

Mines Safety Matters

Cyanide management on mine sites

Cyanide is commonly used in gold processing but is also used in electroplating, metal cleaning and manufacture of textiles. It can be present as a solid crystal, a liquid, or a colourless gas.

Signs and symptoms of cyanide exposure

Exposure to cyanide can occur by inhalation, skin contact or ingestion. Smell is not a reliable indicator of cyanide presence as approximately only 60 per cent of people can smell it.

The effects of exposure to cyanide occur rapidly. Within seconds to minutes, the individual can experience:



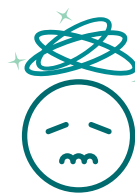
Facial flushing



Headache, nausea,
vomiting



Difficulty breathing
(rapid breathing)



Feeling faint
or dizzy



Confusion

Without immediate treatment, laboured breathing, coma, seizures, and death may occur within minutes.

Symptoms may be delayed if there is skin contact with cyanide gas or solution, as cyanide uptake from skin absorption occurs at a slower rate than inhalation. Also, skin or mucosal (e.g. lining of nose, mouth, lungs or stomach) contact with cyanide solution can cause itching, discolouration and corrosion due to the alkalinity.

Cyanide exposure management

Maintain process control

- Maintain control of processes that are critical to reducing the release of cyanide gas, such as maintaining pH above 10 to prevent conversion of liquid cyanide solutions to gas.
- Maintain a strict inspection and maintenance program on plant and equipment to limit the risk of cyanide gas release, and to prevent skin contact with solid or liquid cyanide.
- Develop processes to prevent leaks or spills, as well as the process of cleaning up a leak or spill if one occurs, in compliance with AS/NZS 4452.
- Ensure safe systems of work are in place and the effectiveness of controls can be verified.
- For mine operators, all preventative procedures and emergency response protocols must be detailed in the mine safety management system.

- Ensure workers are aware of where cyanide hazards exist and there is a risk of the release of hydrogen cyanide.
- Provide training and supervision to people who may be unfamiliar with the risks of working with or being around cyanide. This may include contractors, drivers delivering other goods, and those who work outside the plant area.

Dangerous Goods Safety Act 2004 s. 8

Duty to minimise risk from dangerous goods

Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007 r. 57, r. 58, r. 74

WHS Mines Regulations r. 37, r. 203, r. 621 to r. 625

Limit exposure

- Limit access to high-risk areas where unexpected failure of controls could have serious and fatal consequences.
- Fixed gas monitors to be installed and personal detectors must be worn when accessing these areas.
- Hydrogen cyanide gas detectors have two alarms:
 - one set at 10ppm, the peak limitation exposure standard for hydrogen cyanide gas and the level above which no person should be exposed at any time
 - the other alarm is typically set at 4.7ppm, which is the short-term exposure limit for hydrogen cyanide gas, the level above which no person should be exposed for more than 15 minutes at any one time and no more than 4 times in any one shift.
- If detectors alarm, immediately move personnel upwind and evacuate to an area with fresh air.
- Ensure adequate ventilation is available in areas where cyanide is in use, such as gold rooms, labs, other confined or enclosed spaces.
- Move away from contaminated clothing or spills.

Use and maintain personal protective equipment (PPE) and clothing

- Use PPE and protective clothing that is appropriate to the cyanide related tasks including:
 - using impervious gloves when handling cyanides
 - wearing a protective apron, rubber boots, face shield or goggles if there is the possibility of being splashed
 - using a self-contained breathing apparatus or a hazmat suit when there is a concentration of cyanide dust or gas in the air.
- Keep PPE and clothing separate from normal clothing.
- Check gloves and boots for leaks.
- Maintain self-contained breathing apparatus as per AS/NZS 1715.
- At least wear gloves when handling contaminated PPE and clothing.
- Decontaminate then launder protective clothing in the normal way.
- Grossly contaminated safety equipment or clothing cannot be reused and must be disposed of using requirements set by the local waste disposal authority.

Provide emergency response capabilities

- Ensure workers can recognise symptoms of cyanide exposure and know emergency response procedures.
- Ensure antidote (hydroxocobalamin) is readily available on-site.
- Ensure first medical response personnel are trained to respond to cyanide exposures.
- Establish access to a consulting medical doctor to oversee medical first response.
- Maintain sufficient facilities on site to support treatment of multiple patients (e.g., medical centre beds, oxygen therapy equipment, support personnel to assist).
- Maintain sufficient antidote for the treatment of multiple casualties. Antidote should be provided to accompany casualties to the nearest hospital for follow-up treatment and observation.
- Ensure agreements are in place with nearby hospitals to allow rapid response in the event of casualties being delivered. Do not assume a hospital is equipped to treat cyanide poisoning.
- Maintain an appropriate schedule of patient observation and assessment.
- Ensure workers do not drive, operate machinery, or engage in high-risk tasks until completely clear of symptoms, and assessed and medically cleared by the consulting medical doctor familiar with cyanide exposure.

Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007 r. 75, r. 76 and r. 118

WHS Mines Regulations r. 39, r. 670A and r. 668

Treating cyanide exposure

Medical first response

- Move the patient or patients upwind to fresh air to prevent further exposure to cyanide.
- If the patient is showing signs of distress, immediately administer oxygen.
- Avoid pulling contaminated clothing over the head and mouth.
- Quickly remove contaminated clothing and immediately wash the affected bodily areas for two to three minutes while maintaining oxygen therapy.
- If contact occurs with eyes, rinse for 10–15 minutes.

Next steps

- If the site has a registered nurse or a qualified paramedic working under instruction of a medical doctor, administer the antidote according to medical direction.
- If the site does not have a registered nurse or qualified paramedic working under instruction of a medical doctor:
 - maintain oxygen therapy
 - collect the antidote from site
 - transport the patient, together with the antidote, to the nearest hospital or medical facility with which site has an agreement for immediate medical treatment on arrival, maintaining oxygen therapy throughout the journey
 - contact the hospital or medical facility to notify them that the patient is in transit
 - if there is no arrangement between the mine site and the medical facility, contact the nearest medical facility to ensure they are able to assist with treatment, then transport patient and antidote as agreed.

Notifying WorkSafe

- The uncontrolled release of cyanide into a work area is a notifiable incident (irrespective of whether a person loses bodily function, requires medical treatment, or is transferred from a remote location).
- A notifiable incident involving cyanide requires a person conducting a business or undertaking to immediately notify WorkSafe on **1800 678 198** (24 hours). After making the area safe, the scene must be preserved until released by the Duty Inspector.
- The mine operator must take all reasonable steps to ensure that reportable incidents involving cyanide are notified in writing to the regulator via the Safety Regulation System, as soon as possible after becoming aware of an incident arising.

Dangerous Goods Safety Act 2004 s. 9

Duty to report certain situations

Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007 r. 121

Reportable situations prescribed

WHS Act s. 38

Duty to notify of notifiable incidents

WHS Mines Regulations r. 675V

Duty to notify regulator of reportable incidents

For further information, see the incident reporting page on the WorkSafe website at www.worksafe.wa.gov.au.