late 2008 after independent design verification (manned testing).
- Immediate sales to Jim Walter Resources, Chevron Mining, and Drummond Company in Alabama. Other customers include River View Mine, Sugar Camp Energy, and Tocoa Minerals.
- Thoroughly investigates each customer's requirements and custom designs each unit to ensure customer's goals and objectives are met – Systems Integration Process.
- Preparing draft testing protocol for MSHA certification of internal components.

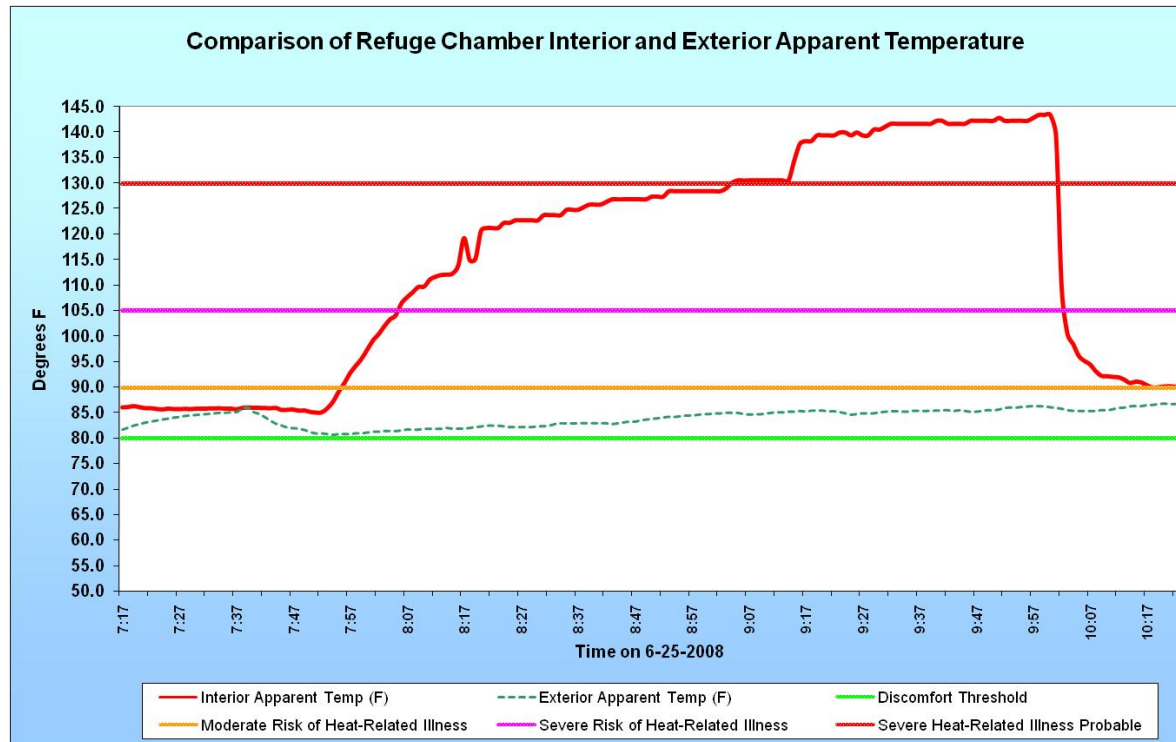


# SYSTEMS INTEGRATION CYCLE



# MSHA 30CFR PARTS 7 AND 75; FINAL RULE

- §7.503(5) The maximum mine air temperature under which the refuge alternative is designed to operate when the unit is fully occupied.
- MineARC® testing (no cooling system) – 80°F air temperature and 60ft<sup>3</sup> per occupant.
- Apparent temperature of 143°F in less than two hours.



# MINEARC® COALSAFE®

- Intrinsically safe – no electrical parts or components.
- CO<sub>2</sub> and CO scrubber.
- Intrinsically safe cooling system.
- 96 to 300 hours of life support.
- Push button airlock flushing.
- High pressure cylinders isolated from occupants.
- Removable cylinder rack.
- Pilot valves on cylinders for leak prevention.





# THE MARCIS™ INTEGRATED SCRUBBER / COOLER

- Integrated scrubber and cooler.
- Sublimated gas drives pneumatic motor for active scrubber flow.
- Pre-packaged CO and CO<sub>2</sub> chemical cartridges.
- Liquid CO<sub>2</sub> – refrigerant R744.
- Sensible heat removal capacity of 180btu/lb.
- Condensate removal - 2Qt per hour.
- Maintain internal apparent temperature below 95°F in 85°F mine temperatures.



# EMERGENCY GAS BYPASS SYSTEM

- Liquid CO<sub>2</sub> cylinders empty.
- Cylinders still contain sublimated gas at -109°F.
- Gas bypass valve allows scrubber to operate from sublimated gas stored in cylinders.
- MARCis™ running time - approximately 30 minutes per cylinder.
- Up to 20 hours operation – 20% factor of safety.
- Reduced cooling capacity.



# REMOVABLE CYLINDER RACK

- Removable cylinder rack – separately transportable.
- Compressed air, liquid CO<sub>2</sub>, and O<sub>2</sub> cylinders isolated from occupants.
- Swap out cylinder rack in less than 10 minutes.
- Separate CO<sub>2</sub> and O<sub>2</sub> cylinder banks.
- Manifold system isolated from cylinders in standby – leak prevention.
- Gas media enters manifold during pre-shift inspection and operation only.



# TRANSPORT & HANDLING

- 3 x 4" tubular skids.
- $\frac{3}{4}$ " floor plate – smooth bottom.
- 4" x  $\frac{1}{4}$ " pipe surround package.
- Lifting eyes on all four upper corners – 1" plate.
- Front 1" steel bumpers.
- Vertical corner protection – 1" steel plate with connection points top and bottom.
- Wheel & hitch packages – built to customer specifications.



# OPERATING PROCEDURES

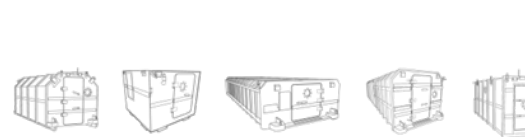
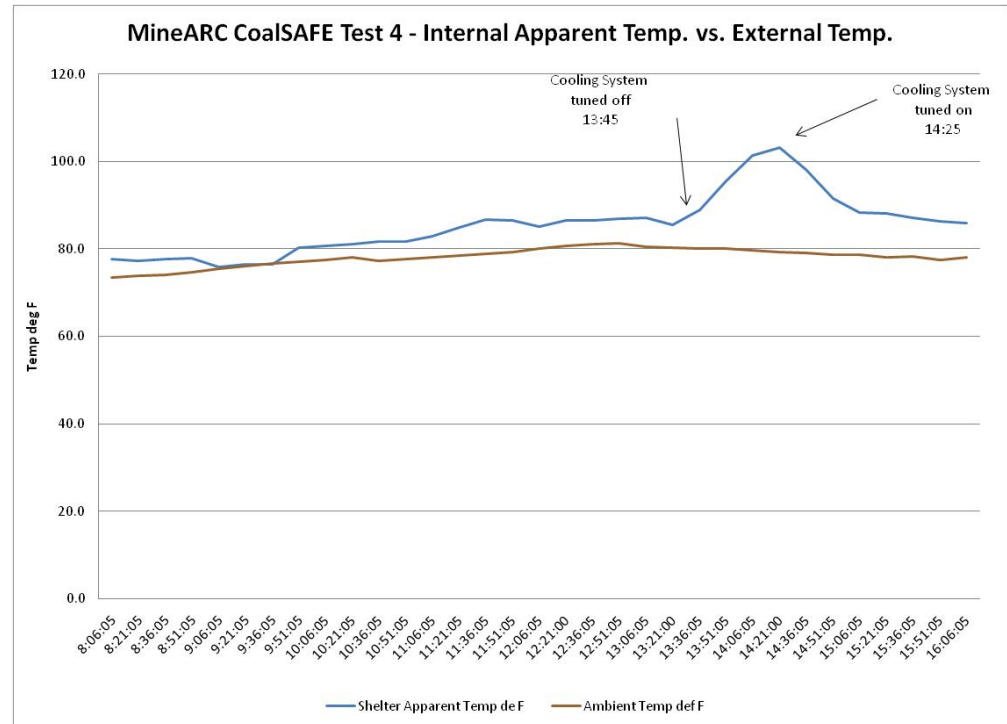
- Risk assessed operating procedure – team based.
- Two minutes to activate entire system – 5 key steps can be performed in any order.
- Numeric operating procedure with 2" green reflective numbers.
- Operating Procedure Summary sticker.
- Photographic Operating Procedures.
- Manuals and MSDS Sheets





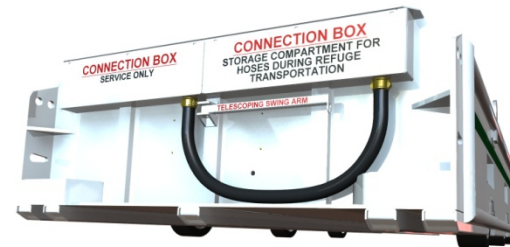
# INDEPENDENT HUMAN TESTING

- Independently monitored by IHST Inc, Dallas and ECS Corporation, Perth.
- Multiple manned tests – 8 hour duration on average.
- Maintain an internal apparent temperature below 95°F in air temperatures up to 80°F
- Mechanical and functional tests performed in excess of 300 hours.

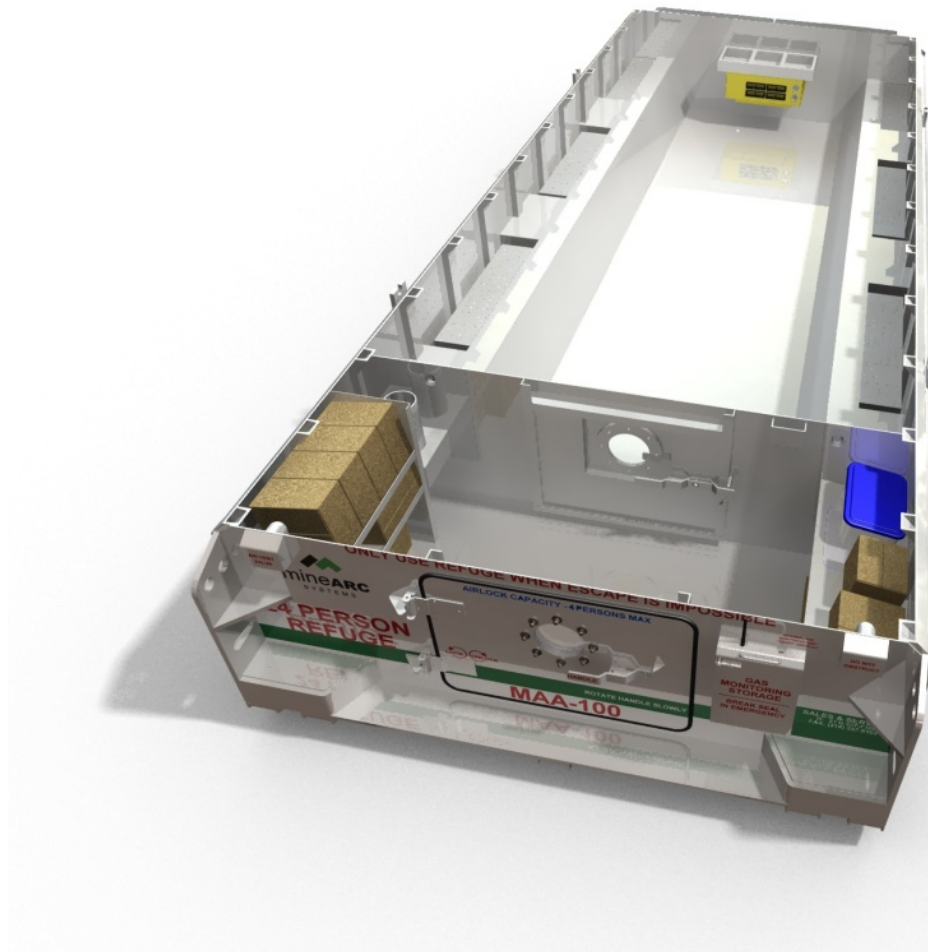


# 44" REFUGE WITH EXTERNAL CYLINDER BAY

- 12,16, 20, & 24 person occupancy.
- 48" maximum height with 4" wheel clearance.
- 10ft maximum width.
- Internal ribs for smooth external.
- Lifting eyes designed for slinging in shaft.
- Skid base section.
- Recessed wheels – lowered by changing axle bolt position.
- Separate cylinder bay.
- Umbilical hose - 3" x 6' multi layer industrial rubber hose mounted to swing arm.



# 44" REFUGE WITH EXTERNAL CYLINDER BAY



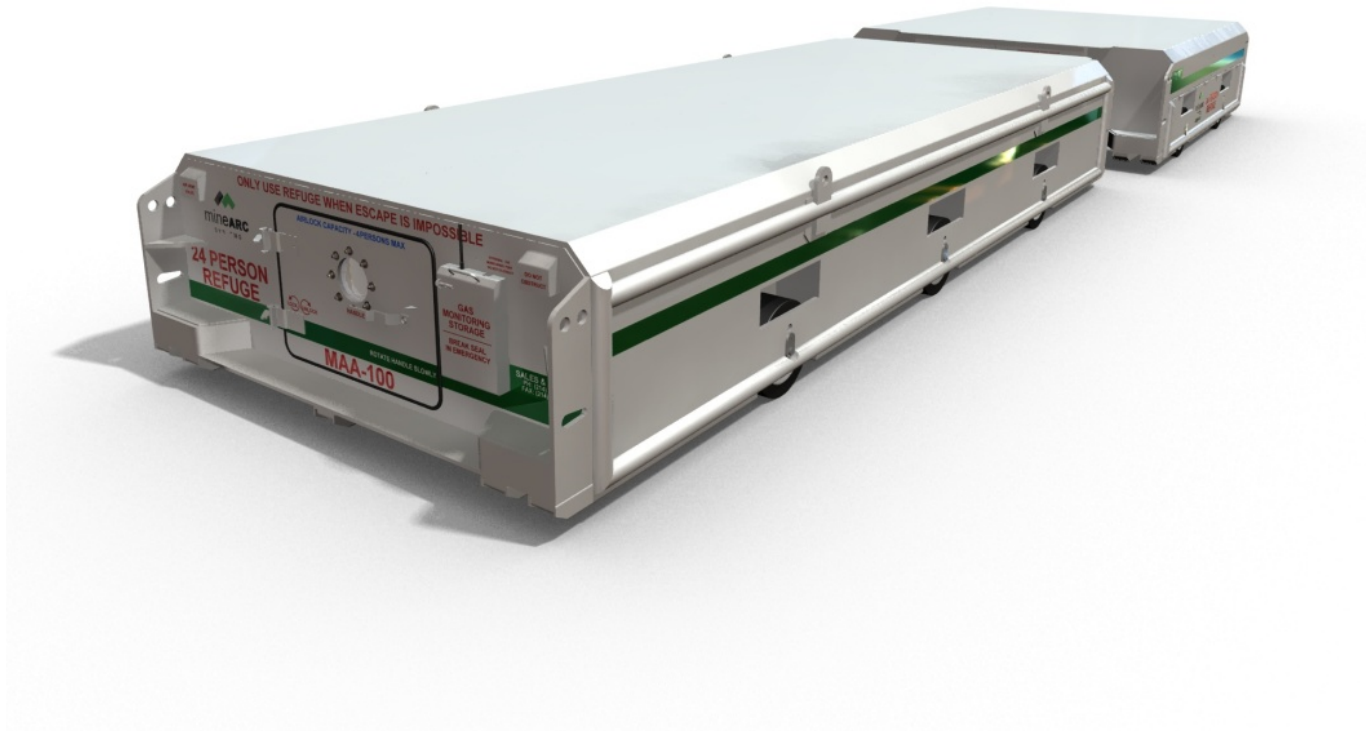


# 44" EXTERNAL CYLINDER BAY

- Constructed to same specifications as refuge.
- Hinged access panels (removable).
- Cam and groove coupling for umbilical hose connection.
- External pre-shift examination gauge hatch.
- Inline filters and quick connects with locking ball valves and identification tags – system can be connected / disconnected under pressure with no loss of gas media.
- All quick connect hoses are alternate types and cannot be connected to the wrong supply hose.



# 44" REFUGE WITH EXTERNAL CYLINDER BAY



# Thank You.



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