



Dangerous Goods Safety Bulletin No. 0212

Subject: Managing risk from underground storage of explosives

Date: 30 April 2012

Background

In recent years there has been a definite trend of increased use of underground magazines for explosives storage in Western Australia. While this practice avoids some of the downsides of traditional surface storage, it creates new challenges that may not have been recognised, or properly addressed, particularly the potential effects of unconfined blasts.

A review of research papers indicates that the overpressure from unconfined underground blasts is more destructive than is generally understood. Blast waves propagate significantly further through underground tunnels than on the surface. Cross-cuts and corners have limited effect and only decrease the overpressure by some 10 to 25 per cent for high pressures. Pressure waves may be intensified as they reflect off walls and other surfaces, resulting in peak pressures that are greater than the initial blast overpressure.

Hazard

Incorrect assumptions about the blast wave behaviour may result in flawed risk assessments that do not consider the possibility of total control failure and a subsequent detonation of all explosives within the magazine, but instead rely on the magazine deluge system to extinguish a fire, and the ventilation system to adequately manage any fumes.

The consequences of an unconfined explosion of many tonnes of explosives within an underground mine must not be underestimated — they could be fatal.

Recommendations

Resources Safety strongly recommends that mines with underground explosives magazines take the actions listed below.

- Review existing risk assessments and ensure the potential effects of an unconfined explosion are adequately addressed. Consider potential effects such as:
 - damage or destruction of ventilation fans
 - people and plant both near and away from the magazine being thrown against walls and objects
 - collapse of the mine or parts of the mine, with isolation of access and escape routes.
- Ensure crib rooms and other non-production facilities are adequately separated from the magazine. As a rule of thumb, a separation distance of twice the vulnerable facilities distance specified in Table 3.2.3.2 of Australian Standard AS 2187.1 for the NEQ stored is suggested, as measured through tunnels and passages. For example, the separation distance between a crib room and a magazine storing 15 tonnes of explosives would be 2,200 m.
- Assess refuge chambers to determine if they are adequately engineered to withstand the forces of an unconfined blast or the resulting reverse-blast wave (backdraft).
- Develop an emergency response plan for the worst-case scenario of an unconfined explosion at a magazine. Any rescue scenario is likely to involve challenges and difficulties unlike other anticipated emergencies.

- Minimise the quantity of explosives stored underground — consider using a combination of surface and underground storage to meet production needs.

A handwritten signature in black ink, appearing to read 'P. Hine', followed by a stylized flourish or underline.

Philip Hine

DIRECTOR DANGEROUS GOODS SAFETY