



Mining & Quarrying
OCCUPATIONAL HEALTH &
SAFETY COMMITTEE

Hazardous Chemicals Dangerous Substances Management Guide

Promoting Work Health and Safety in the Workplace

The South Australian Mining and Quarrying Occupational Health and Safety Committee

Promoting Work Health and Safety in the Workplace

This workplace industry safety resource is developed and fully funded by the Mining and Quarrying Occupational Health and Safety Committee (MAQOHSC).

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Hazardous Chemicals and Dangerous Substances Management Guide

AIM

This Guidance Material has been developed to provide small to medium mine and quarry operators with an understanding of the legislative requirements for Hazardous Chemical and Dangerous Substances Management.

Applicable South Australian Legislation

- *Work Health and Safety Act 2012 (SA)*;
- *Work Health and Safety Regulations 2012 (SA)*;
- *Dangerous Substances Act 1979 (SA)*; and the
- *Dangerous Substances Regulations 2002 (SA)*.

Legislative requirements in relation to explosives and the transport of dangerous substances can be found in more detail in other referenced publications in **Appendix G**.

1. What are Hazardous Chemicals and Dangerous Substances?

Legislative and Compliance References:
<i>Work Health and Safety Act 2012 (SA)</i>
<i>Work Health and Safety Regulations 2012 (SA)</i>
<i>Dangerous Substances Act 1979 (SA)</i>
<i>Dangerous Substances Regulations 2002 (SA)</i>
Globally Harmonised System of Classification and Labelling of Chemicals (GHS) 3 rd Edition
Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code)
<i>Explosives Act 1936 (SA)</i>
<i>Explosives Regulations 2011 (SA)</i>

1.1. Hazardous Chemicals

Hazardous chemicals are substances, mixtures and articles that can pose a health or physical hazard to humans, other organisms or the environment.

Some processes will produce hazardous chemicals as by-products or waste. These hazards may not be easily identified when generated at the workplace.

For example: hydrogen sulphide in a sewer or diesel exhaust fumes from truck engines. Information on by-products may be available from a Safety Data Sheet (SDS), but not always.

You should find out what hazardous chemicals may be produced from work activities. For example: use of welding rods may release toxic fumes or vapours, and grinding metals may release toxic metal dust or fumes.

There are two broad types of hazards that are associated with hazardous chemicals:

Health hazards:

These are the properties of a chemical that cause adverse health effects. Adverse health effects can be acute (short term) or chronic (long term).

Typical acute health effects include headaches, nausea or vomiting and skin irritation or corrosion, while chronic health effects include asthma, dermatitis, nerve damage or cancer.

Examples of chemicals with health hazards include poisonous (toxic) chemicals, chemicals which cause skin corrosion (such as acids) and carcinogens (cancer causing chemicals).

Exposure to these chemicals usually occurs through inhalation, ingestion or skin contact.

Physicochemical hazards:

These are physical or chemical properties that can result in immediate injury to people or damage to property. Inappropriate handling can often result in injury to people and/or damage to property.

Examples of chemicals with physicochemical hazards include flammable liquids, compressed gasses and explosives.

Infectious substances, radioactive sources and environmental poisons are not considered hazardous chemicals.

For legal purposes, the *Work Health and Safety Regulations 2012* (SA), defines a hazardous chemical as any substance, mixture or article that satisfies the criteria for a hazard class in the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

However, it does not include a substance, mixture or article that satisfies the criteria solely for one the following hazard classes:

- a) acute toxicity—oral—category 5;
- b) acute toxicity—dermal—category 5;
- c) acute toxicity—inhalation—category 5;
- d) skin corrosion/irritation—category 3;
- e) serious eye damage/eye irritation— category 2B;
- f) aspiration hazard—category 2;
- g) flammable gas—category 2;
- h) acute hazard to the aquatic environment—category 1, 2 or 3;
- i) chronic hazard to the aquatic environment—category 1, 2, 3 or 4;
- j) hazardous to the ozone layer.

1.2. Dangerous Substances

Dangerous substances and dangerous goods are listed in the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (“ADG Code”). The ADG Code contains a list of all chemicals classified as dangerous goods for transport. When these chemicals are stored they are known as dangerous substances.

Dangerous substances are chemicals that include corrosive, flammable, explosive, spontaneously combustible, toxic, and oxidising or water reactive substances.

Dangerous substances include items, such as petrol, liquefied petroleum gas (LPG), pesticides, fertilisers and acids. Dangerous substances will normally have one or more health and physiochemical properties and may also be classed as hazardous chemicals.

A Safety Data Sheet will identify if a chemical is a hazardous chemical and also identify in Section 14 of the *Work Health and Safety Regulations 2012* (SA) when a substance is classified as a dangerous good. This should also be stated on the chemicals label.

2. Prohibited and Restricted Chemicals

Legislative and Compliance References:	
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations: 380 - 388
<i>Work Health and Safety Regulations 2012 (SA)</i>	Schedules: 10, Restricted Carcinogens, 20, Substance prohibited in underground mines

Schedule 10 of the *Work Health and Safety Regulations 2012 (SA)* prohibits some cancer causing substances (carcinogens) from use and allows others only to be used in specific circumstances.

However, it is unlikely, that these substances would be used in a small to medium mine or quarry process.

Note: *Underground mining operations have prohibitions and restrictions set out in Schedule 20 of the Work Health and Safety Regulations 2012 (SA).*

3. Who has a Duty to Manage Hazardous Chemicals and Dangerous Substances?

The following is the South Australian Work Health and Safety legislative requirements for Hazardous Chemicals for a 'person conducting a business or undertaking' (PCBU).

A PCBU is the current legal term for a business or employer under the South Australian Work Health and Safety legislation.

The aim of the Work Health and Safety Regulations is to ensure adequate information is given to workers so that chemicals can be stored and handled safely on site.

As small mines and quarries are likely to have a 'senior representative' or 'site manager', the responsibilities for the PCBU are written in these terms for the majority of this document.

Work Health and Safety Regulations 2012 (SA)

Chapter 7 – Hazardous chemicals

Part 1 – General workplace management

Division 2 – Obligations relating to data sheets and other matters

3.1. Labelling Hazardous Chemicals

A PCBU must ensure that:

- Containers of hazardous chemicals used, supplied or produced at the workplace are labelled correctly. This includes hazardous chemicals that are transferred or decanted from their original containers at the workplace.
- Each label includes information which identifies the chemical, its ingredients, basic health information, etc., in accordance with Schedule 9, Part 3 of the *Work Health and Safety Regulations 2012 (SA)*.
- Hazardous chemicals in enclosed systems, such as pipework or reaction vessels, are identifiable to any person who may be exposed to the contents.

- Where a container does not have a label, it must be stored by itself and not used until it has been correctly identified and labelled. If the substance cannot be identified then it must be disposed of.

3.2. Safety Data Sheets (SDS)

A PCBU must:

- Obtain the relevant Safety Data Sheets from the manufacturer, importer or supplier no later than when the hazardous chemical is first supplied to the workplace, or ideally, before the hazardous chemical is to be used.
- Ensure that the Safety Data Sheets are accessible to any worker, emergency services person or anyone else who may be exposed to the hazardous chemical.

3.3. Hazardous Chemicals Register

A PCBU must ensure that:

- A hazardous chemicals register is kept and maintained.
- The register is readily accessible to workers and emergency services staff.
- The register includes details of all hazardous chemicals used, handled or stored at the workplace, as well as their corresponding Safety Data Sheets.

3.4. Manifest of Hazardous Chemicals

- A PCBU will be required to prepare a manifest once manifest quantities are exceeded. These quantities are defined in **Appendix C**.
- The manifest must include details, such as the PCBU contact information, the types and quantities of hazardous chemicals stored at the site, and a site plan of the workplace identifying where the hazardous chemicals are located, refer to schedule 12 of the *Work Health and Safety Regulations 2012* (SA).
- If manifest quantities are exceeded you will also need to submit your emergency plan to the relevant emergency services.

3.5. Placards

A PCBU is required to put up placards once placard quantities of a chemical are exceeded. These quantities are defined in **Appendix C**. The requirements for placards and outer warning placards are defined in Schedule 13 of the *Work Health and Safety Regulations 2012* (SA).

Work Health and Safety Regulations 2012 (SA)

Chapter 7 – Hazardous chemicals

Part 1 – Hazardous chemicals

Division 5 – Control of Risk - Obligations of person conducting business or undertaking

3.6. Managing Risks

A PCBU must manage risks to health and safety associated with the using, handling, generating or storing of hazardous chemicals in the workplace.

A PCBU must:

- Identify any risks of physical or chemical reactions.
- Ensure ignition sources are not introduced into areas where a fire or explosion hazard exists.
- Keep hazardous chemicals stable.
- Contain and manage spills.
- Protect pipe work and containers that hold hazardous chemicals from impact.
- Keep and maintain appropriate firefighting, emergency and safety equipment.
- Review the hazard control measures every 5 years.

Safe Work Australia has an approved *Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace* which is a practical guide to achieving compliance.

This publication is available on the SafeWork SA website: <http://www.safework.sa.gov.au>.

3.7. Airborne Contaminants / Workplace Exposure Standards (WES)

- A PCBU must ensure that no person at a workplace is exposed to a substance in airborne concentration that exceeds the workplace exposure standard for that substance.
- Air monitoring may be required if a PCBU is not certain whether or not Workplace Exposure Standards are being exceeded or to determine if there is a risk to health.
- These records must be made available to employees, and are to be held for a period of no less than 30 years.
- A PCBU must also manage hazardous atmospheres to ensure safe oxygen levels for workers and no build-up of combustible gas, vapour, mist, fume or dust; as well as control of ignition sources.

3.8. Health Monitoring

- A PCBU must provide health monitoring where there is significant risk to the worker's health due to either ongoing exposure to hazardous chemicals referred to in Schedule 14 of the *Work Health and Safety Regulations 2012* (SA), or any other substance where there is a risk to health and a valid way of detecting a health effect or determining exposure.
- There are specific requirements for workers using lead or doing asbestos removal work as detailed in the *Work Health and Safety Regulations 2012* (SA), Regulation 395, Regulation 405-418 (Lead) and Regulation 435 - 444 (Asbestos).

- Health monitoring must be conducted by a competent medical practitioner (Safe Work Australia website provides guidance).
- In situations where exposure to a hazardous substance could lead to disease or ill health, and where there is a means of measuring the effect, the PCBU must take all reasonable steps to obtain the health monitoring report and undertake any remedial action that is needed.
- The health monitoring must be conducted at the expense of the PCBU and the records must be kept for 30 years (Asbestos records must be kept for 40 years).
- The requirements for health monitoring must be explained to the worker before they commence work using a hazardous chemical, and a copy of the results of health monitoring must be given to the worker.
- If there is an adverse health result, i.e. the worker has an illness, or the report contains recommended remedial measures, a copy of the report must also be forwarded to SafeWork SA.

3.9. Induction, Information, Training and Supervision

A PCBU must:

- Provide adequate supervision, instruction and training to all employees who may be exposed to hazardous chemicals in the workplace.
- Ensure that instruction and training is adequate and addresses any risks identified in a risk assessment.
- Ensure that instruction and training is provided in a suitable manner for all employees.

3.10. Dangerous Substances Legislative Requirements

The aim of the dangerous substances legislation is to ensure the safe storage and handling of dangerous substances to protect workers, the public and the environment from harm.

A licence may be required for the keeping of prescribed quantities of dangerous substances, LP gas (Class 2.1), flammable liquids (class 3), toxic substances (Class 6) and corrosive substances (Class 8).

A person must, in keeping, handling, conveying, using or disposing of a dangerous substance, or in transporting dangerous goods, take such precautions and exercise care to avoid danger to the health and safety of any person, the safety of property and prevent the risk of environmental harm.

4. Record, Assess and Manage Risks Associated with Hazardous Chemicals

The following table provides Site Managers with a step by step overview of the requirements to record assess and manage risks associated with hazardous chemicals.

	ACTION	DESCRIPTION
1	Hazardous Chemicals are identified.	<p>Site Managers are responsible for determining all hazardous chemicals used, handled or generated within their operations. Some hazardous chemicals may also be classed as dangerous substances.</p> <p><u>Refer to section 1.0 and 2.0</u></p>
2	Access and review Safety Data Sheets (SDSs) for all chemicals.	<p>Safety Data Sheets contain information on how to store and handle a chemical safely. It is a legislative requirement that Safety Data Sheets must be accessible to workers via the site hazardous chemicals register.</p> <p><u>Refer to section 5.0</u></p>
3	Conduct Risk Assessment (if needed) and Implement Controls.	<p>A risk assessment should allow you to identify controls needed to use a chemical safely on site. The Risk Assessment may include consideration of the storage requirements, spill or emergency response issues, personal protective equipment (PPE), first aid, monitoring and disposal requirements.</p> <p><u>Refer to section 6.0</u></p>
4	Record chemical on site register, and develop a manifest (if needed by assessing the quantity on site).	<p>List the chemicals on site Register by product name or identifier. Based on the quantity determine if a dangerous substances licence is needed or if the chemical needs to be entered on a manifest for the Emergency Services.</p> <p><u>Refer to section 7.0</u></p>
5	Determine what emergency equipment is required.	<p>The Safety Data Sheet will provide a guide as to what controls are required to prevent worker exposure as well as if emergency response equipment and personal protective equipment is required. Emergency Response procedures should be documented in the site Emergency Response Plan.</p> <p><u>Refer to section 10.0 and 11.0</u></p>
6	Establish storage areas, placarding (if required) and signage.	<p>Safety Data Sheets provide guidance on appropriate storage requirements. It is a Legislative requirement that all chemicals have appropriate labelling and if in large or bulk (legislated) quantity have placards at their location and site entry points.</p> <p><u>Refer to sections 12.0, 13.0, 15.0</u></p>

7	Ensure all chemicals are correctly labelled.	<p>All chemicals must be correctly labelled. Ensure labels for chemicals purchased meet GHS labelling requirements from 1 Jan 2017. Decanted or unpackaged chemicals will need to be labelled as per the <i>Code of Practice for Labelling Hazardous Chemicals</i>. Bulk or Transport containers will be labelled to the ADG Code via Transport Placards.</p> <p style="text-align: center;"><u>Refer to section 14.0</u></p>
8	Ensure workers are inducted and trained in all safety requirements.	<p>All workers who interact with a chemical must be inducted and trained in all aspects of its associated hazards, handling, personal protective equipment requirements, storage and emergency response.</p> <p style="text-align: center;"><u>Refer to section 16.0</u></p>
9	Establish monitoring and review programs / schedule.	<p>Monitoring, auditing, inspection and review programs ensure the integrity of systems and controls.</p> <p style="text-align: center;"><u>Refer to sections 18.0 and 19.0</u></p>

To assist mines and quarries meet the above obligations, the following information provides guidance on actions required to manage hazardous chemicals in the workplace.

5. Safety Data Sheets (SDS)

Legislative and Compliance References:	
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 330, 339, 344
<i>Work Health and Safety Regulations 2012 (SA)</i>	The Safety Data Sheet must comply with clause 1 of Schedule 7 unless Regulation 331 applies.

5.1. What are Safety Data Sheets?

Safety Data Sheets contain critical information relating to a supplied Hazardous Chemical.

A Safety Data Sheet for a hazardous chemical must state the following information about the chemical:

- Section 1: Identification: Product identifier and chemical identity;
- Section 2: Hazard(s) identification;
- Section 3: Composition and information on ingredients, in accordance with Schedule 8;
- Section 4: First aid measures;
- Section 5: Firefighting measures;
- Section 6: Accidental release measures;
- Section 7: Handling and storage, including how the chemical may be safely used;
- Section 8: Exposure controls and personal protection;

- Section 9: Physical and chemical properties;
- Section 10: Stability and reactivity;
- Section 11: Toxicological information;
- Section 12: Ecological information;
- Section 13: Disposal considerations;
- Section 14: Transport information;
- Section 15: Regulatory information;
- Section 16: Any other relevant information.

Safety Data Sheets are a primary source of information to assist with conducting risk assessments and providing induction and training to workers.

5.2. Obligations to obtain and supply Safety Data Sheets

Site Managers must ensure that Safety Data Sheets are available for all hazardous chemicals used and stored within their site.

Suppliers have the obligation to provide Safety Data Sheets with the first supply of a hazardous chemical (*Work Health and Safety Regulations 2012 (SA)*, Regulation 339) to a workplace.

If no Safety Data Sheet is supplied upon receipt of any substance, Site Managers should contact the supplier, manufacturer or importer to obtain the appropriate Safety Data Sheet before use.

Safety Data Sheets may also be downloaded from the manufacturer's website (although not all manufacturers provide their Safety Data Sheets online, they can be requested via email).

Site Managers must ensure that:

- Safety Data Sheets are obtained and reviewed prior to use of the substance.
- Safety Data Sheets supplied must meet the requirements of Schedule 7 of the *Work Health and Safety Regulations 2012 (SA)*.
- All Safety Data Sheets must be less than 5 years old (manufacturers are required to review them every 5 years). Generic Safety Data Sheets supplied by third party database companies or those obtained from international sources, should not be relied upon as they may not contain all original manufacturers' information.
- All Safety Data Sheets must be made readily available to workers who may use a hazardous chemical. This could be in the form of hard copy near the substance or digital copy accessed via mobile technology.

6. Hazard Identification, Risk Assessment and Control

Legislative and Compliance References:

Work Health and Safety Regulations 2012 (SA)

Regulations 32 - 38, 351, 353, 354
 Risk Assessments are detailed in the *Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace*

While general information relating to known hazards and risks associated with any chemical can be found within the Safety Data Sheets.

Site Managers who do not know the appropriate controls for exposure to a hazardous chemical should conduct a risk assessment to determine the hazards associated with its storage and use. The findings of the risk assessment will determine the requirements for **Sections 7.0 – 19.0** of this document. MAQOHSC can offer assistance in the risk assessment process.

The details on how to conduct a hazardous chemical risk assessment are found in the *Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace*. An example of a Risk Assessment worksheet is provided in **Appendix B**.

The following table provides a general overview of the considerations when conducting a risk assessment:

	ACTION	DESCRIPTION
1	What is the chemical / substance?	Review Safety Data Sheets for proprietary chemicals and site work processes to identify other exposures e.g. work process generated dust or welding fumes. Consider the types of substances and the properties. <ul style="list-style-type: none"> Physical Form of the substance (powder, liquid, gel, gas) and concentration Chemical and physical properties
2	How can workers be exposed to chemicals? Consult with workers.	<ul style="list-style-type: none"> Nature of the work being undertaken. Where will the substance be used? Routes of exposure (inhaled, swallowed (ingested), skin, eyes (absorbed)) Frequency of exposure (how often and for how long?) Consider Exposure Standards Section 17.0
3	What would the effects of any exposure be?	<ul style="list-style-type: none"> skin / eye, irritation poisoning aspiration burns consider both short and long term health effects e.g. carcinogens
4	Are there any other hazards? What are other potential impacts?	<ul style="list-style-type: none"> Will there be adverse effects if accidentally mixed with other chemicals? e.g. toxic fumes, noxious fumes, explosive gases? Is it flammable? e.g. are there any ignition sources? Can it combust due to environmental factors? e.g. contact with water, air, extreme heat or cold? Potential for explosion? e.g. due to compressive build up, explosive material, vapour release?

5

What are the potential environmental impacts?

- Is there potential for harm to the environment through its use, storage or disposal?
- Can other organisms / animals come into contact with the chemical?
- Is there the chance that a spillage could enter a drain, stormwater or other watercourse?

7. Registers and Manifests

Legislative and Compliance References:

<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 346, 347, 348
<i>Work Health and Safety Regulations 2012 (SA)</i>	Schedules 11, 12

7.1. The Difference between a Hazardous Chemicals Register and Manifest

A hazardous chemicals register is a list of hazardous chemicals on site, accompanied by the current Safety Data Sheets for each of those chemicals. It does not include hazardous chemicals in-transit or consumer products.

Under the *Work Health and Safety Regulations 2012 (SA)*, a hazardous chemicals register is required to be prepared and kept up-to-date so that people can easily find information about chemicals stored, handled or used at the site. An example of a combined hazardous substance register / Manifest is provided in **Appendix A**.

Since manufacturers and importers of hazardous chemicals are required to update their Safety Data Sheets at least every five years, you will need to obtain a new Safety Data Sheet from the chemical supplier periodically to ensure you have the most up-to-date and current Safety Data Sheets.

7.2. What chemicals don't need to be recorded on the Register?

Work Health and Safety Regulations 2012 (SA), Regulation 344 and Regulation 346, determine that chemicals which are consumer products (such as hand cleaner, detergents, bug sprays, general household cleaning and office products) are not required to be recorded on a site register nor have Safety Data Sheets maintained, as long as they are used in a method and quantity consistent with domestic household use.

8. Dangerous Substances Licences

Determining the total stored quantities of Liquefied Petroleum Gas (LPG), flammable liquids (Class 3), toxic substances (Class 6) and corrosive substances (Class 8) is needed to assess if the site needs a licence to keep Dangerous Substances.

8.1. Liquefied Petroleum Gas (LPG)

A licence is required for any premises which keeps more than 250 kilograms of LPG.

8.2. Flammable Liquids (Class 3)

A licence is not required if the following quantities are kept:

- a) up to 120 litres of Class 3, Packing Group I or II provided that it is contained in packaging which has a capacity of less than 60 litres;
- b) up to 1 200 litres of Class 3, Packing Group III;
- c) up to 5 000 litres of Class 3, Packing Group I or II and up to 5 000 litres of Class 3, Packing Group III provided that the premises have an area of not less than two hectares and in or on which premises there is carried on a rural industry and that:
 - I. any above ground storage is separated from protected works as defined in AS 1940 The Storage and Handling of Flammable and Combustible Liquids and any part of the boundary of the land by not less than 15 metres; and
 - II. the area of ground around the storage is kept clear of combustible vegetation or refuse for a distance of not less than 3 metres;
- d) any quantity of Class 3, Packing Group I or II provided that it is contained in packaging which has a capacity not exceeding 5 litres and where the substances as packaged are manufactured products;
- e) any quantity of Class 3, Packing Group III provided that it is contained in packaging which has a capacity not exceeding 25 litres and where the substances as packaged are manufactured products.

Note: Any quantity of flammable liquids that exceeds (a) to (e) above will require a licence to keep.

8.3. Toxic and Corrosive Substances (Classes 6 and 8)

A licence is required for greater than 250 (kg or L) of Packing Group I, 2000 (kg or L) of Packing Group II or 5000 (kg or L) of Packing Group III.

If smaller quantities of one or more Packing Groups are stored, use the equation below to determine if a licence is required.

Do I need a licence for Class 6 and 8 substances?

If the following equation is true

$$\frac{LI+SI}{250} + \frac{LII+SII}{2000} + \frac{LIII+SIII}{5000} \leq 1 \text{ then a licence is not required}$$

Where

- LI** the volume in litres of liquids substances in packing group I
- SI** the mass in kg of solid substances in packing group I
- LII** the volume in litres of liquid substances in packing group II
- SII** the mass in kg of solid substances in packing group II
- LIII** the volume in litres of liquid substances in packing group III
- SIII** the mass in kg of solid substances in packing group III

An application to store dangerous substances can be made via the SafeWork SA website.

9. Hazardous Chemical Manifest

A manifest is a written summary of specific types of hazardous chemicals with physicochemical and acute toxicity hazards that are used, handled or stored onsite and is primarily for chemical emergency planning.

9.1. What chemicals need to be recorded on the Manifest?

A manifest is required where the quantities of those hazardous chemicals exceed the threshold amounts found in **Appendix C**.

Its primary purpose is to provide the emergency services organisations (MFS and CFS) with information on the quantity, classification and location of hazardous chemicals at the workplace. It also contains information such as site plans and emergency contact details.

The manifest must comply with the requirements of Schedule 12 of the *Work Health and Safety Regulations 2012* (SA) and it must be updated as soon as practicable after any change to the amount or types of chemicals being used, stored, handled or generated on site.

The manifest must include:

- Name of responsible person or business;
- Address of the workplace;
- Version history and review date;
- Business hours and after hours contact details of at least two persons (if an incident occurs);
- Name of chemical, proper shipping name, UN number, class and division as stated in Table 3.2.3 of the ADG Code;
- Quantity / volume / weight (generally record the largest amount to be stored); and
- Location within site. (plan of workplace)

9.2. Site Plans

The Manifest site plan / map must be maintained showing the physical location of the goods described on the manifest and include appropriate descriptions and legends / symbols that clearly identify what chemical is located where.

- Drains on the site
- Fire services and isolation points for fuel and power
- Main entrance and entry and exit points from the workplace

The manifest and map should be kept near the main entrance and be available to emergency services upon request. An example of a combined hazardous substance register / manifest is provided in **Appendix A**.

10. Emergency Preparedness and Emergency Planning

Legislative and Compliance References:	
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 43, 357, 359, 360, 361, 362, 557, 664
<i>Mining Regulations 2011 (SA)</i>	Regulation 80 (5) k)
<i>Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace</i>	www.safework.sa.gov.au
Safe Work Australia Emergency Plans fact sheet	www.safeworkaustralia.gov.au
<i>DRAFT Code of Practice - Mining Regulations</i>	www.safeworkaustralia.gov.au
MAQOHSC Emergency Plans Guide	www.maqohsc.sa.gov.au

Site Managers must ensure that Emergency Response Plans (ERP) are developed, implemented, communicated and tested within their site. Emergency Response Plans must also be developed in consultation with workers and external emergency services organisations.

Refer to the MAQOHSC Emergency Plans Guide for information on how to develop Emergency Response Plans.

Additionally, Site Managers must also ensure that emergency response equipment is provided and maintained to deal with all potential emergencies.

A Safety Data Sheet provides suggested emergency equipment such as fire extinguisher types, recommended spill clean-up kits, personal protective equipment and first aid supplies.

Refer to the *Work Health and Safety Regulations 2012 (SA)* Chapter 10, Division 5, Regulation 664 Emergency Management and the *Code of Practice for Managing Risks of Hazardous Chemicals in the Workplace*.

11. Hazardous Chemical Controls and Personal Protective Equipment

Legislative and Compliance References:	
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 36 (general), 351-2 (chemical), 617-8 (mines)
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 44, 45, 46, 47

Site Managers must ensure that appropriate controls are in place to manage risks for all hazardous chemicals on their site.

This may include:

- **Engineering Controls** - For storage – Segregation, bunding, and monitoring equipment – alarms. For worker exposure - Engineering e.g. pumping via enclosed systems rather than allowing exposure; Ventilation e.g. Local exhaust extraction, dilution. For dusts – enclosed cabins, water sprays, road stabilizing, wheel washes etc.
- **Administrative controls** - Signage, labels and placarding, procedure development, training and exposure time limiting
- **Personal Protective Equipment** - Overalls, chemical aprons, respirators, gloves (both for use of the chemical and emergencies)
- **Emergency Equipment** - Firefighting media, spill kits

Most chemicals will require workers handling them to use some form of personal protective equipment. Recommended personal protective equipment for individual chemicals is identified within the relevant Safety Data Sheets.

When selecting personal protective equipment consideration must be given to the nature of the chemical, the potential exposure level and how it will be used in the workplace. Personal protective equipment recommendations in the Safety Data Sheets are general and may not necessarily reflect the site exposure to the chemicals based upon their actual use.

Any personal protective equipment required for the handling and use of chemicals as part of any person's job must be provided by the PCBU. PCBUs have the responsibility to ensure all personal protective equipment is available, fit for purpose and fits the user properly.

All personal protective equipment provided must comply with Australian Standards; some are detailed in **Appendix G**.

12. Storage

Legislative and Compliance References:	
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 355, 356, 358, 363-367
<i>Dangerous Substances Regulations 2002 (SA)</i>	Regulations 41, 46, 48, 59-62

Site Managers must ensure that appropriate storage areas and facilities are provided for all hazardous chemicals on their site.

Storage areas must:

- Protect chemicals from damage or degradation;
- Ensure chemicals do not become unstable due to exposure to elements or other chemicals;
- Are protected from theft and unauthorised access;
- Protect workers and environment from unintended exposure, spills or other impacts;
- Limit and / or contain impacts of an incident or emergency event (i.e. contain spill, limit fire); and
- Do not create a greater risk through incorrect storage, proximity to other chemicals or ignition sources.

12.1. General Requirements

When establishing storage areas Site Managers must ensure:

- All chemicals are stored correctly in accordance with Safety Data Sheet instructions and consider all other risks identified in the risk assessment, such as proximity to other chemicals, heat, light, or air.
- All chemicals should be stored in accordance with the relevant Australian / New Zealand Standards (or equivalent) detailed in **Appendix G**.
- Buildings and structures used for storing hazardous chemicals are constructed to comply with Australian Building Codes and Regulations that considers the type, nature and quantity of substance being stored.
- Hazardous Chemicals are stored separately, away from all other plant, equipment and other general supplies.
- Incompatible chemicals are segregated and stored separately from each other (**Appendix F**).

- Some Basic rules:
 - Segregate organic from inorganic chemicals
 - Oxidisers and organic peroxides should be segregated from all other classes, especially flammable and combustible materials
 - Acids are incompatible with alkalis, hypochlorites, cyanides and Dangerous Goods of Class 4.3
 - Class 4.3 shall be kept away from water sources (rain or other liquid chemicals)
 - Flammable materials are to be kept away from open flames and other sources of ignition (**refer section 12.2**)
- Storage areas are maintained and kept clean and free of other fuel loads (rubbish, leaves etc.).
- Storage areas have appropriate signage installed (**refer sections 13.0 and 15.0**).
- Storage areas are scheduled for regular inspection (**refer section 19.0**).
- All persons who are required to operate, clean, maintain, repair, inspect or test storage areas or their components, shall have all relevant information about the storage facility and any associated hazards and risks made readily available to them.

12.2. Ignition sources

Where there is a risk of fire or explosion Site Managers must ensure that no ignition source is present, or can be introduced, into the hazardous area. Ignition sources may include:

- Welding, grinding and other “hot work” type activities;
- Plant equipment and machinery (e.g. hot engines, exhaust, sparks); and
- Non-intrinsically safe devices (e.g. radios, mobile phones, electric hand tools).

Note: *Where it is required that a potential ignition source is introduced into a hazardous area, such as for the purpose of carrying out maintenance or repairs.*

Managers should ensure there is an appropriate Permit to Work system in place to assess the risks and provide necessary authorisations and supervision.

12.3. Bunds

All stored chemicals shall be stored in such a way that all spills and leaks are suitably contained. Consideration should be given to appropriate bunding and spill kits.

The minimum volume of a bund varies depending on what is stored and how it is stored. The bund requirement does not only relate to bulk goods, it also needs to be considered for packaged goods.

Bulk liquids should be stored in bunds or on spill containment pallets that can contain at least 130% of the capacity of the largest single container of substance being stored.

Bunds should be regularly inspected for general wear and potential leakage and where they show signs of wear that could allow spillage, they should be replaced immediately.

12.4. Containers

Containers used for hazardous chemical storage must be:

- Compliant with recommendations made in individual substance Safety Data Sheets;
- Compliant with recommendations outlined in the Australian / New Zealand standards listed in **Appendix G**;
- Protected from damage;
- Maintained and inspected on a regular basis; and
- Stored on a stable base / platform with any required retention systems secured to prevent movement.

12.5. Disposal

Site Managers must ensure that any excess, disused and waste hazardous chemicals are disposed of correctly. Guidance on recommended disposal methods can be found in the chemical Safety Data Sheets.

When determining appropriate disposal methods, consideration also needs to be given to all:

- Local Council Regulations and by-laws;
- *Environmental Protection Act 1993 (SA)*; and
- *Environmental Protection Regulations 2009 (SA)*.

13. Placards

Legislative and Compliance References:	
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 349, 350
<i>Work Health and Safety Regulations 2012 (SA)</i>	Schedule 13

13.1. What are placards?

Placards are visual warning signs that include specific information and symbols indicating the type of substance and related hazards present within a building or work area.

They are a means of alerting emergency services and other persons to the presence of hazardous chemicals and provide a quick, visual source of information.

13.2. When must placards be displayed?

Placards must be displayed where the quantity of a chemical stored (or group of similar chemicals) meet or exceed the 'placarding quantity' detailed in Schedule 11 of the *Work Health and Safety Regulations 2012 (SA)* and **Appendix C**.

13.3. Types of placards and requirements

There are 2 different types of placards required to be displayed depending on the nature, classification and quantity of chemicals stored within a site or storage area.

These include:

- Outer warning placard for the entrance to the workplace ("Hazchem" sign when quantities exceed schedule 11 thresholds); and
- Information placards for hazardous chemicals in bulk or in packages.

In general, placards must be:

- Designed to meet the requirements detailed in Schedule 13 of the *Work Health and Safety Regulations 2012 (SA)*;
- Must display the specific UN numbers, Hazchem codes and class labels as set out in the Australian Code for The Transport of Dangerous Goods by Road and Rail (ADG Code);
- Clearly visible and legible by any person approaching the placard;
- Separate from all other signage;
- Maintained and kept clean;
- Replaced if broken, damaged or illegible;
- Updated if risk or substance changes; and
- Removed when substance is no longer stored / present.

Note: The Label used for placarding purposes is usually the Class Diamond from the ADG Code, **not** the pictograms from the Globally Harmonised System of Classification and Labelling of Chemicals (GHS).

14. Labels

Legislative and Compliance References:	
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 335, 338, 341 - 343
<i>Work Health and Safety Regulations 2012 (SA)</i>	Schedule 9: Part 3

14.1. General Requirements

Site Managers must ensure that all hazardous chemicals are correctly labelled. This includes all hazardous chemicals that are supplied to site and decanted from their original packaging or container. Labels may also be required on certain pipework used to convey hazardous chemicals.

Labels must:

- Meet the design and layout requirements of *Work Health and Safety Regulations 2012 (SA)* Schedule 9 and the *Code of Practice - Labelling of Workplace Hazardous Chemicals*;
- Be clearly visible and legible;
- Be reviewed on a regular basis; and
- Updated as soon as possible where there is any change to information from the manufacturer or supplier.

14.2. Label Elements

Labels are required to display specific information that includes:

- **Product identifier:** chemical name;
- **Ingredients:** quantities of each chemical ingredient;
- **Expiry Date:** if any;
- **Pictograms:** the GHS provides 9 key symbols / pictures that represent chemicals various hazardous properties. Only these pictograms are to be used for labelling purposes;
- **Signal Words:** signal words describe the potential severity of the hazard. The signal words used are “DANGER” and “WARNING”;
- **Hazard Statements:** describe the nature and potential severity of the chemical hazard. Hazard statements include phrases such as; “Highly flammable”, “May cause cancer”, “Gas under pressure”;
- **Precautionary Statements:** describe some recommended measures to minimise risks associated with the hazardous chemical. The GHS uses four types of precautionary statements that cover; Prevention, Response, Storage and Disposal recommendations; and
- **Manufacturer or Importer details:** Australian names, address, contact numbers.

Refer to **Appendix E** for pictograms and an example of a compliant label.

14.3. Decanted / unpackaged chemicals

Decanted chemicals are those that have been transferred from their original packaging or container to another package or container.

All decanted chemicals need to be labeled, however they do not need to contain all of the detail from the original packaging.

Labels on decanted chemicals should contain as much information as possible, but as a minimum they must include:

- Product identifier; and Hazard pictogram along with a hazard statement consistent with the original labelling.

14.4. Small Containers

Where a chemical is supplied in a package that is too small to fit a label with all required details, it is acceptable to have a reduced amount of information on an appropriate sized label.

As a minimum small container labels must include:

- Product identifier;
- Australian name and contact details of manufacturer or supplier;
- Hazard pictogram and hazard statement; and
- Any other relevant information that is practical to include (if there is room on the label, then include as much information as possible).

14.5. Pipework

Pipework used to convey hazardous chemicals must be clearly labelled and identified. Pipework may be labelled by:

- Placing labels directly on the pipe;
- Placing signage directly adjacent to the pipe; and
- Using coloured pipe coating compliant with *AS 1345: Identification of the contents of pipes, conduits and ducts* for guidance.

15. Safety Signage

Legislative and Compliance References:

<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulation 352
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In addition to product labels and placards, some level of general safety signage may still be required in areas where chemicals are stored or used.

General signage may include:

- General hazard warning signs;
- Personal protective equipment requirements, such as eye protection, face mask, long sleeves, protective footwear etc.;
- Restricted entry;
- No smoking;
- Restricted electronic / mobile device usage; and
- Site Managers must ensure all signage is installed and maintained.
- All safety signs must be designed to comply with *AS 1319: Safety Signs for the Occupational Environment*.

16. Induction and Training

Legislative and Compliance References:

<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 39, 379
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Site Managers must ensure that prior to workers using any chemical or substance they are inducted and trained in all hazards and risks associated with its use, and must, as a minimum, include:

- Hazardous chemicals information systems, Safety Data Sheet location etc.;
- Information about hazardous chemicals they are required to work with (or may be exposed to e.g. dusts);
- Hazard control measures, including safe work procedures;
- Labelling containers and label information;
- Proper storage, use and fit of personal protective equipment;
- First aid and emergency procedures; and
- All records of training and induction must be kept in the workers training file.

17. Exposure Standards

Legislative and Compliance References:

<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulation 49, 50
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Site Managers must ensure that workers are not exposed to hazardous chemicals in an airborne concentration which exceed the “Exposure Standards”.

17.1. What are Exposure Standards?

The Workplace Exposure Standards (WES) for Airborne Contaminants (Exposure Standards) provide guidance on how much of a particular substance a worker can be exposed to before that substance is likely to have a health impact.

Workplace Exposure Standards includes:

- **8 hour time weighted average:** how much a person can be exposed to in an average working day i.e. an 8 hour period;
- **Peak limitation:** maximum a person should be exposed to at one time (less than 15 minute period); and
- **Short term exposure limit:** how much a person may be exposed in a short time period. (15 minutes).

The Exposure Standards can be accessed on the SafeWork Australia website:

<http://www.safeworkaustralia.gov.au/sites/swa/whs-information/hazardous-chemicals/pages/exposurestandards>

Note: *Section 8 of some Safety Data Sheets may contain information regarding Exposure Standards.*

17.2. How do I assess exposure?

To assess how a person is exposed to a particular substance we must first conduct a risk assessment and consult with workers as discussed in **Section 6.0** of this document.

To determine exposure we first need to consider:

- The work and activities that the worker directly undertakes;
- Their work environment and other operational activities that occur in their vicinity;
- Which chemicals they will interact with; and
- How long they spend undertaking those activities and how long they are exposed to individual chemicals.

Once it has been established the type of work to be undertaken, and the duration of those activities, it may be required to undertake air monitoring and measurement to ensure a person's exposure is not above the exposure standards.

Note: *It may be required to engage the services of a professional occupational hygienist to undertake air sampling and analysis. See Australian Institute of Occupational Hygienists (AIOH) consultant search function.*

17.3. When is air monitoring required?

Air monitoring / sampling must occur where:

- There is uncertainty whether exposure to a substance exceeds the Exposure Standards; and
- Where it is required to determine if there is a health risk (i.e. as part of the risk assessment).

Note: *It is considered good practice to conduct periodic air monitoring to ensure that over time exposure levels do not change. Air monitoring activities should be included as part of regular inspection and monitoring schedules and be based on risk.*

17.4. What if exposure levels are above the standard?

Under no circumstances must workers be exposed to levels above the Exposure Standards. If standards are, or are likely to be exceeded then consideration needs to be given to controls, such as

- Adjusting the work, including work schedule to limit the exposure;
- Reducing the duration and frequency of tasks / sharing tasks with other personnel;
- Substitute the substance for a less hazardous type;
- Place the process within an enclosure (separate the worker and substance);
- Provide mechanical ventilation or extraction;
- Consider mechanical devices for handling chemicals;
- Purchasing smaller quantities to avoid decanting; and
- Consider additional personal protective equipment (least desirable control).

18. Health Monitoring

Legislative and Compliance References:	
<i>Work Health and Safety Regulations 2012 (SA)</i>	Regulations 368 - 378, 406
<i>Work Health and Safety Regulations 2012 (SA)</i>	Schedule 14

18.1. What is health monitoring?

Health monitoring means monitoring of a person to identify changes in the person's health, status because of exposure to certain chemicals.

Health monitoring may include:

- General consultation;
- Physical examination skin checks or spirometry (lung function) tests;
- Clinical tests urine or blood samples; and
- X-rays.

18.2. When is health monitoring required?

Health monitoring is required where:

- A person is, or is likely to be regularly exposed to a substance outlined in Schedule 14, table 14.1 of the *Work Health and Safety Regulations 2012 (SA)*; and
- On medical advice for example of a person suffers an unexpected high level exposure.

18.3. General Obligations

Where health monitoring is required Site Managers must:

- Inform workers and prospective workers about health monitoring requirements relating to their job;
- Ensure health monitoring is carried out by, or under the supervision of a registered medical practitioner with experience in health monitoring;
- Consult workers in relation to the selection of the registered medical practitioner;
- Pay all expenses relating to health monitoring;
- Provide any required information about a worker to the registered medical practitioner;
- Obtain and provide a copy of the report to the worker, and the Regulator if the report contains adverse test results or recommendations that remedial measures should be taken;

- Keep reports as confidential records for at least 30 years after the record is made (40 years for reports relating to asbestos exposure); and
- Not disclose the report to anyone without the worker’s written consent, unless required under the *Work Health and Safety Regulations 2012* (SA).

19. Workplace Monitoring, Auditing and Review

Legislative and Compliance References:

<i>Work Health and Safety Regulations 2012</i> (SA)	Regulations 38, 352
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Site Managers must ensure they have an appropriate Monitoring, Auditing and Review program to ensure hazard and risk controls are implemented and remain effective.

19.1. Workplace Monitoring Programs

Workplace monitoring may include formal (documented) and informal (observation / interaction) type activities.

Informal (observation and interaction) type activities occur as part of day to day operations and may include:

- Hazard Reporting procedures (workers reporting identified hazards);
- General safety observation programs (workers observing other workers / processes);
- Management interactions and discussions with workers (active management participation in safety); and
- Air quality and health monitoring programs (**see Section 17 and 18.0**).

19.2. Audit and Inspection Programs

Audit and inspection programs are formal, scheduled and documented activities designed to test the integrity of procedures and controls as well as the physical conditions within a site or work area.

Audits and inspection requirements should be based on risk and test all elements of the sites Principal Mining Hazard Management Plans including any additional emergency response or environmental plans.

Audit and inspection programs should include:

- General weekly and / or monthly inspections of the worksite that checks:
 - Storage conditions (e.g. building condition, no rubbish build ups, no ignition sources);
 - Condition and stability of chemicals (e.g. container condition, stacked properly, no leaks);
 - General safety signage including placards and labels (e.g. good condition, legible);

- Inspection and testing of all emergency equipment, fire systems and first aid / medical facilities;
- Personal protective equipment inspections (e.g. good condition, available, still appropriate for use / user etc.);
- General plant and equipment inspections (e.g. no leaks, no excessive fumes, no substance build up etc.);
- Audits of management system programs including all documented procedures, guides, training material, risk assessments and Safety Data Sheets; and
- Audits and testing of emergency procedures and response drills.

19.3. Management Review

Site Managers must ensure that they regularly review information and results from monitoring, auditing and inspection programs to determine if current hazardous substance procedures and controls are:

- Being applied and implemented correctly to adequately mitigate risks; and
- Still appropriate and relevant to their operations.

Where there are deficiencies found in current process (i.e. controls do not properly reduce risks) or, where there are non-conformances discovered (i.e. operations are not being conducted as per agreed procedure or controls) then corrective action must be taken.

A corrective action would be where an existing control is altered, or a new control is introduced to better mitigate the risks.

Any actions taken to correct deficiencies or non-conformances must go through the same risk assessment process discussed in **Section 67.0**.

This process of monitor, inspect, audit, review creates a continuous business improvement cycle.

20. Common Substance Guide

Hazardous chemicals used and hazardous waste generated on a small mine or quarry site can include the following:

20.1. Explosives / Detonators

Description of Group

Explosives commonly used in the quarrying industry are predominantly ammonium nitrate based.

The main type is a simple ammonium nitrate / fuel oil mixture, with proprietary brands possibly containing inert fillers, celluloses, starches, “air bubbles”, stabilisers or metal powders in small or very small proportions.

Accessories such as detonators, primers, boosters, lead lines, delays and detonating cords may include one or more of the chemicals below:

- Gunpowder;
- Pentaerythritoltetranitrate (PETN);
- Trinitrotoluene (2,4,6 TNT);
- Sodium nitrate;
- Lead azide;
- Lead styphnate;
- Molybdenum disulphide;
- Aluminium powder; and / or
- Cyclotetramethylenetetranitrate (HMX).

Primary Hazards and Risks

Hazards associated with these products are mainly due to their dangerous nature as explosives and the potential for catastrophic accidents if strict safety standards are not observed in terms of handling, mixing, storage, transport and use.

The risks of premature detonation from impact, friction, extraneous electricity or excessive heating are very real and the precautions and requirements in the Explosives Regulations, Codes of Practice and Standards must be observed at all times.

Health effects are somewhat less critical and no adverse health effects should be expected under conditions of normal use, provided good standards of personal hygiene are observed.

Precautions for Use / Handling:

- Do not generate and inhale dust;
- Avoid eye contact;
- Avoid repeated or prolonged skin contact;
- Wash hands immediately after use and before smoking, eating, drinking or using the toilet;
- Wash contaminated clothing and personal protective equipment before storing or re-using;
- Do not test fire detonators in poorly ventilated areas due to the risk of inhalation of lead fume; and
- Do not enter areas of blasting until gases and dust have dissipated - toxic gases - particularly oxides of nitrogen - are often a by-product of the explosion.

Protective clothing and equipment:

- When handling packaged explosives in quarry, overalls, antistatic safety shoes and hard hats are minimum recommended protective clothing requirements; and
- When using bulk explosives in quarry use overalls, antistatic safety shoes, hard hats, impervious gloves and safety goggles or glasses.

Storage:

- Storage of explosives must comply with *AS 2187.1: Explosives - Storage, Transport and Use* and the *Explosives Regulations 2011* (SA).

20.2. Fuels

Description of group

Fuels are petroleum based hydrocarbons with the main fuel being distillate (diesel), with petrol and LP gas being used to a lesser degree. These may contain additives or chemicals including:

- Toluene;
- Xylene;
- Benzene and benzene-like compounds;
- *n*-Hexane; and
- Tetraethyl lead.

Primary Hazards and Risks

Fuels are another group of chemicals where there is a high physical safety risk, being class 2.1 flammable gases or class 3 flammable liquids.

Note: *Diesel fuel is classed as a combustible liquid, not a flammable liquid.*

The physical safety aspects are covered by the appropriate Codes and Standards as listed in the references.

Fuels in general are hazardous chemicals due to containing cyclic or polycyclic aromatic compounds which by themselves have been associated with skin disorders including cancer. The most likely effect, if any, could be dermatitis due to a drying and defatting action.

Studies such as one for long term exposure to petrol by distribution workers in the United States did not identify any associated adverse health effects. However, skin or eye contact and inhalation of vapours or mists should be avoided.

For normal use (as a fuel), infrequent low level exposure is unlikely to create a health risk and toxic effects are unlikely provided good personal hygiene practices and adequate ventilation are followed.

Note: *Chronic misuse of petrol i.e. sniffing or even by use as a solvent or cleaning fluid can lead to a number of serious effects on the heart, central nervous and blood systems, leading to death.*

Precautions for Use / Handling:

- Use only in well ventilated areas - any ventilation equipment must be explosion proof;
- Keep away from all ignition sources;
- Do not use as solvent or cleaning fluid;
- Avoid repeated or prolonged skin contact;
- Avoid eye contact;
- Do not inhale vapours or mists (vapours encountered during normal fuelling operations in well ventilated areas do not pose a significant health risk);
- Wash hands immediately after use and before smoking, eating, drinking or using the toilet; and
- Wash contaminated clothing and personal protective equipment before storing or using.

Protective clothing and equipment:

- Protective clothing / equipment is not necessary for normal fuelling operations from approved dispensing equipment in a well-ventilated area;
- If splash of fuel is likely, then use chemical type goggles or a face shield;
- If skin contact cannot be avoided, impervious gloves should be worn; and
- If respiratory protection is required due to high concentrations of vapor or misting then Australian Standard 1716 approved equipment should be used.

Storage:

- Storage of fuels must comply with *AS 1940: Storage and handling of flammable and combustible liquids*.

20.3. Lubricating Oils and Greases

Description of Group

Most lubricating oils and greases are petroleum based, a few which are vegetable based and a number of silicone or graphite based products.

Many will contain various chemical additives, such as lithium or molybdenum compounds and antifoam agents. Some greases may contain small quantities of organic lead, however it is extremely unlikely that any significant quantity of lead could be absorbed under normal use conditions.

Primary Hazards and Risks

Oils and greases used in the mining and quarry industry do not pose a significant hazard with normal use, provided good standards of personal hygiene are followed.

The most probable effect, if any, through a combination of prolonged exposure and poor personal hygiene could be dermatitis brought on by the defatting and drying effect on the skin or oil acne which appears as large open blackheads. Inhalation of mists or vapours caused by elevated temperatures should be avoided.

Any carcinogenic risk would most probably be as a result of polycyclic aromatic compounds, which, if present at all, will be in relatively low levels, and again, will not be a problem under normal use conditions.

One area of caution should be with used oils and greases which, due to conditions during use, may have developed hazardous compounds.

For this reason it is a sensible precaution to avoid skin or other contact with used (and sometimes hot) lubricants. Nitrile or PVC gloves should be used and in the event of skin contact, wash off as soon as possible with soap and water.

Other hazardous situations may arise from burning these products when dangerous chemicals, such as carbon monoxide, oxides of nitrogen, oxides of sulphur, aldehydes and ketones could result.

Where high pressure equipment is used care must be taken to avoid injecting oil or grease under the skin. If this occurs medical help must be sought immediately.

Aerosols such as penetrating oils usually have hydrocarbon propellant. Hazardous chemicals may be present, but use is infrequent and provided safety precautions below are followed there will be little or no risk.

Oils and greases must not come into contact with strong oxidizing agents, since this can result in spontaneous combustion or even explosion.

Precautions for Use / Handling:

- Store and use in well ventilated areas away from sources of ignition;
- Avoid prolonged or repeated skin contact, especially used oils;
- Avoid eye contact;
- Avoid breathing in mists or vapours caused by heating or from aerosols;
- When handling oils or greases, do not wear rings or watches that may trap the chemical;
- Wash hands immediately after use and before eating, smoking, drinking or using the toilet; and
- Wash contaminated clothing (for maintenance personnel, at least weekly) after use and clean personal protective equipment before storing or re-using.

Protective Clothing and Equipment:

- Use of nitrile or PVC gloves where there is risk of skin contact;
- Eye protection is strongly recommended for all workshop activities;
- A respirator is not required under normal circumstances, however if there is a risk of misting, then use the appropriate respirator as per Australian Standards 1715 and 1716; and
- Use of a reputable skin protectant cream is recommended.

20.4. Compressed Gases

Description of Group

Compressed gases are a diverse group of chemicals used predominantly for welding and cutting operations or in refrigeration systems.

Gases encountered range from inert 'non-toxic' gases, such as nitrogen and argon, highly flammable gases, such as acetylene and Handigas (propane / propylene) to highly reactive gases such as oxygen. All are kept under pressure in metal cylinders which are labelled and coloured in a standard and distinctive way to allow easy and instant recognition.

In most welding and cutting operations a combination of gases are used (Argoshield is pre-mixed) and precautions taken must consider both gases being used.

Refrigerants are used somewhat less frequently and on their own, mainly in mobile equipment air conditioning systems.

Primary Hazards and Risks

Physical safety risks associated with the storage, handling and use of these chemicals, such as dangers associated with any compressed gas, flammability, reactivity and compatibility with other chemicals. Due to the weight and shape of containers, there are also significant manual handling risks.

Serious incidents have occurred through the connection and use of the wrong cylinder. All cylinders have distinct colour codes, in addition to labelling.

The common cylinder colours are as follows:

Gas Type	Cylinder Colour
Oxygen	Black
Acetylene	Claret
Nitrogen	Pewter
Argoshield 51	Blue body, green-grey shoulder, black neck
Handigas	Silver or grey
R12 Refrigerant	Top aqua, bottom galvanised or white
R22 Refrigerant	Top moss green, bottom galvanised or white

The following table highlights known health risks from commonly used gases:

Gas Type	Health Risk
Oxygen	Breathing concentrations between 25% and 75% may cause inflammation of organs.
Acetylene	Asphyxiates can have anaesthetic and narcotic effects. Maximum allowable concentration 0.5%.
Nitrogen	Asphyxiates only.
Argoshield 51	81% Argon, 16% Carbon Dioxide and 3% Oxygen. Mainly an asphyxiant, however long term exposure to levels of carbon dioxide between 0.5 and 1% is likely to lead to calcium decomposition in body tissues and kidneys.
Handigas	95% Propane and 5% Propylene. Asphyxiates, and has anaesthetic effect in higher concentrations. (Propylene has been used as an anaesthetic.)
R12 Refrigerant	Asphyxiates with mild narcotic properties. 5% concentration can cause dizziness and 15% loss of consciousness. Decomposes on burning to toxic products.
R22 Refrigerant	As for R12 above, however this chemical is thought to be mutagenic and estrogenic and women of child bearing age should not be exposed.

Note: Some of the above gases may cause cryogenic burns from the intense cold generated by sudden release of pressure.

Precautions for Use / Handling:

- Always use suitable approved pressure reducing valves with compressed gases;
- Fittings for Acetylene should be steel, stainless steel or aluminum. **Never** use Acetylene with copper, silver, mercury or brasses; brazing materials containing more than 66% copper due to the danger of formation of explosive acetylides;
- For Oxygen, use only oxygen compatible materials and use only degreased, approved pressure rated equipment;
- **Never** use greases or other lubricants with oxygen;
- Acetylene is stored in acetone (inside cylinder), make sure hoses are compatible;
- Make sure cylinders not in use have plugs or dust caps fitted at all times - this is particularly important with oxygen which reacts with many materials;
- Beware of possibility of cryogenic burns (cold burns) resulting from sudden or prolonged pressure release of some compressed gases;
- Beware of oxygen build up in clothing since this has resulted in severe burns due to clothes igniting;
- Never smoke when using gases - even non-flammable gases may decompose to toxic chemicals and be inhaled on passing through the cigarette or pipe;
- Only use gases in well ventilated areas. It is recommended that boiler making shops have extraction systems installed;
- Many gases are heavier than air - beware of gas build up in pits, trenches, bins or enclosed spaces. If in doubt, it is essential to have atmosphere tested by a qualified person;
- Always double check colour coding and labelling on cylinders before use;
- Always open cylinder valves slowly and only when reducing valve fitted;
- Always close cylinder valves when not in use;
- Avoid using rubber seals or gaskets with refrigerant gases since decomposition of natural rubber may occur and result in leaks; and
- Acetylene can spontaneously decompose or cause an explosion at high pressures. Ensure pressure is always below 100kPa.

Protective Clothing and Equipment:

- Use safety glasses, goggles or face shield as appropriate;
- Wear overalls or long sleeve shirt and pants;
- Wear leather or plastic gloves; and
- When handling cylinders wear safety shoes.

Storage:

- All cylinders should be stored upright, kept below 45°C and stored away from combustibles in a well ventilated area preferably outside normal work stations;
- Secure cylinders such that they cannot fall or be knocked over;
- Storage areas should be secure and locked; and
- Oxygen, Acetylene and Handigas should not be stored near each other unless well separated with a non-combustible partition.

20.5. Paints / Thinners / Solvents / Cleaning fluids

Description of Group

This group of chemicals is derived mainly from hydrocarbons, often aromatic and volatile, or from plastic polymers and co-polymers. Some additives, such as zinc phosphate, lead chromate, isocyanates and a multitude of other fillers and pigments may be used.

Use in the quarrying industry is relatively infrequent and is mainly associated with construction and maintenance of both fixed plant and mobile equipment, particularly trucks for road use.

Most of the solvents and thinners used already exist in the paints themselves. Cleaning fluids such as degreasers can be included with this group since they too are used in maintenance operations and present the same inherent hazards.

Primary Hazards and Risks

Many of the paints etc. in this group, particularly those which are hydrocarbon based, are highly flammable and have low flash points presenting a real risk of fire (or explosion) if precautions are not taken. The vapours are heavy and can build up in poorly ventilated areas, pits, trenches or enclosed spaces.

Common base solvents and thinners are often toluene, xylene, mineral turpentine (paraffins and naphthenes), and white spirit with some benzene, *n*-butyl alcohol, ethanol and methanol.

Degreasers may also contain ethylene glycol based ethers, oleic acid and / or alkalis in a hydrocarbon base.

Some of these compounds are toxic, can cause dermatitis, are known carcinogens, can cause respiratory sensitization, and can lead to permanent respiratory disability with excessive, prolonged or repeated exposure.

A few first schedule paints still use lead chromate and are used in permitted industrial applications.

A common misconception is that water based paints are less hazardous. This is not necessarily the case and the same precautions should be applied when using (particularly spraying) these products.

The dust from sanding some paints and the toxic by-products of burning off paints can also be a hazard.

Precautions for Use / Handling:

- Avoid prolonged or repeated skin contact;
- Avoid contact with eyes;
- Avoid breathing in fumes vapours or overspray mist including aerosol mists;
- Ensure area of use is well ventilated;
- Keep away from all sources of ignition;
- Do not store or use in close proximity to strong oxidising agents (ammonium nitrate, peroxides, hypochlorite);
- Do not wear rings or watches that may trap the chemical;
- Do not use thinners and organic solvents to clean the skin after use;
- Wash hands immediately after use and before eating, drinking or using the toilet;
- Wash contaminated clothing before re-use (at least weekly), and clean personal protective equipment before storing or re-using; and
- Fumes and vapours are heavier than air. Beware of dangerous build up in pits, trenches, tanks and enclosed spaces. If in doubt have the atmosphere tested by a qualified person. Do not purge space with oxygen.

Protective Clothing and Equipment:

- Overalls or long sleeve shirt and pants;
- Safety glasses, goggles or suitable face shield;
- Appropriate hat or hair cover (Hard hat in most mine and quarry areas);
- Impervious gloves;
- Organic vapour respirator or dual filter for spray paint. If using isocyanates, supplied air mask must be used; and
- Skin protectant cream can assist and is recommended.

Storage:

- Do not store in close proximity to strong oxidizing agents; and
- Store in well ventilated areas and in cabinets that comply with *AS 1940: Storage of flammable and combustible liquids*.

20.6. Adhesives

Description of Group

The most commonly used adhesives in mines and quarries will be chemicals for sealing or creating gaskets such as silicone sealants or “form-a-gasket” type materials.

Other materials which can be included in this group are such materials as Loctite products and epoxy crusher backing.

Another class of adhesive which may be used very infrequently, and mostly by contractors, is the adhesives for fixing rubber backings and wear sheets or splice joining conveyor belts.

Primary Hazards and Risks

Materials such as Loctite products and gasket forming or sealing products may contain chemicals that are classified as hazardous but use is in such small quantities and so infrequently that provided the materials are used in well ventilated areas and with simple precautions to avoid skin and eye contact, the risk could be considered negligible. It is necessary to be aware that some formulations involving acrylates can instantly bond skin.

Epoxy resins that are commonly used as crusher liner backing are hazardous and whilst used infrequently, the method of use, relatively large volume used and mixing of two components does create risk of exposure. Epoxy resins have heavy vapours which can collect; constituents can be highly corrosive to the eyes and even cause blindness. Class 2 carcinogens such as epichlorohydrin may also be present. Epoxy resins are also known to be skin and respiratory system sensitizers.

Adhesives used for bonding rubber to steel or splicing conveyor belts are usually comprised of organic volatiles and there is a real danger of hazardous vapour build in poorly ventilated areas or enclosed spaces which can be both toxic and highly flammable.

Precautions for Use / Handling:

Where using small amounts of adhesives or sealants in normal maintenance procedures then providing natural ventilation, using impervious gloves and safety glasses will suffice.

For “bulk use” adhesives such as the epoxy resins and rubber bonding adhesives and curing or surface preparation liquids the following precautions should be applied:

- Ensure work area is well ventilated;
- Avoid breathing vapours;
- Avoid prolonged or repeated skin contact;

- Avoid contact with eyes;
- Take care not to splash materials during mixing. Note that epoxy resins can generate significant heat during hardening process. Always mix to instruction, intense heat and foaming may occur if poorly mixed;
- Keep solvent based adhesives away from sources of ignition;
- Beware of vapor build up in pits or enclosed spaces;
- Wash hands immediately after use and before eating, drinking, smoking or using the toilet;
- Wash contaminated clothing before re-use and clean personal protective equipment before storing or re-using; and
- Avoid breathing dust if cutting or grinding hardened epoxy resins.

Protective Clothing and Equipment:

- Use goggles or safety glasses;
- Use impervious gloves;
- If vapours cannot be avoided use organic vapour respirator refer to *AS 1715: Selection, maintenance and use of respiratory protection devices*. All protection devices must comply with *AS 1716: Respiratory protection devices*;
- If cutting or grinding hardened epoxy resins use suitable dust mask; and
- Use suitable hand barrier cream.

Storage:

- Store in cool dry place below 30°C; and
- Keep nozzles on cartridges and lids tight on containers.

20.7. Fluxes

Description of Group

Fluxes may be encountered as discrete powdered solids, or as liquids for use in soldering and brazing operations, or as an integral part of another product such as the flux coating on normal welding rods and in multi-core solders.

Primary Hazards and Risks

Possibly the main hazard with the fluxes are the gases or fumes created during use. Generation of these fumes is often increased if excessive temperatures are used during welding / brazing / soldering operation.

Handling commonly used welding rods does not involve a hazard to health and apart from the obvious safety hazards relating to high temperatures and sparking during use or intense ultraviolet radiation from electric arcs; the only problems will arise from the generation of gases and fumes.

Liquid and powdered fluxes create additional hazards in that they may be harmful through skin or eye contact or in some cases where vapours are emitted at normal temperatures. Brazing fluxes can contain fluorides, inorganic and organic borates and may contain volatiles, such as acetone and methanol.

Soldering fluxes are usually mixtures of zinc and ammonium chlorides. These chemicals and their fumes and mists can be both poisonous and corrosive through skin absorption, eye absorption or inhalation.

Notwithstanding the hazardous nature of these chemicals it is unlikely that symptoms will present if used in small quantities, in well ventilated areas and if used and stored correctly.

Precautions for Use / Handling:

- Do not store fluxes near chlorine compounds or strong oxidizers;
- Use only in well ventilated areas;
- Use extraction systems and / or hoods in workshops;
- Avoid prolonged or repeated skin contact;
- Avoid contact with the eyes;
- Avoid continuous skin exposure to welding radiation;
- Protect eyes from radiation flashes;
- Avoid breathing in fumes, gases or mists;
- Beware of vapour build up from volatile fluxes and keep container away from ignition sources;
- Take precautions against physical burns and sparking;
- Use welding screens to protect other persons from direct ultraviolet radiation from arc welding;
- Wash hands before eating, drinking, smoking or using the toilet; and
- Wash and clean contaminated clothing and personal protective equipment before storage and re-use.

Note: *Contact lenses can concentrate chemicals in the eye and create additional hazards.*

Protective Clothing and Equipment:

Note that since these products are associated with boiler making activities that protective clothing needs to be of the appropriate type.

- Wear overalls or long sleeves and pants;
- Use safety glasses, goggles or face mask of the appropriate oxy - cutting or arc welding type;
- Use impervious gloves;
- Use suitable barrier cream; and
- If vapours or fume cannot be avoided use organic vapour / particulate respirator as per AS 1715: *Selection, maintenance and use of respiratory protection devices.*

20.8. Acids

Description of Group

The two strong inorganic acids usually encountered in the quarry, are sulphuric acid (used as a battery acid) and hydrochloric acid (which may be used as a cleaner, particularly for concrete transit mixers).

It should be noted that automotive batteries might be included in this grouping, because of the sulphuric acid association and in this case high capacity batteries are usually of the lead / acid type and contain lead and lead compounds.

Primary Hazards and Risks

Both sulphuric and hydrochloric acid are highly corrosive and can cause burns to the skin, mouth, throat, eyes and respiratory system. Contact with the eye may well result in blindness.

Both acids can react with certain metals to generate potentially explosive hydrogen gas. This gas is also generated within lead / acid batteries. Both acids can react with other compounds to produce poisonous gases and these acids should be neutralized with soda ash or limestone prior to disposal.

Hydrochloric acid is more volatile than sulphuric acid and the hydrogen chloride fumes given off are extremely soluble and a hazard to the respiratory / digestive systems and the eyes. Sulphuric acid (such as battery acid) will only give off significant sulphur trioxide gas at high temperatures, and in this respect is less of a hazard.

Within the quarry, sulphuric acid is normally used only when charging new batteries which are usually stored in the "dry state". Risks from normal use are low, provided personal protective measures are strictly adhered to. Most risks are associated with splashes and the generation of hydrogen gas in batteries which are physical safety risks rather than risks to health.

There is a higher risk factor with hydrochloric acid, due to its use as a cleaning agent which exposes the user to a higher chance of exposure to splashes, spray and fumes if strict control measures are not taken.

An additional risk with batteries would normally only occur in the event of a fire, or subjecting batteries to a very high temperature. This can result in generation of lead fume.

Precautions for Use / Handling:

- Ensure that work area is well ventilated;
- Avoid all skin contact;
- Avoid all eye contact;
- Avoid breathing fumes / vapours / mists;
- Always dispense (and store) acids in a separate area away from other chemicals and close to water supply;
- Keep soda ash / limestone close to hand for neutralization purposes;
- Wash acid resistant gloves and aprons etc. prior to removal;
- Keep all ignition sources (flame, sparks etc.) away from lead / acid batteries and take care not to short battery across terminals;
- If clothing becomes contaminated remove immediately and thoroughly wash any contact points on body with copious quantity of water. If skin is burned or otherwise irritated seek medical attention;
- Wash hands before eating, drinking, smoking or using the toilet;
- Wash contaminated clothing immediately and separately to other clothing;
- Thoroughly clean personal protective equipment prior to storing or re-use;
- Be aware that acid contaminated rags can self-ignite and are a significant fire risk;
- Do not leave acid containers open and make sure all containers are thoroughly cleaned prior to disposal;
- Ensure acid transfer containers are properly labelled and thoroughly cleaned after use;
- Do not leave old batteries full of acid;
- Do not burn old batteries; and
- Carry out careful clean-up immediately after use of acids to prevent people touching acid spots on bench etc.

Protective Clothing and Equipment:

- Use chemical safety goggles or full face shield;
- Use acid resistant gauntlet style gloves;
- Use acid resistant apron;
- Wear acid resistant footwear; and
- Where fumes cannot be avoided use respirator with acid gas B or B1 cartridge as per AS 1715: *Selection, maintenance and use of respiratory protection devices.*

20.9. Bitumen and Asphaltic Pre-coats

Description of Group

Bitumens are a combination of oxidized and non-oxidized petroleum asphalts and are used in blending plants (pug mills) in some quarries for the production of bitumen treated crushed rocks and rubbles for use as a road base.

Some quarries use asphaltic pre-coats to supply surface coated screenings for the spray sealing market. This range of pre-coats, are a blend of small proportions of asphalt, kerosene and possibly other light solvents in a diesel fuel (distillate) base.

Primary Hazards and Risks

In the solid or semi-solid state bitumens present little or no hazard. In the hot and fluid state ready for use there are a number of hazards not the least of which is the risk of severe burns from skin contact.

Bitumens contain Sulphur compounds which can form hydrogen sulphide, which is a highly toxic gas. Decomposition (particularly from overheating) can cause flammable vapours from a “cracking” effect and the formation of other potentially dangerous gases, such as carbon monoxide and sulphur dioxide.

It is necessary to be aware of the possibility of the build-up of these gases and vapours in tanks, trenches and other enclosed spaces with inadequate ventilation.

Bitumen may also contain polycyclic aromatic compounds which are possible carcinogens.

Notwithstanding the above, bitumen should not present significant risks to health under conditions of normal use in well ventilated areas provided a good standard of personal hygiene is adhered to.

The asphaltic pre-coats have similar properties to bitumen with the added risk of their volatility, flammability, and higher potential for contact through vapours, splashing or misting. Skin and respiratory sensitisation and possible dermatitis are an increased risk with these products.

Precautions for Use / Handling:

- Ensure ventilation is adequate. Do not enter tanks or other enclosed spaces unless the atmosphere has been tested by a qualified person;
- Use explosion proof equipment for handling hydrocarbon based pre-coats;
- Beware of vapour and gas build up in tanks, trenches etc.;
- Avoid prolonged or repeated skin contact;
- Avoid eye contact;
- Do not breathe vapours, fumes or mists;
- Keep these chemicals away from strong oxidizing agents;
- Do not wear rings and watches which may trap the chemicals;
- Keep pre-coats away from all ignition sources;
- Wash hands before eating, drinking, smoking or using the toilet; and
- Wash contaminated clothing before re-use and clean personal protective equipment before storing or re-using.

Protective Clothing and Equipment:

- Use impervious gloves;
- Use protective glasses or goggles;
- Wear full cover overalls;
- Wear hard hat in required areas or otherwise suitable head cover; and
- Use suitable barrier cream.

In applications where some misting or vapours cannot be avoided, use organic vapour / particulate respirator as per *AS 1715: Selection, use and maintenance of respiratory protective devices for example: Sulphuric acid, hydrochloric acid.*

21. Atmospheric contaminants

Atmosphere contaminates in the workplace can include the following:

21.1. Dust / particulates.

These can include crystalline silica, lead and nickel.

Reference:

Code of Practice - *Welding Processes* (Safe Work Australia)

Guidance: *Hazardous Chemicals Requiring Health Monitoring - Crystalline silica* (Safe Work Australia)

Guide to Managing Risks of Exposure to Diesel Exhaust in the Workplace (Safe Work Australia)

21.2. Gases produced by combustion.

These are produced by blasting and industrial combustion engines, and include CO, CO₂, NO_x, SO₂ and diesel particulate.

Reference:

Guide to Managing Risks of Exposure to Diesel Exhaust in the Workplace (Safe Work Australia)

22. Dangerous Substances likely locations at Mines:

Class	Description	Examples	Location in mine
1	Explosives	ANFO	M
2.1	Flammable gases	liquefied petroleum gas (LPG) liquefied natural gas (LNG) acetylene oxygen methane	P P P,WS,M P M
2.2	Non-flammable, non-toxic gases	nitrogen carbon dioxide compressed air helium	P P,W,M M,P,WS P
2.3	Toxic gases	anhydrous ammonia hydrogen cyanide sulphur dioxide carbon monoxide	P P, W P, W M, P, WS
3	Flammable liquids	unleaded petrol (ULP) diesel kerosene aviation fuel	M, WS M P
4.2	Substances liable to spontaneous combustion	Pyrite bearing coal Some base metal sulfides in the presence of pyrite	M, W M, W
5.1	Oxidising agents	Caro's acid ammonium nitrate hydrogen peroxide potassium permanganate calcium hypochlorite	P M (explosives) P P P
6.1	Toxic substances	cyanide arsenic compounds cadmium compounds	P P, W P, W
7	Radioactive material	naturally occurring radioactive minerals containing radioactive elements (U, Th Ce etc.) radon gas radium in dust and water measuring instruments using radioactive sources	M, P, WS, W
8	Corrosive substances	nitric acid sulfuric acid hydrochloric acid Caro's acid sodium hydroxide calcium hydroxide calcium oxide lead acid batteries	P P P P P P P W
9	Miscellaneous dangerous goods	asbestos some metal concentrates	W, P, M, WS P

M = mining; P = processing; W = waste; WS = workshop and maintenance

FURTHER ASSISTANCE

MAQOHSC Work Health and Safety Specialists are available to provide further advice and assistance on all Work Health and Safety matters.

MAQOHSC Work Health and Safety Specialists are able to be contacted via our website at www.maqohsc.sa.gov.au or email maqohsc@sa.gov.au.

ADDITIONAL INFORMATION

Work Health and Safety Legislation, Codes of Practice, fact sheets, Health and Safety Representatives (HSR) information and guides can be found at the following websites:

SafeWork SA - www.safework.sa.gov.au or call 1300 365 255

Safe Work Australia - www.safeworkaustralia.gov.au or call 1300 551 832

Appendix B: Example: Risk Assessment Worksheet

CHEMICAL NAME:		WHAT IS IT USED FOR:	
FREQUENCY USED:		USED BY (OCCUPATION):	
NATURE OF HAZARD:	TICK	ROUTES OF EXPOSURE:	TICK
TOXIC (<i>POISONOUS</i>)		EYES	
HARMFUL (<i>BURNS</i>)		SKIN	
IRRITANT (<i>BREATHING, ITCHINESS</i>)		INHALATION	
SENSITISER (<i>ALLERGIES/ RASHES</i>)		INGESTION	
CARCINOGENIC		INJECTION	
CORROSIVE			
EXPLOSIVE			
FLAMMABLE			
COMBUSTIBLE			
OXIDISING			
IN THE EVENT OF A SPILL, CAN THE SUBSTANCE LEAK INTO A DRAIN OR WATERCOURSE?			
IF THE ANSWER IS "YES", THEN CONSIDER ALTERNATIVE STORAGE LOCATION AND STORE IN BUNDS WITH 130% CAPACITY OF CONTAINER. ENSURE SPILL CLEAN-UP KITS ARE AVAILABLE.			
STORAGE REQUIREMENTS:	TICK	PPE REQUIREMENTS: (LIST "OTHERS")	TICK
NATURAL VENTILATION (OUTDOORS)		EYE PROTECTION	
GENERAL VENTILATION (WINDOWS)		GLOVES	
ROOF VENTILATION (WHIRLY GIG)		RESPIRATOR (FACE MASK)	
EXTRACTION FAN (ELECTRIC)		LONG SLEEVES / PANTS)	
ISOLATION / SEGREGATION		OTHER:	
FIRE PROOF CABINET		OTHER:	
BUNDS		OTHER:	
PLACARD REQUIRED?			
OTHER:			
EMERGENCY RESPONSE:	TICK		TICK
EVACUATION REQUIRED?		EYE WASH STATION	
FIRE EXTINGUISHER		FIRST AID KIT (GENERAL)	
HOSE REEL		FIRST AID KIT (SPECIAL)	
SPILL KIT		IMMEDIATE MEDICAL ATTENTION	
ASSESSMENT CONDUCTED BY:			
SIGNATURE:			
DATE:			

Appendix C: Placard and Manifest

Placard and manifest requirements under the Work Health and Safety Regulations



The Work Health and Safety (WHS) Regulations require a person conducting a business or undertaking to placard the workplace, prepare a manifest and notify the regulator where specified quantities of certain hazardous chemicals exceed threshold amounts. The threshold amounts and types of hazardous chemicals are prescribed in Schedule 11 of the WHS Regulations.

The new WHS Regulations introduce a number of changes to placard and manifest requirements compared to pre-harmonised laws. A key change is the use of hazard classes and categories under the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), instead of classes and categories of dangerous goods according to the Australian Code for the Transport of Dangerous Goods by Road or Rail 7th Edition (ADG Code).

This guidance note assists duty holders comply with the requirements for placards and manifests under the WHS Regulations. It shows the link between GHS classes and categories and equivalent classes of dangerous goods under the ADG Code.

Column 1	Column 2	Column 3	Column 4	Column 5	ADG Code Classification
Item	Description of hazardous chemical		Placard quantity	Manifest quantity	
1	Flammable gases	Category 1	200 L	5 000 L	2.1
2	Gases under pressure	Acute toxicity, categories 1, 2, 3 or 4 Note 1—Category 4 only up to LC ₅₀ of 5000 ppmV	50 L	500 L	2.3 - Note 2
3		Skin corrosion categories 1A, 1B or 1C	50 L	500 L	2.3 - Note 2
4		Aerosols (including flammable aerosols)	5000 L	10 000 L	2.1 or 2.2
5		Not specified elsewhere in this table	1000 L	10 000 L	2.2
6		Category 1	50 L	500 L	3 (PG I)
7	Flammable liquids	Category 2	250 L	2500 L	3 (PG II)
8		Category 3	1000 L	10 000 L	3 (PG III)
9		Any mix of chemicals from Items 6 - 8 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 L	10 000 L	
10		Category 4	10 000 L	100 000 L	Note 3
11	Self-reactive substances	Type A	5 kg or L	50 kg or L	GTDTBT - Note 4
12		Type B	50 kg or L	500 kg or L	4.1 (Type B)
13		Type C-F	250 kg or L	2500 kg or L	4.1 (Type C-F)
14	Flammable solids	Category 1	250 kg	2500 kg	4.1 (PG II)
15		Category 2	1000 kg	10 000 kg	4.1 (PG III)
16		Any mix of chemicals from Items 12 - 15 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	
17	Pyrophoric liquids and Pyrophoric solids	Category 1	50 kg or L	500 kg or L	4.2 (PG I)
18	Self heating substances and mixtures	Category 1	250 kg or L	2500 kg or L	4.2 (PG II)
19		Category 2	1000 kg or L	10 000 kg or L	4.2 (PG III)
20		Any mix of chemicals from Items 17 - 19 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	
21	Substances which in contact with water emit flammable gas	Category 1	50 kg or L	500 kg or L	4.3 (PG I)
22		Category 2	250 kg or L	2500 kg or L	4.3 (PG II)
23		Category 3	1000 kg or L	10 000 kg or L	4.3 (PG III)
24		Any mix of chemicals from Items 21 - 23 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	
25	Oxidising liquids and Oxidising solids	Category 1	50 kg or L	500 kg or L	5.1 (PG I)
26		Category 2	250 kg or L	2500 kg or L	5.1 (PG II)
27		Category 3	1000 kg or L	10 000 kg or L	5.1 (PG III)
28		Any mix of chemicals from Items 25 - 27 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	
29	Organic peroxides	Type A	5 kg or L	50 kg or L	GTDTBT - Note 4
30		Type B	50 kg or L	500 kg or L	5.2 (Type B)
31		Type C-F	250 kg or L	2500 kg or L	5.2 (Type C-F)
32		Any mix of chemicals from Items 30 and 31 where none of the items exceeds the quantities in columns 4 or 5 on their own	250 kg or L	2500 kg or L	
33	Acute toxicity (Note 5)	Category 1	50 kg or L	500 kg or L	6.1 (PG I)
34		Category 2	250 kg or L	2500 kg or L	6.1 (PG II)
35		Category 3	1000 kg or L	10 000 kg or L	6.1 (PG III)
36		Any mix of chemicals from Items 33 - 35 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	
37	Skin corrosion	Category 1A	50 kg or L	500 kg or L	8 (PG I)
38		Category 1B	250 kg or L	2500 kg or L	8 (PG II)
39		Category 1C	1000 kg or L	10 000 kg or L	8 (PG III)
40	Corrosive to metals	Category 1	1000 kg or L	10 000 kg or L	8 (PG III)
41		Any mix of chemicals from Items 37 - 40 where none of the items exceeds the quantities in columns 4 or 5 on their own	1000 kg or L	10 000 kg or L	
42	Unstable explosives		5 kg or L	50 kg or L	GTDTBT - Note 4
43		Any mix of chemicals from Items 11, 29 and 42 where none of the items exceed the quantities in columns 4 or 5 on their own	5 kg or L	50 kg or L	GTDTBT - Note 4

- NOTES:**
- For item 2, gases under pressure with acute toxicity category 4 only applies up to a LC₅₀ of 5000 ppmV, which is equivalent to Div. 2.3 under the ADG code.
 - Division 2.3 under the ADG Code includes gases and vapours as acutely toxic (categories 1, 2 and 3) and gases which are corrosive to skin (category 1).
 - Only liquids with a flash point of up to 93°C are classified as flammable liquids under the WHS Regulations. C1 combustible liquids with flash points between 93°C and 150°C are not classified as flammable liquids under the GHS or WHS Regulations.
 - GTDTBT = Goods too dangerous to be transported.
 - For gases classified with Acute Toxicity, the placard and manifest quantities as defined under item 2, rather than items 33-36, should be used.

Flammable liquid classification: For the purposes of this table, if a flammable liquid of category 4 is used, handled or stored in the same spill compound as one or more flammable liquids of categories 1, 2 or 3, the total quantity of flammable liquid is determined as if the flammable liquid of category 4 had the same classification as the flammable liquid in the spill compound with the lowest flash point. For example, 1000 L of flammable liquid category 1 and 1000 L of flammable liquid category 4 is considered to contain 2000 L of flammable liquid category 1.

Appendix D: Example: Placards

OUTER WARNING PLACARD

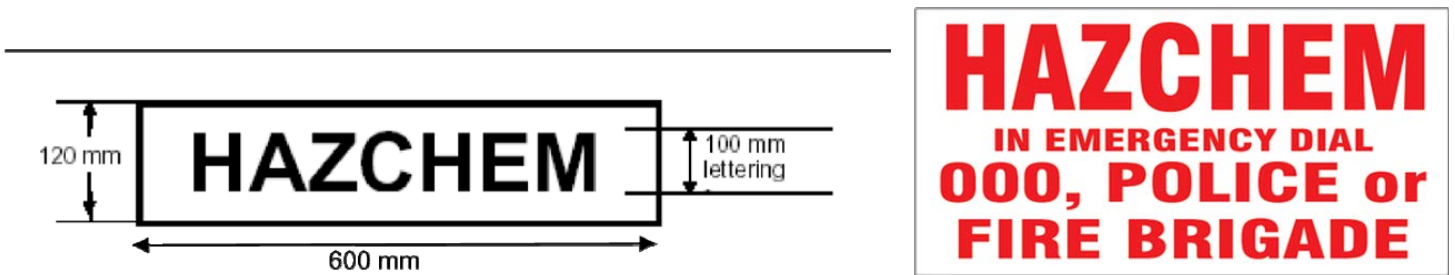


Figure 13.1 Form and dimensions of outer warning placard

BULK STORAGE PLACARD

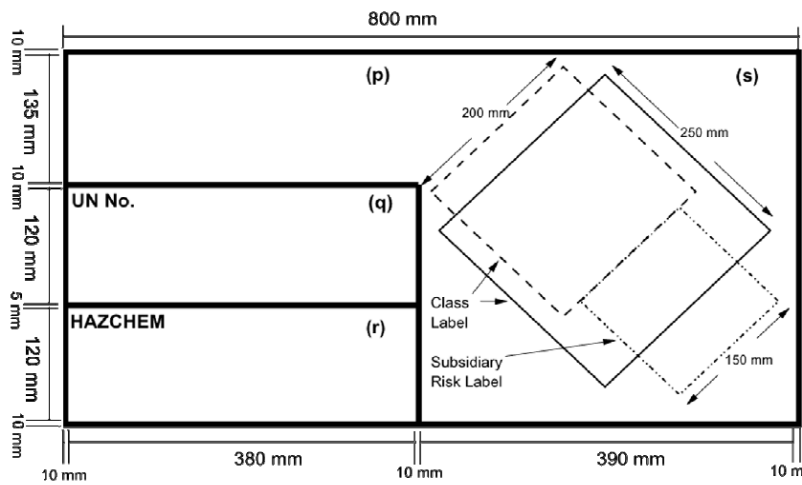


Figure 13.2 Template for a placard for a hazardous chemical stored in bulk












SOME DIAMOND CLASS LABELS





Appendix E: Pictograms and Labels

GHS symbols and meanings

	Acute toxicity via oral, dermal or inhalation		Explosives, self-reactive substances, organic peroxides		Flammable, pyrophoric, self-heating substances; water reactive
	Oxidising substances		Hazardous to the environment		Corrosive, skin damage, eye damage
	Aspiratory or respiratory hazard, carcinogenicity, mutagenicity		Compressed, liquefied or dissolved gases		May cause immediate health effect—skin, eye, respiratory

		
Chronic health hazard (eg carcinogen, mutagen, reproductive hazard)	Environmental hazard	Explosive
		
Acute toxicity	Flammable	Oxidiser
		
Compressed gas	Health hazard, eg irritant or sensitiser	Corrosive

GHS compliant label

Flammosol	Product identifier
Contains: Aliphatic hydrocarbons 95% Toxicole 5%	Identity and proportion of each chemical ingredient
500ml	
DANGER	Signal word
 	Pictograms
Highly flammable liquid and vapour Toxic if swallowed Causes skin irritation	Hazard statements
Keep away from sparks and open flames. – No smoking. Wear protective gloves and eye and face protection. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. Store locked up in well ventilated place. Keep cool. Dispose of contents / container in accordance with local regulations. Refer to the Safety Data Sheet before use.	Precautionary statements
IF SWALLOWED: Immediately call a POISON CENTRE or doctor/physician. Rinse mouth. IF ON SKIN (or hair): Take off contaminated clothing and wash before re-use. If skin irritation occurs: Get medical advice/attention. Rinse skin using plenty of soap and water. In case of fire: Use powder for extinction	
Madeup Chemical Company, 999 Chemical Street, Chemical Town, My State. Telephone: 1300 000 000	Other useful information
	Name, address and telephone number of the Australian manufacturer or importer.

Appendix F: Segregation Chart

To prevent unintended interactions between chemicals, storage areas should be designed to segregate incompatible chemicals and dangerous substances as much as possible.

Segregation may be achieved by providing physical barriers, such as walls, partitions and containers or by using distance to separate them.

Segregation also needs to consider the potential for chemicals to mix in the event of a spill.

Below is a segregation chart with general recommended segregation requirements.

Class of goods	2.1	2.2	2.2 SR 5.1	2.3	3	4.1	4.2	4.3	5.1	5.2	6.1	8	9	Combustible liquids
2.1	✓ A	✓ B	✗ S1	✗ S1	✗ S2	✗ S2	✗ S4	✗ S5	✗ S2	✗ S4	✗ S1	✗ S1	✓ C	✗ S2
2.2	✓ B	✓ A	✓ B	✗ S1	✗ S2	✗ S2	✗ S4	✗ S5	✓ B	✗ S4	✓ B	✗ S1	✓ C	✗ S2
2.2 SR 5.1	✗ S1	✓ B	✓ B	✗ S1	✗ S2	✗ S2	✗ S4	✗ S5	✗ S2	✗ S4	✓ C	✗ S1	✓ C	✗ S2
2.3	✗ S1	✗ S1	✗ S1	✓ I	✗ S2	✗ S2	✗ S4	✗ S5	✗ S2	✗ S4	✓ C	✗ S1	✓ C	✗ S2
3	✗ S2	✗ S2	✗ S2	✗ S2	✓ A	✗ S3	✗ S4	✗ S5	✗ S2	✗ S4	✗ S3	✓ B	✓ B	✓ B
4.1	✗ S2	✗ S2	✗ S2	✗ S2	✗ S2	✓ A	✗ S4	✗ S5	✗ S2	✗ S4	✗ S3	✓ B	✓ B	✗ S2
4.2	✗ S4	✗ S4	✗ S4	✗ S4	✗ S4	✗ S4	✓ A	✗ S5	✗ S4	✗ S4	✗ S4	✓ B	✓ B	✗ S4
4.3	✗ S5	✗ S5	✗ S5	✗ S5	✗ S5	✗ S5	✗ S5	✓ A	✗ S5	✗ S5	✗ S5	✗ S5	✓ G	✗ S5
5.1	✗ S2	✓ B	✗ S2	✗ S2	✗ S2	✗ S2	✗ S4	✗ S5	✓ D	✗ S4	✓ C	✗ S3	✓ C	✗ S3
5.2	✗ S4	✗ S4	✗ S4	✗ S4	✗ S4	✗ S4	✗ S4	✗ S5	✗ S4	✓ E	✓ CE	✗ S4	✓ CE	✗ S4
6.1	✗ S1	✓ B	✓ C	✓ C	✗ S3	✗ S3	✗ S4	✗ S5	✓ C	✓ CE	✓ A	✓ H	✓ B	✗ S3
8	✗ S1	✗ S1	✗ S1	✗ S1	✓ B	✓ B	✓ B	✗ S5	✗ S3	✗ S4	✓ H	✓ F	✓ C	✗ S3
9	✓ C	✓ C	✓ C	✓ C	✓ B	✓ B	✓ B	✓ G	✓ C	✓ CE	✓ B	✓ C	✓ A	✓ B
Combustible liquids	✗ S2	✗ S2	✗ S2	✗ S2	✓ B	✗ S2	✗ S4	✗ S5	✗ S3	✗ S4	✗ S3	✗ S3	✓ B	✓ A

Segregation guidance notes for incompatible goods:

S1	Segregate these goods by 3m or more in a well ventilated area. For liquid dangerous goods the distance is measured from the edge of the spill catchment area. See supplementary notes 6 and 7 .
S2	Segregate by 5 m or more. If one of the dangerous goods is a liquid, measure the distance from the edge of the spill catchment area. Liquid dangerous goods should be located within a separate spill catchment area. See supplementary notes 6 and 7 .
S3	Segregate by 3 m or more for PG III goods and 5m or more for PG II, PG I goods or where the goods may react dangerously. If both are solids then a minimum of 1m separation may be used. Where one of the goods is a liquid the distance is measured from the edge of the spill catchment area. See supplementary notes 6 and 7 .
S4	Segregation preferred by the use of fire-rated partitioned areas. Consider use of separate detached building for organic peroxides and for highly pyrophoric class 4.2 goods.
S5	Segregation of class 4.3 preferred by use of a separate, detached building without water based fire suppression system.

DANGEROUS GOODS COMPATIBILITY AND GHS LABELLING ELEMENTS DISPLAY

CLASS	2.1	2.2	2.3	3	4.1	4.2	4.3	5.1	5.2	6	8
2.1		OK	SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE	ISOLATE	SEPARATE	SEPARATE
2.2	SEPARATE		SEPARATE	SEPARATE	REFERS TO SDS	SEPARATE	REFERS TO SDS	REFERS TO SDS	SEPARATE	REFERS TO SDS	SEPARATE
2.3	SEPARATE	SEPARATE		SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE
3	SEPARATE	SEPARATE	SEPARATE		SEPARATE	SEPARATE	SEPARATE	SEPARATE	ISOLATE	SEPARATE	SEPARATE
4.1	SEPARATE	REFERS TO SDS	SEPARATE	SEPARATE		SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE	REFERS TO SDS
4.2	SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE		SEPARATE	SEPARATE	ISOLATE	SEPARATE	SEPARATE
4.3	SEPARATE	REFERS TO SDS	SEPARATE	SEPARATE	SEPARATE	SEPARATE		SEPARATE	SEPARATE	REFERS TO SDS	REFERS TO SDS
5.1	SEPARATE	REFERS TO SDS	SEPARATE	SEPARATE	SEPARATE	SEPARATE	SEPARATE		SEPARATE	SEPARATE	SEPARATE
5.2	ISOLATE	SEPARATE	SEPARATE	ISOLATE	SEPARATE	ISOLATE	SEPARATE	SEPARATE		SEPARATE	SEPARATE
6	SEPARATE	REFERS TO SDS	SEPARATE	SEPARATE	SEPARATE	SEPARATE	REFERS TO SDS	SEPARATE	SEPARATE		REFERS TO SDS
8	SEPARATE	SEPARATE	SEPARATE	SEPARATE	REFERS TO SDS	SEPARATE	REFERS TO SDS	SEPARATE	SEPARATE	REFERS TO SDS	REFERS TO SDS

SEPARATE	Dangerous goods of these two classes should be kept apart by at least 3 metres or other suitable control measures. Consult Safety Data Sheet or supplier.
SEGREGATE	Dangerous goods of these two classes are likely to interact with each other in such a way as to significantly increase risk and should not be kept in the same area unless it can be demonstrated that the risks can be fully controlled. Consult SDS for further guidance.
ISOLATE	Dedicated stores or storage cabinets are recommended. Adequate separation from other buildings and boundaries is required. Consult SDS for further guidance.
REFERS TO SDS	Segregation of these two classes may be necessary. Refer to the SDS for further guidance. All Class 9 dangerous goods should be segregated in accordance with the SDS.
OK	Dangerous goods of the same class have similar primary hazards and are usually considered compatible. Consult with the SDS or supplier about requirements for individual substances.

Australian Dangerous Goods Code at www.ntc.gov.au Australian Standard 3833: The Storage and Handling of Mixed Classes of Dangerous Goods, in Packages and Intermediate Bulk Containers.

CLASS TYPES:

- Class 2.1—Flammable Gas
- Class 2.2—Non Flammable Non Toxic Gas
- Class 2.3—Toxic Gas
- Class 3—Flammable Liquid
- Class 4—Flammable Solid
- Class 4.2—Spontaneously Combustible
- Class 4.3—Dangerous When Wet
- Class 5.1 – Oxidising Agent
- Class 5.2 – Organic Peroxide
- Class 6—Toxic
- Class 8—Corrosive

Source: University of Wollongong Dangerous Goods Compatibility Guide

Appendix G: Legislation, Codes of Practice, Standards and Safeguards

Legislation

- *Work Health and Safety Act 2012 (SA)*;
- *Work Health and Safety Regulations 2012 (SA)*;
- *Dangerous Substance Act 1979 (SA)*;
- *Dangerous Substance Regulations 2002 (SA)*;
- *Mines Act 1971 (SA)*; and
- *Mining Regulations 2011 (SA)*.

Codes of Practice

- Code of Practice - Managing Risks of Hazardous Chemicals in the Workplace;
- Code of Practice - Labelling of Workplace Hazardous Chemicals;
- Code of Practice - How to Manage and Control Asbestos in the Workplace;
- Code of Practice - How to Safely Remove Asbestos;
- Australian Code for The Transport of Dangerous Goods by Road and Rail (ADG Code); and
- National Construction Code (NCC).

Australian / New Zealand Standards

Chemicals

- AS 2187: Explosives - storage, handling and use;
- AS 1596: The storage and handling of LP Gas;
- AS 1894: Code of practice for the safe handling of cryogenic fluids;
- AS 2714: Storage and handling of Class 5.2 substances (organic peroxides);
- AS 4326: Storage and handling of oxidising agents;
- AS/NZS 4452: Storage and handling of toxic substances; and
- AS 3780: Storage and handling of corrosive substances.

Fire Protection Systems

- AS 1670: Automatic fire alarm installations;
- AS 2118: Automatic sprinkler installations;
- AS 2419: Fire Hydrant installations;
- AS 2441: Fire hose reel installations; and
- AS 2444: Selection and location (of fire extinguishers).

Storage and installations

- AS 1319: Safety signs for the occupational environment;
- AS 1940: The storage and handling of flammable and combustible liquids;
- AS 4332: Storage and handling of gas cylinders;
- AS 4289: Oxygen and acetylene reticulation systems; and
- AS 1692: Tanks for flammable and combustible liquids.

Personal Protective Equipment (PPE)

- AS/NZS 1715: Respiratory protective devices (selection);
- AS/NZS 1716: Respiratory protective devices;
- AS/NZS 1801: Occupational protective helmets;
- AS/NZS 2210.1: Safety, protective and occupational footwear;
- AS/NZS 1336: Recommended practice for eye protection; and
- AS/NZS 1337.4: Personal Eye Protection.

Safeguards

- SafeWork SA Safeguards: available from SafeWork SA website www.safework.sa.gov.au

Mining and Quarrying
Occupational Health and
Safety Committee

Level 2, Torrens Building
220 Victoria Square
Adelaide SA 5000

Telephone (08) 8204 9842
www.maqohsc.sa.gov.au

