



Case Study:

Rio Tinto Yarwun Custom Ammonia Chemical Shelters

Rio Tinto in Yarwun, Queensland, install multiple custom refuge chambers to protect from Ammonia gas risks.

While some caustic substances are used during the alumina refining process, the most significant hazard is located off-premises, with several facilities near external sources of Anhydrous Ammonia.

Rio Tinto Yarwun is an Aluminium Oxide refinery located approximately ten kilometres northwest of Gladstone in central Queensland. First commissioned in 2004, the plant produces about 3.4M tonnes per annum, utilising a conveyor belt transfer system. The system extends out to a dedicated wharf facility, transporting incoming Iron Ore and outgoing Alumina.

Key Takeaways

- Custom ChemSAFE Safe Havens were engineered and manufactured to suit varied on-site crew numbers and meet the unique site requirements
- The dual functionality of the chambers permit use in non-emergency situations, providing additional benefit
- Additional Anhydrous Ammonia detection and protection measures were included due to the nature of the surrounding hazard



Pictured: Custom ChemSAFE Safe Haven



Challenges

- Anhydrous Ammonia risk with limited reaction time
- Fluctuating personnel and location
- Locating shelters close to personnel whilst working in restrictive space and existing moving equipment on the wharf

Solutions

- Intelligent planning to utilise limited space
- Dual-purpose facility: chemical safe haven and breakroom
- Specialised Ammonia detection

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Utilising Limited Space

Protection against toxic gas release was critical to the site, requiring strategic placement of each chemical refuge to provide the lowest possible time for any one person to reach safety. Wharf personnel are located across multiple facility areas, including the access roads, wharf entrance, and wharf length. Coupled with fluctuating populations which increase during maintenance and ship loading and unloading, ensuring capacity met these numbers was vital.

Faced with integrating refuge chambers into an already cramped wharf structure, MineARC Systems worked with Rio Tinto and HATCH to develop suitable locations and designs to allow rapid access for all personnel. Three custom ChemSAFE Safe Havens were engineered and manufactured to the site's specific needs.



Pictured: Custom chemical shelter on wharf

With limited availability on the wharf to position a new safe room, any introduced shelter needed provision for additional use. A proposed solution was to utilise the middle section of the wharf, improving accessibility, and providing an easily recognisable dual-purpose shelter.

The multifunction safe room was custom engineered from a ChemSAFE Standard Design (SD) structure. It included additional amenities to allow personnel to use the space for designated breaks during shift and shutdown periods. The interior space was optimised with specialised fold-up seating and intelligent use of fit-out to allow comfortable day-to-day occupation without altering the effectiveness of the shelter during emergencies.

Wharf Multifunction Chemical Refuge Chamber

In line with other basic safe room specifications, the ChemSAFE SD Chamber features:

- Internal Airlock with Positive Pressure Flushing System
- Air Curtain System for rapid entry
- Backup UPS for all critical systems
- Automated Oxygen Delivery System (AODS)
- GuardIAN Refuge Chamber Monitoring
- Series IV Controller with chemical scrubbing
- iVAN Voice Command System
- Aura-FX Fixed Digital Continuous Gas Monitoring
- Exterior insulation for direct sun exposure
- Internal and external ammonia detection
- Rio Tinto system A4 paint

Additional crib-type elements include collapsible tables and chairs, kitchenette with fridge, water cooler and appliances.



a)

**Dual-Purpose Shelter:
Chemical Safe Haven
and Breakroom**

b)

Elevated, Linked Security Shelter

A risk assessment determined the time needed for the security team to exit their post and seek suitable shelter outside of their existing structure was too long and could potentially expose personnel. As the security hut could not be suitably converted into a safe room, a custom chemical shelter was integrated onto the side of the security hut to allow direct access.

The ChemSAFE chamber located at the wharf entrance security station required specialised engineering to ensure the attachment would allow personnel to access the refuge chamber easily. As the security station is elevated off the ground, the shelter needed to be raised to allow safe access.

Connecting the existing building to the refuge chamber's airlock is a mating flange and bellows system. The extension provided a secure and flexible pathway from inside the building to the chamber's airlock without requiring security personnel to enter a potentially hazardous external environment, reducing risk to personnel during an accidental Ammonia release or unsafe event.



Pictured: Raised chemical shelter
attached to the security hut

Rio Tinto's global progressive thinking identified the high safety risk from neighbouring facilities at their Yarwun refinery. Combining these findings with an internal review, Yarwun collaborated with MineARC Systems to build a rapid hazard management solution with dual functionality.

As personnel safety on-site was a priority, the utmost care was taken with the placement of safe rooms, alarms, and gas monitoring systems. The three custom ChemSAFE chemical shelters now provide emergency protection for people across the wharf area.



Pictured: Adjoining security shelter sealed entry

Tailored Industry Solutions

Refuge Chambers & Toilets

- ChemSAFE Standard Design, customised
 - 8-hour standalone duration
- ChemSAFE Standard Design, elevated
 - 8-hour standalone duration

Life-Supporting Technology

- Backup UPS
- Automated Oxygen Delivery System (AODS)
- GuardIAN Refuge Chamber Monitoring
- Series IV Chemical Scrubber
- Aura-FX Fixed Digital Gas Monitoring
- Interior Airlock
- Positive Pressure Flushing System
- Internal and External Ammonia Detection

Training & Education

- Training and operation materials
- On-site operational training

For More Information

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