

Dangerous Goods Act 1985

# Code of practice for the storage and handling of dangerous goods

2013

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# The legislative framework

## ***Dangerous Goods Act 1985***

The DG Act sets out the general duties for the manufacture, storage, transport, sale and use of dangerous goods and the import of explosives into Victoria. It also permits regulations and codes of practice to be made for dangerous goods.

## **Dangerous Goods (Storage and Handling) Regulations 2012**

The DG (S&H) Regulations set out specific duties for the storage and handling of dangerous goods. Section 45(1) of the DG Act provides that failure to comply with regulations made under the DG Act is an offence.

## **Code of Practice for the Storage and Handling of Dangerous Goods**

The DG (S&H) Code provides practical guidance on how to comply with the DG (S&H) Regulations, for manufacturers and suppliers of dangerous goods and occupiers storing and handling dangerous goods.

# Preface

This Code of Practice (**Code**) provides practical guidance on how to comply with the Dangerous Goods (Storage and Handling) Regulations 2012 (**DG (S&H) Regulations**).

It was developed by WorkSafe Victoria (**WorkSafe**). Representatives of employers, employees and government agencies were consulted during its preparation.

The Code was made under the Dangerous Goods Act 1985 (**DG Act**) and was approved by the Minister, the Hon. Gordon Rich-Phillips MLC, Assistant Treasurer.

Manufacturers, suppliers and occupiers should read the Code in conjunction with the DG Act and DG (S&H) Regulations.

The practical guidance in the Code is not mandatory. That is, a person may choose to comply with the DG (S&H) Regulations in some other way, provided the method used also fulfils the requirements of the DG (S&H) Regulations. A person or company cannot be prosecuted simply for failing to comply with the Code.

However, in legal proceedings, failure to observe the Code can be used as evidence that a person or company has contravened or failed to comply with the DG (S&H) Regulations. If a person has not adopted the method described in the Code, it is up to that person to show the legal requirement in the DG (S&H) Regulations has been met by an alternative method. Therefore, the practical guidance in the Code should be followed, unless there is an alternative course of action that would also fulfill the requirements of the DG (S&H) Regulations.

A health and safety representative (**HSR**) may cite the Code in a provisional improvement notice when providing direction on how to remedy an alleged contravention of the DG (S&H) Regulations.

Approval of this Code may be varied or revoked by the Minister. To confirm the Code is current and in force, go to **worksafe.vic.gov.au**.

# Key Terms

A number of terms used repeatedly throughout the Code are listed below for easy reference. There is also a more comprehensive list of terms in Appendix 10.

**ADG Code** - the Australian Code for the Transport of Dangerous Goods by Road and Rail (Seventh edition or subsequent edition).

**Compatible** - in relation to two or more substances or items, means they will not react together to cause a fire, explosion, harmful reaction or the evolution of flammable, corrosive or toxic vapours.

**Consumer package** – a package that is intended for retail display and sale.

**Corresponding legislation** – legislation in another Australian jurisdiction which provides for the classification, assignment of subsidiary risk and packing group and/or the marking of dangerous goods for the purposes of transport by road, rail, air or sea.

**Emergency** – an event that exposes a person or property in the vicinity of the event to an immediate risk through:

- an explosion, fire, harmful reaction or the evolution of flammable, corrosive or toxic vapours involving dangerous goods, or
- the escape, spillage or leakage of any dangerous goods.

**Emergency services authority** –

- the Metropolitan Fire and Emergency Services Board, or
- the Country Fire Authority,

whichever is appropriate to the location of the premises.

**First supplier** – a person who has not manufactured the goods in Victoria and is, or intends to be, the first person to supply the goods in Victoria to another person (eg a person who imports the goods into Victoria from overseas or interstate).

**GHS** – the Globally Harmonized System of Classification and Labelling of Chemicals (Third revised edition or Fourth revised edition) published by the United Nations.

**Handling** - includes:

- conveying the dangerous goods within premises, including within pipework, and
- manufacturing, processing, using, treating, dispensing, packing, supplying, transferring, rendering harmless, disposing of or destroying the dangerous goods.

**Hazard** - any thing, activity, occurrence or circumstance of any kind that has the potential to cause injury to persons or damage to property by:

- an explosion, fire, harmful reaction or the evolution of flammable, corrosive or toxic vapours involving dangerous goods, or
- the escape, spillage or leakage of any dangerous goods.

**Incident** – an emergency or an unintended event that, but for the intervention of a risk control measure or human intervention, is likely to result in an emergency.

**Packaged dangerous goods** – dangerous goods (including goods too dangerous to be transported or C1 combustible liquids) in a container with a net capacity of not more than 500L or a net mass of not more than 500kg.

**Plant** – includes any machinery, equipment, appliance, implement and tool, any component of any of those things, and anything fitted, connected or related to any of those things.

**Workplace** – any place, whether or not in a building or structure, where persons work who are employed under a contract of employment or a contract of training or who are self-employed persons.

**Worker** – person engaged by an occupier to work at the occupier's premises.

# 1. Background

## 1. Purpose and scope

The purpose of the Code is to provide practical guidance about the safe storage and handling of dangerous goods at your workplace, and ways you can meet your duties under the Dangerous Goods (Storage and Handling) Regulations 2012 (**DG (S&H) Regulations**). You should read this Code if you are engaged in the storage and handling of dangerous goods.

**Note:** In this Code, the words 'must', 'requires' or 'mandatory' indicate that legal requirements exist, which must be complied with. The word 'should' indicates a recommended course of action, while 'may' indicates an optional course of action.

## 2. What are dangerous goods?

Dangerous goods are substances capable of causing harm to people and property because of their hazardous properties. They may be corrosive, flammable, combustible, explosive, oxidising or water-reactive or have other hazardous properties.

## 3. Application

The Code applies to **manufacturers** and **suppliers** of dangerous goods covered by the DG (S&H) Regulations. It also applies to **occupiers** of premises at which these dangerous goods are stored and handled. Additionally, it may be useful for health and safety representatives (**HSRs**), employees and contractors.

**Manufacture** refers to any part or whole of the process of:

- making non-dangerous goods from dangerous goods
- making non-dangerous goods from non-dangerous goods, where in the course of the process dangerous goods are made, and
- the unmaking, altering, repairing or remaking of dangerous goods.

An **occupier** includes a person who:

- is the owner of the premises
- exercises control at the premises under a mortgage, lease or franchise, or
- is normally or occasionally in charge of, or exercising control or supervision at, the premises as a manager or employee or in any other capacity.

# Background

## 3.1. Dangerous goods covered by the DG (S&H) Regulations and this Code

The following table sets out the dangerous goods covered by the DG (S&H) Regulations and this Code. While the table uses classifications from the ADG Code, the equivalent GHS categories are also covered. See Appendix 7 of this Code for the equivalent GHS categories.

Type of goods	Description	Reference for classification
Class 2 dangerous good	Gases	ADG Code
2.1	Flammable gases	
2.2	Non-flammable, non-toxic gases	
2.3	Toxic gases	
Class 3 dangerous goods	Flammable liquids	
Class 4 dangerous goods	Flammable solids, substances liable to spontaneous combustion and substances which in contact with water emit flammable gases	
4.1	Flammable solids, self-reactive substances and solid desensitised explosives	
4.2	Substances liable to spontaneous combustion	
4.3	Substances which in contact with water emit flammable gases	
Class 5 dangerous goods	Oxidising substances and organic peroxides	
5.1	Oxidising substances	
5.2	Organic peroxides	
Class 6.1 dangerous goods	Toxic substances	
Class 8 dangerous goods	Corrosive substances	
Class 9 dangerous goods	Miscellaneous dangerous substances and articles	
Goods too dangerous to be transported	Goods listed in Appendix A to the ADG Code.	ADG Code
	Goods determined under regulation 30(2)(a) of the Dangerous Goods (Transport by Road or Rail) Regulations 2008 to be too dangerous to be transported.	Dangerous Goods (Transport by Road or Rail) Regulations 2008
	Goods (other than goods mentioned above) that are so sensitive or unstable they cannot be safely transported even if the relevant requirements of the Dangerous Goods (Transport by Road or Rail) Regulations 2008 and the ADG Code are complied with.	
C1 combustible liquids	A liquid dangerous good with a flashpoint greater than 60°C but not greater than 93°C and a fire point less than its boiling point.	Dangerous Goods (Storage and Handling) Regulations 2012
	A combustible liquid declared by WorkSafe to be a C1 combustible liquid under regulation 10 of the Dangerous Goods (Storage and Handling) Regulations 2012.	

# Background

## 3.2. Dangerous goods not covered by the DG (S&H) Regulations and this Code

### Dangerous goods at workplaces and non-workplaces

The DG (S&H) Regulations do not apply to dangerous goods at a workplace or non-workplace that are:

- explosives
- used in the manufacture of explosives in accordance with Part 3 of the Dangerous Goods (Explosives) Regulations 2011
- batteries while they are in use
- in a fuel container fitted to a vehicle or boat
- in the form of an appliance or plant that forms part of a vehicle or boat and is necessary for its operation
- in the fuel container of a domestic or portable fuel burning appliance
- combustible liquids other than C1 combustible liquids
- in portable firefighting, safety or medical equipment for use at the premises
- asbestos designated by UN 2212 or UN 2590
- infectious substances, or
- radioactive substances.

### Dangerous goods at non-workplaces

The DG (S&H) Regulations also do not apply to dangerous goods at a non-workplace that are:

Description	Aggregate quantities of not more than
Compressed gas of Class 2.1 or Class 2.2 or compressed oxygen that form part of a welding set or are used or intended to be used with a portable flame torch	50L
Compressed oxygen or air that is used or intended to be used for medical purposes	All quantities
Class 3 dangerous goods	250L
Pool chlorine and spa sanitising agents	100kg/L
Sodium hypochlorite designated by UN 1791	100kg/L
Class 9 dangerous goods	100kg/L

Dangerous goods of Packing Group I	5kg/L
C1 combustible liquids	1000L
Any other dangerous goods (not including Class 2.3 dangerous goods)	100kg/L
Dangerous goods that are declared to be HCDG and have no UN Number	All quantities
Dangerous goods that don't create a significant danger to persons or property (which are specified in a determination under regulation 10 of the DG (S&H) Regulations by WorkSafe)	All quantities

## 4. Other Victorian legislation

Appendix 1 of the Code provides a list of other Victorian legislation that may also be applicable to the storage and handling of dangerous goods.

The *Occupational Health and Safety Act 2004 (OHS Act)* and *Occupational Health and Safety Regulations 2007 (OHS Regulations)* are of particular relevance. The OHS Act and Part 4.1 of the OHS Regulations regulate the storage and handling of hazardous substances. Since many dangerous goods are also classified as hazardous substances, the OHS Act and OHS Regulations will often apply in addition to the DG Act and the DG (S&H) Regulations.

The difference between dangerous goods and hazardous substances is that dangerous goods are classified on the basis of immediate physical or chemical effects (eg fire, explosion, corrosion and poisoning) affecting people or property, while hazardous substances are classified only on the basis of health effects (whether they be immediate or long-term).

## 5. Interstate legislation

The storage and handling requirements for dangerous goods in other jurisdictions may be different to those contained in the DG (S&H) Regulations. If you are involved in the storage and handling of dangerous goods outside of Victoria you should refer to the relevant corresponding legislation for that jurisdiction.

## 2. Duties of manufacturers and suppliers

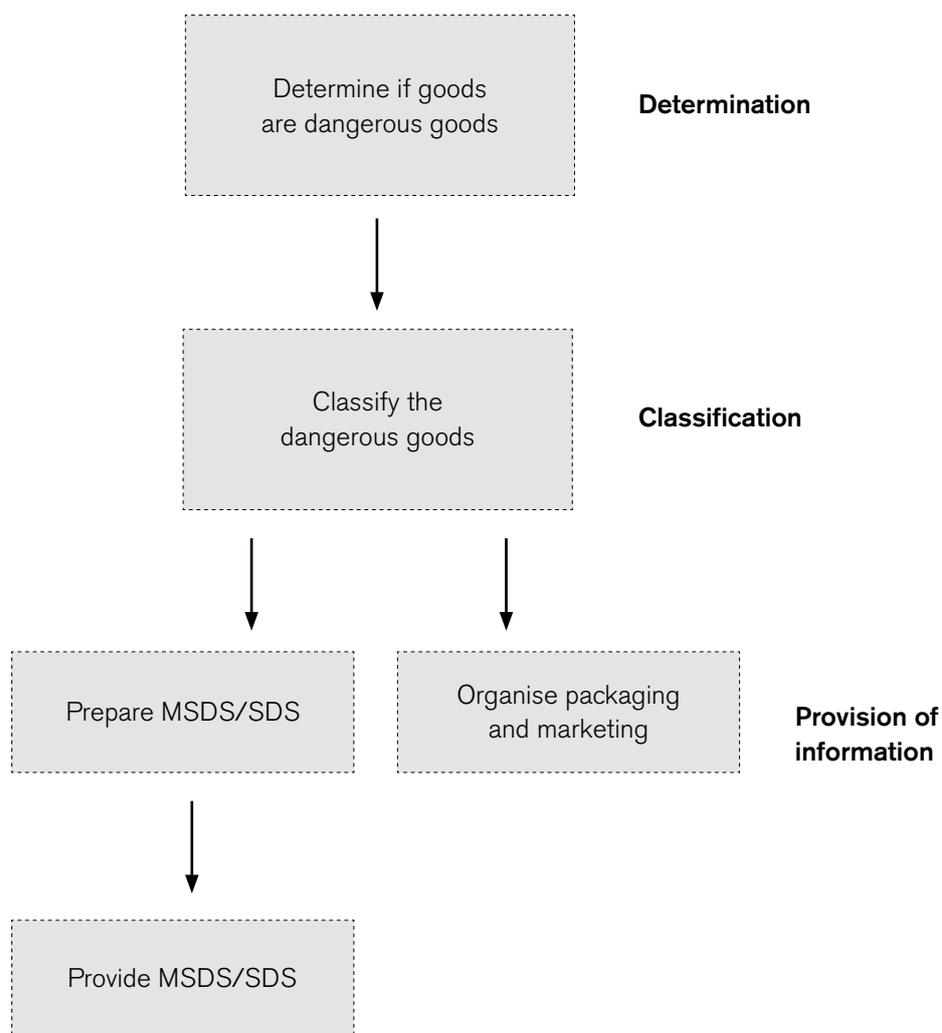
This part provides guidance to those who manufacture or supply dangerous goods. If you manufacture or are the first supplier of dangerous goods, you are required to make a determination that the goods are dangerous goods, and assign the dangerous goods either an ADG Code classification or a GHS Code classification.

You are also required to prepare either a material safety data sheet (**MSDS**) or a safety data sheet (**SDS**) for dangerous goods (other than C1 combustible liquids) and provide this to persons specified in the DG (S&H) Regulations. More information on these documents and the difference between

them is provided at *Section 9 – Preparing a material safety data sheet/safety data sheet* of this Code. You also have to organise packaging and marking for the dangerous goods. However, if you are a supplier (but not a first supplier), your duties are limited to ensuring the packaging and labelling is correct.

References to 'you' in Part 2 of this Code refer to manufacturers and/or suppliers as indicated.

Figure 1 provides an overview of the duties of manufacturers and first suppliers.



**Figure 1: Duties of manufacturers and first suppliers**

# Duties of manufacturers and suppliers

## 6. Determining the goods are dangerous goods

### DG (S&H) Regulation 13

If you suspect or have reasonable grounds for suspecting goods that you manufacture or supply as a first supplier are dangerous goods, you are required to determine if this is the case. The determination must be made before the goods are manufactured if you are the manufacturer or before the goods are supplied if you are the first supplier.

Whether you have reasonable grounds for suspecting the goods are dangerous goods is an objective test. That is, it does not depend on your personal knowledge, but rather on whether a person in the business of manufacturing or supplying the goods would reasonably suspect they are dangerous goods.

When making the determination you must have regard to one of the following:

- for dangerous goods of a particular class – regulation 38 of the Dangerous Goods (Transport by Road or Rail) Regulations 2008
- for C1 combustible liquids – *AS 1940:2004 The storage and handling of flammable and combustible liquids* (**see note below**), and
- for goods too dangerous to be transported – regulation 39 of the Dangerous Goods (Transport by Road or Rail) Regulations 2008.

Regulations 38 and 39 of the Dangerous Goods (Transport by Road or Rail) Regulations 2008 use the ADG Code classifications subject to certain conditions.

**Note:** The definition of 'C1 combustible liquid' in the DG (S&H) Regulations differs from the definition of 'C1 combustible liquid' in *AS 1940:2004*. Despite the differences in definition, you must apply the criteria of 'flash point', 'fire point' and 'boiling point' outlined in *AS 1940:2004* to determine whether the combustible liquid meets the definition of 'C1 combustible liquid' in the DG (S&H) Regulations. If *AS 1940:2004* is revised or replaced subsequent to the publication of this Code, you must comply with the criteria outlined in the new *AS 1940:2004* within 12 months of the revision or replacement.

## 7. Classifying the dangerous goods

### DG (S&H) Regulation 13

If you determine the goods are dangerous goods, you must ensure the goods are assigned either:

- the appropriate class, subsidiary risk and packing group in accordance with the Dangerous Goods (Transport by Road or Rail) Regulations 2008 (which use the ADG Code classification system) or corresponding legislation, or
- a hazard class according to the GHS.

If you classify the dangerous goods according to the GHS and intend to transport them by road or rail, you will also need to classify the dangerous goods in accordance with the Dangerous Goods (Transport by Road or Rail) Regulations 2008 or corresponding legislation.

## 8. Packing, marking and labelling

### DG (S&H) Regulations 14 & 15

### Packing

You must ensure the condition of the dangerous goods and the packaging of the dangerous goods, complies with the Dangerous Goods (Transport by Road or Rail) Regulations 2008 or corresponding legislation.

### Marking and labeling

You must ensure the package marking of the dangerous goods complies with the Dangerous Goods (Transport by Road or Rail) Regulations 2008 (or corresponding legislation). You may label inner packaging in accordance with the GHS, provided the sole or outer packaging is marked in accordance with the Dangerous Goods (Transport by Road or Rail) Regulations 2008 (or corresponding legislation).

If you have determined the goods to be C1 combustible liquids or goods too dangerous to be transported, you must also ensure the packaging is clearly marked with their name.

Appendix 8 of this Code provides a comparison table of equivalent ADG Code and GHS pictograms.

# Duties of manufacturers and suppliers

## 9. Preparing a material safety data sheet/ safety data sheet

**DG (S&H) Regulations** 18, 19, 20, 21, 23

A material safety data sheet (**MSDS**) and a safety data sheet (**SDS**) are information sheets for dangerous goods. You only need to prepare and provide one or the other. The key difference between them is that an MSDS uses ADG Code classifications, whereas an SDS uses GHS classifications.

You must prepare an MSDS or SDS for all dangerous goods covered by the DG (S&H) Regulations and this Code, except for C1 combustible liquids. Under the DG (S&H) Regulations you are not required to prepare an MSDS or SDS for C1 combustible liquids. However, under the OHS Regulations you will need to prepare an MSDS for C1 combustible liquids that are 'hazardous substances'.

**Note:** Other jurisdictions may require you to prepare an MSDS/SDS for C1 combustible liquids. If you are involved in the storage and handling of dangerous goods outside of Victoria you should refer to the corresponding legislation in your particular jurisdiction.

### MSDS under the DG (S&H) Regulations

The DG (S&H) Regulations provide that an MSDS must be written in legible English and include the following information:

- date the MSDS was last reviewed or if it has not been reviewed, date of preparation
- name, address and telephone number of the Australian manufacturer of the dangerous goods or person who imported the dangerous goods into Australia
- an Australian telephone number that can be used to obtain information on the dangerous goods in an emergency
- product name of the dangerous goods
- for dangerous goods classified in accordance with the ADG Code, the proper shipping name, UN number, class, subsidiary risk and packing group
- for dangerous goods classified in accordance with the GHS, the hazard class
- for goods too dangerous to be transported, the name of the goods as specified in Appendix A to the ADG Code

- chemical and physical properties of the dangerous goods
- chemical name of the individual ingredients in the dangerous goods, or if the identity of an ingredient is commercially confidential, the generic name for the ingredient. However, if you think the chemical or generic name won't provide sufficient commercial protection, the ingredient isn't a dangerous good and the ingredient doesn't have a known synergistic effect, you may describe the ingredient on the MSDS as 'other ingredients not determined to be dangerous goods' (**see note below**)
- proportion (or proportion ranges) of the individual ingredients in the dangerous goods
- any relevant health hazard information including first aid information, and
- information on precautions for the safe use of the dangerous goods.

### MSDS under corresponding legislation/ SDS

Instead of preparing an MSDS in accordance with the requirements of the DG (S&H) Regulations, you may prepare:

- an MSDS in accordance with Part 4.1 of the OHS Regulations
- an MSDS in accordance with corresponding legislation, or
- an SDS in accordance with the GHS (provided the SDS is in legible English and contains the name, address and telephone number of the person who imported the dangerous goods into Australia).

**Note:** Despite anything above, you must immediately provide the chemical name of the ingredients of the dangerous goods to any registered medical professional if it is not provided in the MSDS/SDS and they request this information to assist with patient treatment.

# Duties of manufacturers and suppliers

## Additional information in an MSDS/SDS

For dangerous goods that may be unstable except under controlled storage conditions and/or when made up of a particular chemical composition, the MSDS/SDS should also provide details of those conditions and/or specify the recommended proportion and safe limits for each chemical making up the dangerous goods. For example, vinyl chloride monomer and ethylene oxide gas depend on the addition of inhibitors to ensure they remain chemically stable and do not start to polymerise, so the MSDS/SDS for these dangerous goods should note this fact and specify the required proportions of the inhibitors.

## Reviewing and revising an MSDS/SDS

You must review an MSDS/SDS as often as necessary to ensure the information in it remains accurate and current. For example, an MSDS/SDS would need to be reviewed if there was a change in the formulation of a dangerous good, or if new information on the health effects of a dangerous good or its ingredients became available. In any event, you must ensure the MSDS/SDS is reviewed at least every five years after the last date of review or the date of preparation – whichever is later. After any review, the MSDS/SDS should be reissued with the review date. You must ensure the MSDS/SDS is revised if a review reveals that it contains inaccurate or outdated information.

## 10. Providing a material safety data sheet/ safety data sheet

### DG (S&H) Regulation 22

You must provide a copy of the current MSDS/SDS on or before the first occasion the dangerous goods are supplied to any:

- person to whom the dangerous goods are supplied for use, and
- occupier of premises where those dangerous goods are stored and handled (only on request).

If the MSDS/SDS is revised, a copy must be provided to the user and (only on request) to the occupier when the dangerous goods are next supplied. There is no requirement to send a copy of the revised MSDS/SDS to all previous purchasers of the dangerous goods.

### Exception

If you are a retailer, you are not required to provide an MSDS/SDS for:

- dangerous goods supplied in consumer packages
- Class 2 dangerous goods supplied in a container provided by the purchaser, or
- fuel supplied to a vehicle.

A consumer package is a package intended for retail display and sale.

Examples of dangerous goods sold in consumer packages include:

- acetone, mineral turpentine, kerosene
- pool chemicals such as granulated chlorine
- sodium hypochlorite solutions, and
- oil - based paint, primers, sealants and adhesives.

# Duties of manufacturers and suppliers

## 11. Prohibition on supply

### DG (S&H) Regulations 16 & 17

A person must not supply dangerous goods if the person suspects or has reasonable grounds for suspecting the:

- condition of the dangerous goods or the packages of the dangerous goods do not comply with the packaging requirements in *Section 8 – Packing, marking and labeling* in this Code
- package marking or labelling for the dangerous goods does not comply with the marking and labeling requirements in Section 8 of this Code, or
- container the dangerous goods are to be supplied in is leaking or likely to leak.

#### Exception

If you are a retailer who supplies packaged dangerous goods by placing them in a container supplied by the purchaser, the requirements in Section 8 of this Code do not apply to you. Instead you must:

- in the case of Class 2 dangerous goods – ensure the container meets the requirements regarding packaging dangerous goods in the Dangerous Goods (Transport by Road or Rail) Regulations 2008, and
- in the case of other dangerous goods – take all reasonable steps to ensure the container:
  - is of a type and in a condition that will retain and is compatible with the dangerous goods
  - has the name of the dangerous goods clearly marked on the container, and
  - is not ordinarily used to contain food.

You must still not supply the dangerous goods if you suspect or have reasonable grounds for suspecting the container supplied by the purchaser is leaking or likely to leak.

# 3. Duties of occupiers

This part is designed to assist occupiers of premises where dangerous goods are stored and handled.

Occupiers have duties regarding consultation, information provision, training and supervision. Occupiers are also required to obtain MSDS/SDS documents, prepare a register and ensure packages, transfer containers and pipework are appropriately marked. Furthermore, occupiers are obligated to manage risk at the premises by identifying hazards and implementing risk controls to satisfy their general and specific risk control duties. Occupiers also have duties to prepare a fire protection system, as well as other emergency preparation and response duties. Additionally, there are particular duties (including but not limited to preparation of an emergency plan and a manifest, placarding and notification of WorkSafe) which only apply to occupiers with larger quantities of dangerous goods.

References to 'you' in this part refer to 'occupiers'.

## Standards

There are a number of Australian Standards and Australian and New Zealand Standards referred to in this part. These standards are intended to provide guidance on risk controls and form part of the state of knowledge about how to manage risks associated with the storage and handling of dangerous goods. WorkSafe recommends you follow the risk controls provided in these standards. However, you will not have breached the DG (S&H) Regulations, simply because you did not implement the risk controls contained in these standards, provided you have still complied with your duties under the DG (S&H) Regulations in some other way. If these standards are revised or replaced subsequent to the publication of this Code, you should refer to the risk controls in the most current versions.

## 12. Consultation

### DG (S&H) Regulation 24

You must, so far as is **reasonably practicable**, consult with workers whose health or safety is likely to be affected by the dangerous goods and with their HSRs (if any), regarding:

- hazard identification and risk control
- induction, information provision and training, and
- any proposed alterations to structures, plant, processes

or systems of work likely to increase the risk to those workers.

Consultation should take place as early as possible in planning the introduction of new or modified structures, plant, processes and systems of work to allow for changes arising from consultation to be incorporated. It can be done in a number of ways (eg meetings, workshops) depending on the size of your workplace.

### Reasonably practicable

To determine what is reasonably practicable, you must have regard to (a) to (e) below:

#### (a) The likelihood of the hazard or risk concerned eventuating

How likely is it that the storage and handling of the dangerous goods will result in injury to people or damage to property?

#### (b) The degree of harm that would result if the hazard or risk eventuated

How serious are the injuries and property damage likely to be and how many people could be affected?

#### (c) What you know, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk

What is known about the hazards and risks associated with the storage and handling of the dangerous goods and ways to control the risks?

What do manufacturers and suppliers of dangerous goods know about the hazards and risks?

What do other occupiers dealing with similar dangerous goods do to control the risk?

What information can industry professionals and organisations, unions and government agencies provide?

#### (d) The availability and suitability of ways to eliminate or reduce the hazard or risk

Are the risk controls you have identified readily available?

Are they suitable for the premises and persons involved?

#### (e) The cost of eliminating or reducing the hazard or risk

What are the costs associated with implementing risk controls?

# Duties of occupiers

## 13. Induction, information, training and supervision

### 13.1. Workers

#### DG (S&H) Regulation 25

You must ensure that all persons, including HSRs, involved with the storage and handling of dangerous goods at your premises are provided with induction, information, training and supervision. This must be in a language or manner appropriate to them, and relevant to the tasks undertaken and risks associated with those tasks. For example, if a worker at a petrol station is responsible for refilling gas cylinders provided by customers, they must be provided with training specifically about how to check that gas cylinders are safe for refilling (eg the need to check the test date) and on how to safely refill these cylinders.

Specifically, you must ensure the induction, information and training provided, include instruction on the:

- nature of the hazards and properties of the dangerous goods and the processes used for the identification and control of the risks associated with the person's tasks
- purpose, use and maintenance of the measures for the control of those risks
- systems of work and the conduct of persons at the premises to the extent this affects the safe storage and handling of dangerous goods
- operation of the emergency plan for the premises and any procedures and equipment that may be required for use in the event of an emergency, and
- proper use and fitting of personal protective equipment (PPE).

Keeping records of induction and training is not mandatory but may assist you in demonstrating compliance with the DG (S&H) Regulations.

### 13.2. Visitors

#### DG (S&H) Regulation 31

You must ensure visitors (including customers) are provided with sufficient information, safety instructions and supervision to ensure that any risk to them or other persons on the premises, which is associated with the storage and handling of dangerous goods, is reduced so far as is reasonably practicable.

Visitors should be properly informed about:

- the hazards they may be exposed to while on the premises
- appropriate safety measures to be applied while on the premises (eg wearing PPE), and
- what actions to take if any emergency occurs while they are on the premises.

The need for a formal system of providing safety information to visitors, such as a briefing or written safety information, will depend on a number of factors including the:

- nature and severity of hazards on the premises
- extent of the premises and the degree of access provided, and
- degree of supervision for visitors.

In some high-risk situations, it may be necessary to verify through assessment whether visitors have a satisfactory understanding of the safety information.

## 14. Obtaining material safety data sheets/ safety data sheets

#### DG (S&H) Regulation 56

You must obtain the current version of the material safety data sheet (MSDS) / safety data sheet (SDS) for dangerous goods stored and handled at your premises on or before the first time the dangerous goods are supplied to the premises, unless the exception below applies.

Manufacturers and first suppliers have an obligation to provide you with an MSDS/SDS on request. If you are not satisfied with the MSDS/SDS provided, raise your concerns with the manufacturer or first supplier. You may use commercially available MSDS/SDS databases provided they contain the manufacturer's or first supplier's current MSDS/SDS.

# Duties of occupiers

## Exception

You are not required to obtain an MSDS/SDS for:

- dangerous goods stored and handled at a retail outlet or retail distribution warehouse in consumer packages that remain sealed and unopened until sold, and
- dangerous goods in transit on the premises.

However, for dangerous goods which an MSDS/SDS has not been obtained, you must have alternative relevant health and safety information readily available and accessible by workers.

The MSDS/SDS must be readily accessible by all workers, the emergency services authority and any other person on the premises. You should also provide workers with information or training on the purpose of MSDS/SDS and how to use this document effectively.

You must not alter information in an MSDS/SDS prepared by the manufacturer or first supplier. If you choose to provide additional information on the safe storage and handling

of dangerous goods to which the MSDS/SDS relates, this information must be consistent with the information contained in the MSDS/SDS and clearly identified as being provided by the occupier.

## 15. Safety signs

Safety signs may also be of assistance in protecting workers as well as visitors from risks associated with the dangerous goods on the premises. Safety signs are not 'instructions' but are reminders to comply with previously communicated instructions or procedures.

You should provide safety signs that are readily recognisable, understandable and durable.

Safety signs should be:

- in a format appropriate for the intended audience (eg may be pictorial rather than written if the intended audience has a low level of English literacy or understanding)
- visible against background structures, and
- easily interpreted in the conditions that may prevail (eg low light).

See Figure 2 for examples of common types of safety signs.

Types of signs	Examples
Regulatory signs	<div style="border: 1px solid black; padding: 5px; text-align: center; margin-bottom: 5px;"> <b>WARNING – RESTRICTED AREA AUTHORISED PERSONNEL ONLY</b> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>SELF SERVE NOT PERMITTED</b> </div>
Hazard warning signs	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>FLAMMABLE GAS</b> </div>
Precautionary signs	<div style="border: 1px solid black; padding: 5px; text-align: center; margin-bottom: 5px;"> <b>HIGH PRESSURE OUTLET</b> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>ATTACH EARTH CLIP BEFORE PUMPING</b> </div>
Emergency information signs	<div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>EMERGENCY STOP BUTTON</b> </div>

**Figure 2: Safety signs**

# Duties of occupiers

## 16. Register

### DG (S&H) Regulation 60

You are required to keep a register for dangerous goods stored and handled at your premises. A register is a list of the product names of all dangerous goods you store and handle, accompanied where required by the current MSDS/SDS for each of these dangerous goods.

In relation to dangerous goods that are also hazardous substances, it is sufficient for you to list these goods in a register prepared in accordance with the OHS Regulations. This means you only need to establish and maintain a single register for both dangerous goods and hazardous substances if all dangerous goods at your premises are also hazardous substances.

The register must be maintained to ensure it is current. You should update the register when:

- new dangerous goods are introduced to the premises
- the use of existing dangerous goods are discontinued, and
- the manufacturer, first supplier or supplier provides a revised MSDS/SDS.

Since manufacturers and first suppliers are required to review, and where necessary, revise MSDS/SDS at least every five years, all MSDS/SDS in the register or otherwise accessible at the premises should have issue dates within the last five years. If the use of particular dangerous goods is to be permanently discontinued, you should remove it from the register. Dangerous goods used periodically or seasonally do not need to be removed from the register.

The register must be readily accessible by any worker and any other person who is likely to be affected by the dangerous goods on the premises. You should keep it in a central location or a copy of it in each work area.

### Exception

The only dangerous goods that do not have to be included in the register are:

- dangerous goods in packages of a size that do not have to be marked under the ADG Code, and
- dangerous goods in transit.

The best indication of whether dangerous goods are in packages of a size that do not need to be marked under the ADG Code, is whether the sole or inner packages of the dangerous goods are marked in accordance with the ADG Code. For example, if you are the occupier of a retail shop, 150ml bottles of acetone may arrive at your premises in combined unit packaging marked with the ADG Code. The individual 150ml bottles of acetone will not be individually marked with an ADG Code marking and would not need to be included in the register.

## 17. Marking

### DG (S&H) Regulations 57–59

### Packages

If you receive a package of dangerous goods, during the period the dangerous goods remain in the package, you must ensure the package marking remains in a legible form and is not removed, defaced or altered.

If the dangerous goods are removed from the package and the original package marking remains, you must ensure the container forming part of the package is not used to contain dangerous goods other than dangerous goods of the type that was in the package when it was first received.

### Transfer containers

If dangerous goods are transferred into a portable container for use at the premises, you must ensure:

- the container into which the dangerous goods are transferred is clearly labeled with the class, subsidiary risk and product name of the dangerous goods, or
- if this is not possible, another means of clearly identifying the dangerous goods is used.

This requirement does not apply if the dangerous goods transferred are to be used immediately and the portable container is cleared in accordance with *Section 21.6 – Clearing decommissioned receptacles* in this Code.

# Duties of occupiers

## Pipework

You must ensure any pipework containing dangerous goods is marked to ensure, so far as is reasonably practicable, the dangerous goods are clearly identifiable by workers at the premises.

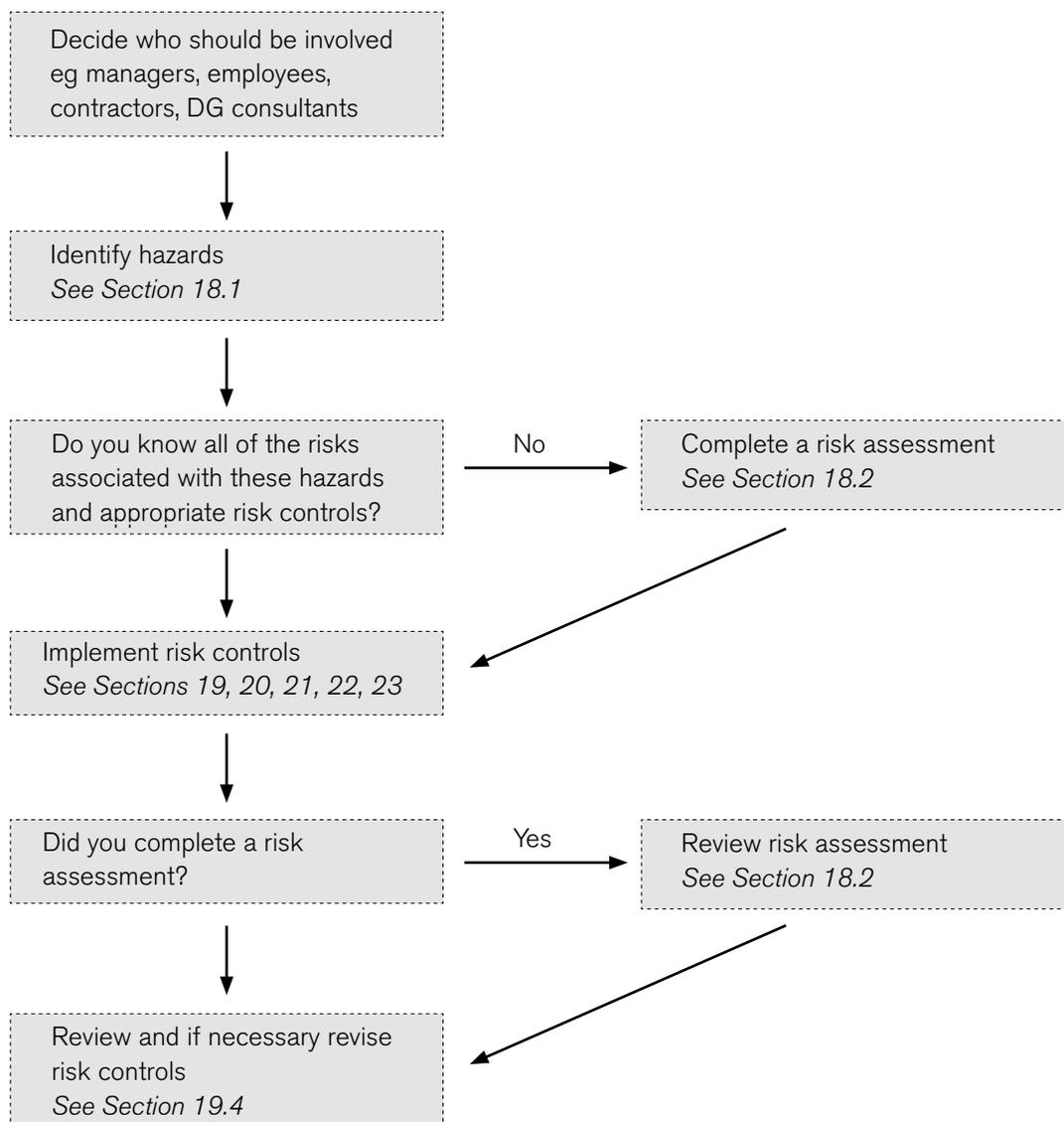
## 18. Risk management process

In order to manage the risks of storing and handling dangerous goods, you must decide who will be involved in the risk management process, identify the hazards at your premises, implement risk controls to eliminate or reduce the risks associated with these hazards, and review and if necessary revise these risk controls.

As part of the risk management process, you may also choose to undertake a risk assessment before implementing the risk controls. Undertaking a risk assessment is not mandatory. If you do undertake a risk assessment you should review this assessment post implementation.

Hazard identification and risk assessment are covered at Sections 18.1 and 18.2 of the Code respectively. Risk controls are dealt with in Sections 19 to 23 of the Code.

See Figure 3 for an overview of the risk management process.



**Figure 3: Risk management process**

# Duties of occupiers

## 18.1. Hazard identification

### DG (S&H) Regulation 26

You must identify any hazard associated with the storage and handling of dangerous goods at your premises, having regard to what you know or ought to reasonably know about the hazard.

Undertaking the following activities may be helpful in identifying hazards:

- reviewing any current relevant MSDS/SDS
- reviewing labels on the packaging of the dangerous goods
- consulting with the suppliers of the dangerous goods or other persons with specific expertise in dangerous goods
- walking through and inspecting the premises and the storage and handling methods, and
- thoroughly examining plans of the premises and reviewing the location of all buildings and services (eg water, gas, electricity, compressed air, steam), as well as the location of drains, chemical pipelines, roads and access ways.

When identifying hazards you must have regard to the factors discussed in (a) to (h) below and determine the associated hazards.

#### (a) Hazardous properties inherent to the dangerous goods

The inherent hazardous properties of dangerous goods include being:

- corrosive
- oxidising
- flammable
- combustible
- explosive, and
- water-reactive.

For example, petrol and sodium hydroxide (caustic soda) have inherent hazardous properties. Petrol is hazardous principally because it is flammable, so the identification of hazards should be based on the potential for fire and explosion. Petrol also has other properties that may prove hazardous. It can act as a solvent and dissolve other hydrocarbons like greases, and can dissolve or weaken certain types of plastics. Sodium hydroxide is corrosive to the skin and eyes, as well as metals. It may also react with other

substances, particularly dangerous goods that are acidic.

#### (b) Chemical and physical properties of the dangerous goods

The chemical and physical properties of dangerous goods include:

- physical state – solid/liquid/gas
- viscosity
- combustion products and concentration
- chemical energy
- vapour pressure
- solubility
- reactivity, and
- electrical conductivity.

See Appendix 6 of this Code for a more complete list of chemical and physical properties that should be considered when identifying hazards.

For example, the chemical and physical properties of dangerous goods can be hazardous in the following ways:

- gases or liquids with low boiling points or high vapour pressures (eg propane, xylene, acetone) can give rise to explosive airborne concentrations in most circumstances
- liquids with high boiling points (eg oils) are likely to create an explosive airborne concentration if they are sprayed on or near ignition sources
- dangerous goods with a very low or high pH (ie acids and bases respectively) are corrosive to the skin and eyes and corrosive to some metals, and
- some dangerous goods (eg many organic peroxides) are chemically unstable or highly reactive and may self-react or react with other materials to cause a fire or explosion.

# Duties of occupiers

## **(c) Manufacturing and transport processes at the premises involving the dangerous goods**

Relevant processes will include those that subject the dangerous goods to particular temperatures and pressures, physical processes (eg separation, mixing, absorption and changes of state) and chemical reactions.

For example, the process of pumping liquefied gas may be hazardous. A reduction in pressure on the suction side of the pump may result in the gas partially vapourising before it enters the pump, causing a vapour lock within the pump. As a result, the pump may stop pumping liquid and instead re-circulate the pocket of vapour. This may cause the pump to overheat and ignite the gas.

## **(d) Structures, plant (including the materials used in the plant), systems of work and activities used in the storage and handling of dangerous goods at the premises**

Structures include any structures associated with the storage and containment of the dangerous goods (eg bulk storage tanks). Systems of work include normal operating procedures, as well as procedures under unusual operating conditions. You should consider the opportunity for operator error in such procedures. Activities may include the movement of vehicles, movement of workers in normal and emergency situations, and visitor access.

For example, a system of work that requires mixing of dangerous goods by hand may present a hazard. Workers involved in the mixing process may be exposed to corrosive dangerous goods or a fire or explosion involving the dangerous goods.

## **(e) Physical location and arrangement of areas, structures and plant used for the storage and handling of dangerous goods at the premises**

You should consider where dangerous goods storage and handling areas are located and how these areas are arranged.

For example, locating dangerous goods close to potential heat or ignition sources or in locations where there is significant movement of plant or vehicles may create a hazard. Similarly, locating incompatible dangerous goods in close proximity to each other may create a hazard.

## **(f) Structures, plant (including the characteristics of the materials used in the plant), systems of work and activities not used in the storage and handling of dangerous goods at the premises but that could interact with the dangerous goods**

Relevant considerations include whether:

- there are any dangerous goods stored near your premises
- nearby facilities such as schools, hospitals, child and aged care facilities, theatres, shopping centres and residences could be affected by an incident at your premises, and
- there are any activities and installations on adjacent premises that could create a hazard.

You should also consider any potential effects of a nearby main road, railway line, airport, gas pipeline, water main, and high voltage power lines and radio transmitters including mobile phone repeater towers.

For example, a timber yard located adjacent to the premises may present a hazard. Depending on the proximity of the timber yard and stacks of timber in relation to where the dangerous goods are stored and handled, a fire at the timber yard could spread to the dangerous goods, causing explosions and the emission of toxic gases.

## **(g) The chemical and physical reaction between dangerous goods and other substances and articles the dangerous goods may come into contact with at the premises**

Chemical reactions result in a chemical change in one or more of the goods when they come into contact with one another. Physical reactions include dilution, dissolution, abrasion, phase change, leaching and absorption.

For example, the chemical reaction caused by mixing an oxidising agent (eg pool chlorine) with a hydrocarbon (eg oil, brake fluid) can result in a very intense fire that is difficult to extinguish. Additionally, the combination of concentrated solutions of the same products may result in a violent reaction that can be explosive or generate a great deal of heat and may result in hot acid and alkali being splashed around. The physical reaction caused by mixing water and acid can create an explosion. The addition of a small amount of water to a large quantity of concentrated acid may result in rapid boiling of the water as it dilutes the acid. If the heat generated can't dissipate quickly enough, the effect may be explosive.

## (h) Types and characteristics of incidents associated with dangerous goods

This includes incidents affecting the structures and plant used to store and handle these goods. You should consider the types of incidents that have occurred when storing or handling dangerous goods at your premises, and premises that store and handle similar dangerous goods. You should also consider what is known about how either of these types of incidents were caused.

For example, there might have been a number of near fatal incidents at another premises involving the same type of dangerous goods that are stored and handled at your premises.

## 18.2. Risk assessment

It may be helpful to undertake a risk assessment if you're not certain what the potential risks or appropriate risk controls are at your premises. Doing a risk assessment will assist you:

- identify which persons are at risk
- determine what sources and processes are causing that risk
- identify if and what kind of control measures should be implemented, and
- check the effectiveness of existing control measures.

However, it is not mandatory for you to undertake a risk assessment.

If you choose to undertake a risk assessment for your premises, there are a number of different tools that can be utilised in the process. At premises where complex dangerous goods processes are involved (eg chemical manufacturing processes), it may be necessary to complete a failure modes and effects analysis, fault tree analysis, layers of protection analysis, or a quantitative risk analysis (QRA). At premises where less complex dangerous goods processes are involved (eg transferring dangerous goods from a truck to a storage warehouse), it may be sufficient to prepare a risk matrix.

More information about risk assessment can be found in the publication *Controlling OHS hazards and risks at worksafe.vic.gov.au*.

Broadly speaking, a risk assessment involves considering the **potential consequences** and **likelihood** of an incident, as well as the order in which risks associated with the incident should be controlled.

## What are the potential consequences of an incident?

In assessing the consequences of an incident you should consider:

- whether a person may be injured or exposed to an immediate risk to health or safety at your premises or adjacent premises
- whether there may be damage to property at your premises or adjacent premises
- the potential for the incident to escalate in seriousness and further endanger or injure a person or damage property on or off your premises, and
- the potential for the incident to cause environmental damage beyond your premises.

For example, an explosion risk has been identified in relation to the hot cutting or welding of drums that once contained flammable or combustible liquid. The consequence of an explosion is that persons working nearby could sustain serious injuries and nearby equipment may also be damaged.

## What is the likelihood the incident will occur?

To assess the likelihood, review historical records and incident information from your premises, similar premises and similar types of industries. Workers are also a very useful source of information. If the particular storage and handling operation is complex or is very high risk, a QRA may be needed.

For example, in relation to the aforementioned explosion risk, the person carrying out the risk assessment reviews the incident records for the premises and talks to management and supervisors, other workers and their HSRs. The combined advice of these people is that the cutting and welding occurs quite frequently at the premises and there have been near misses before, which means there is a significant likelihood that an incident will occur.

# Duties of occupiers

## Other risk assessment information

### Generic risk assessments

Often particular dangerous goods are used in the same or similar way in a number of different premises, or in areas within the same premises. Because the nature of the hazard and the risk in these cases may be similar, you may choose to undertake a risk assessment of one representative situation and apply it to the other areas or premises.

For example, a factory repackages Class 3 dangerous goods and has four separate packaging lines that are the same and able to repackage the same range of products. A risk assessment undertaken for one of the packaging lines may be applied to the other three.

### Recording the outcomes of risk assessments

Keeping records of risk assessments may assist you to demonstrate compliance with your risk control duties. It may also help you identify whether there have been any changes to the risk profile of the premises.

### Review and revision of the risk assessment

You should review and if necessary revise the risk assessment if there is an incident, or where you think a change or proposed change at your premises may lead to a change in the risk profile of the site.

## 19. General risk control duties

As an occupier you have a number of general risk control duties regarding the storage and handling of dangerous goods at your premises.

The requirement contained in these duties to ensure risk is eliminated or reduced, means that you must first attempt to eliminate risk and if this is not reasonably practicable, you must then attempt to reduce risk so far as is reasonably practicable.

Anything you use to eliminate or reduce risk is known as a 'risk control'.

## 19.1. Controlling risk at your premises

### DG (S&H) Regulation 27

You have a general duty to ensure any risk associated with the storage and handling of dangerous goods at your premises is eliminated or reduced.

To comply with this duty you must consider substituting other non-dangerous or less dangerous goods or reducing the quantity of dangerous goods on the premises.

## 19.2. Controlling risk to your workers

### DG (S&H) Regulation 30

You have a general duty to ensure any risk to workers involved with the storage and handling of dangerous goods at your premises is eliminated or reduced.

To comply with this duty you may either:

- eliminate the risk associated with use of the dangerous goods, or
- reduce the risk associated with use of the dangerous goods by:
  - substitution of less dangerous goods
  - reducing the quantity of dangerous goods stored or handled
  - isolation of the dangerous goods from persons
  - use of engineering controls
  - use of administrative controls, or
  - use of PPE.

You must only rely solely on administrative controls or PPE to reduce risk to your workers if it is not reasonably practicable to either eliminate risk or reduce risk with the higher order controls (substitution, reduction, isolation, engineering controls).

## 19.3. Hierarchy of controls

The general duties covered in Sections 19.1 and 19.2 of the Code not only require you to manage risk but also to use particular types of risk controls to do so. These different types of risk controls make up the hierarchy of controls.

At the top of the hierarchy is **elimination**, which you must consider first. If it is not reasonably practicable to eliminate the risk, you must then **reduce** the risk so far as is reasonably practicable, with higher order risk controls. These include **substitution, reduction, isolation and engineering controls**.

If it is not reasonably practicable to use these higher order risk controls, you must then attempt to reduce the risk with lower order controls - **administrative controls** and **personal protective equipment**. These tend to be a less effective way of reducing risk (when used without higher level controls) because they rely on human behavior and are susceptible to human error.

You may need to use a combination of higher order risk controls and lower order risk controls to reduce the risk so far as is reasonably practicable.

## 19.4. Reviewing and revising risk controls

### DG (S&H) Regulation 27

You must ensure any risk control measures implemented at your premises are reviewed and if necessary revised:

- before any alteration is made to a process or system of work that is likely to result in changes to risk associated with the storage and handling of dangerous goods
- following an incident, or
- if for any other reason, the risk control measures do not adequately control the risks.

For example, if you significantly increase the amount of particular dangerous goods stored at the premises, the risks associated with the storage of dangerous goods are likely to increase, and the risk controls should be reviewed and revised. Alternatively, if you replace pipework used to transfer dangerous goods at the premises with new but otherwise identical pipework, it is unlikely risks at the premises will change, and there should not be any need to review and revise risk controls.

## 20. Types of risk controls

The different types of risk controls which comprise the hierarchy of controls are explained in more detail in Sections 20.1 to 20.7 of this Code.

### 20.1. Elimination

Eliminating risks may be done by eliminating either the dangerous goods or the activity involving the dangerous goods which gives rise to the risk. If you store and handle dangerous goods and the dangerous goods are essential to the operation of the premises (for example, where your principal business is contract storage of dangerous goods) then elimination of all risks associated with the dangerous goods is not likely.

Examples of controlling risk by eliminating the dangerous goods include use of:

- a physical process rather than a chemical process to clean an object, such as the use of ultra-sound, high pressure water or even steam cleaning rather than solvent washing
- water-based rather than solvent-based paints or powder coating
- clips, clamps, bolts or rivets instead of an adhesive, and
- hot melt or water-based adhesives instead of solvent-based adhesives.

Examples of controlling risk by eliminating the activity involving the dangerous goods include:

- replacing a forklift to move dangerous goods around with a system of conveyors. In this case an activity that is dependent on the driver's skill and care has been eliminated and replaced by a handling method that is less susceptible to human error
- replacing the manual filling of a large open vat mixing and reacting flammable and toxic dangerous goods with an enclosed continuous process utilising 'in the pipe' mixing and reaction. In this case the activity of hand filling is eliminated, and
- wet mixing of a friction-sensitive dangerous goods powder instead of a more hazardous dry mixing process.

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## 20.2. Substitution

Substitution involves replacing dangerous goods with less dangerous goods. When considering substituting dangerous goods, you should check the replacement substance does not create a different type of equally dangerous risk (eg you may be replacing an asphyxiation risk with a flammability risk). You will need to consider all the risks arising from the storage and handling of the replacement substance to determine whether substitution is appropriate for your circumstances.

Examples of eliminating or reducing risk by substitution include use of:

- a detergent instead of a chlorinated or volatile solvent for degreasing purposes
- a combustible liquid (eg diesel) instead of petrol or kerosene which are Class 3 flammable liquids
- dangerous goods with a higher packing group number (eg substituting xylene (PG III) for toluene (PG II)) – **note** packing group number is only indicative of the flammability risk
- a less dangerous propellant in an aerosol (eg carbon dioxide Class 2.2 instead of un-odourised LPG of Class 2.1)
- dangerous goods without a subsidiary risk, and
- dangerous goods in a less dangerous form (eg a paste, pellets or a solution, instead of a powder).

## 20.3. Reduction

It may be possible to reduce quantities of dangerous goods stored and handled at the premises by:

- regularly disposing of dangerous goods no longer needed
- selecting manufacturing and handling processes that are continuous rather than batch processes
- selecting chemical processes that have high conversion rates and result in less recycling or stockpiling of raw materials
- using just-in-time ordering and supply arrangements, and
- using a just-in-time approach in manufacturing areas (that is only handling those dangerous goods necessary for a production shift rather than stock piling the supply for several shifts in the manufacturing area).

While the principle of reducing quantities of dangerous goods to reduce risk is generally sound, there are some circumstances where this principle is not applicable. The most common circumstances are where the premises is specifically designed to store dangerous goods – either to contain the output from production at a manufacturer's premises, or where the occupier's business is warehousing or contract storage. Another circumstance is where the dangerous goods are used as a stabiliser. It will be necessary to ensure stock levels of dangerous goods used as a stabiliser do not fall below critical levels.

## 20.4. Isolation

Isolation involves separating the dangerous goods from persons or property by either distance or a physical barrier.

### Distance

For most classes of dangerous goods, guidance on safe separation distances can be found in the following standards:

- *AS 1940:2004* - see Clause 4.3.1 and Tables 4.1 and 4.2
- *AS 3780:2008 The storage and handling of corrosive substances* – see Clauses 4.1, 4.3.1 and 4.3.2 and Table 4.1, Clauses 5.1, 5.3.2 and Table 5.1
- *AS/NZS 3833:2007 The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers* – see Clauses 6.1, 6.2 and Table 6.1, and
- *AS 4332:2004 The storage and handling of gases in cylinders* – See Clause 4.4.2 and Table 4.1.

The minimum separation distances suggested in these standards generally vary depending on quantity, storage container, class, packing group (or C1 combustible liquid classification), and whether packages are open or closed.

### Barriers

Barriers include fire walls, screen walls and vapour barriers. Barriers are often used in place of separation distances. For example, consider the situation where an occupier requires a C1 combustible liquids store to be constructed at their premises and the store is intended to be located close to a potential ignition source (eg the factory electrical switchboard). The occupier could place a non-combustible screen wall between the store and the electrical switchboard to create the level of safety that would otherwise be provided by the suggested separation distance. Alternatively, if a flammable dangerous goods store needed to be constructed very close to the site office building and the suggested

# Duties of occupiers

separation distance would not be possible between the two, the placement of a fire wall between the office and store could be used to achieve the safety level that would otherwise be provided by the separation distance.

For dangerous goods with a flammability hazard, fire walls and screen walls must have an appropriate fire resistance level. Fire resistance level (**FRL**) represents the times in minutes (determined in accordance with *AS 1530.4 Methods for fire tests on building materials, components and structures - fire-resistance test of elements of construction* for structural adequacy, integrity and insulation, expressed in that order). A fire-rated door may be supplied with an FRL of 60/60/30, meaning 60 minutes for structural adequacy, 60 minutes for integrity and 30 minutes for insulation.

Further guidance on fire walls, screen walls and vapour barriers can be found in *AS 1940: 2004* Clause 3.7.

Example 2 in Appendix 3 also includes a diagram of how isolation and barriers work in practice.

## 20.5. Engineering controls

Engineering controls are those which use measures to change the physical characteristics of plant, structures and premises to reduce risks associated with the storage and handling of dangerous goods.

Examples of engineering controls include:

- totally or partially enclosing the dangerous goods or external hazard
- providing adequate spill control measures to deal with the largest foreseeable spill
- specifying and installing appropriately rated electrical circuitry, fittings and equipment to minimise ignition hazards
- providing adequate ventilation, including by installation of local exhaust ventilation, to eliminate flammable or otherwise harmful atmospheres
- automating processes to eliminate human exposure and the opportunity for human error
- fitting sensors and controls for liquid levels, pressure and temperature, to eliminate overflow and uncontrolled reactions, and to minimise formation of hazardous atmospheres
- fitting safety-critical control devices, alarms and critical-condition shut-down devices
- using appropriate construction materials and containers (eg atmospheric or pressure vessels)

- installing lighting which provides ample illumination for the tasks to be performed
- installing fire detection systems and fire control systems, and
- incorporating suitable devices to protect installations from external hazards, such as crash barriers to protect from moving vehicles.

## 20.6. Administrative controls

Administrative controls involve using systems of work and work practices (and the provision of information and training on these systems and practices) to reduce risk.

Examples of administrative controls include:

- providing workers with training on how to safely store and handle dangerous goods
- developing procedures that describe safe methods for performing activities associated with the storage and handling of dangerous goods. For example:
  - procedures for waste disposal and effective decontamination, and
  - procedures for inspection, maintenance, repair, testing and cleaning
- reducing the maximum number of workers in the dangerous goods work area (eg the use of internal work permits to restrict non-essential access)
- rotation of workers (with the appropriate skills) to limit the period of exposure for individuals, and
- prohibiting eating, drinking, smoking and carrying matches, lighters and non-intrinsically safe items in potentially contaminated or volatile areas.

## 20.7. Personal protective equipment

Personal protective equipment (**PPE**) involves using protective clothing, footwear and headwear to reduce risk.

Examples of PPE include full-length overalls, aprons, abrasion or chemical-resistant gloves, dust masks, respirators or breathing apparatus, safety footwear, chemical-resistant boots, goggles or face shields, safety helmets, hearing protection or fully encapsulated suits.

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PPE may be necessary:

- where it is not reasonably practicable to reduce risk by other means
- where it is not reasonably practicable to reduce the risk so far as is reasonably practicable by using other means only (eg if you substitute a more dangerous good with a less dangerous good, it may still be necessary to use PPE to control the lesser risks that have not been completely eliminated by substitution)
- to safeguard health and safety until adequate control is achieved by other means (eg where urgent action is required because of plant failure), and
- during some infrequent maintenance operations where the short duration may make other control measures impracticable.

Information on the selection of appropriate PPE and its correct use should be obtained from the MSDS/SDS.

When choosing the most appropriate PPE, consider:

- whether it provides the required level of protection from the risks associated with the particular dangerous goods and/or task
- whether it is suitable for the wearer's size and build, and
- the wearer's need for mobility, dexterity, clear vision and communication.

All PPE provided to workers must be suitable for use with the dangerous goods and maintained in a clean and serviceable condition.

You must arrange for people wearing PPE to be trained in the correct use and fitting of this equipment. You should also arrange for such persons to be trained in the proper maintenance of PPE. Given PPE relies heavily on users following instructions and procedures correctly, you may need to provide a greater level of training and supervision when using this control, compared to the amount of training and supervision required when using higher level controls. It would be helpful to provide a practical demonstration of how to use the PPE.

## 21. Specific risk control duties

Occupiers are also subject to a number of specific duties regarding risks associated with particular aspects of the storage and handling operations such as stability, interaction with other substances, containers for bulk dangerous goods etc.

The requirement contained in these specific duties to ensure risk is eliminated or reduced, means that you must first attempt to eliminate risk and if this is not reasonably practicable, you must then attempt to reduce risk so far as is reasonably practicable.

You must follow the order of the hierarchy of control in implementing controls to comply with these specific duties, unless indicated otherwise in the sections which deal with these duties. You are required to review and revise these risk controls in the circumstances outlined in *Section 19.4 – Reviewing and revising risk controls* of this Code.

### 21.1. Stability of dangerous goods

#### DG (S&H) Regulation 33

You must ensure so far as is reasonably practicable, dangerous goods at your premises do not become unstable, decompose or change in a way that will introduce a new hazard and accompanying risk or increase an existing risk.

Many dangerous goods are highly reactive, unstable or self-reactive except under controlled conditions. These controlled conditions must be maintained. Information about the required levels of stabilisers and/or control temperatures should be provided by the supplier and included in the MSDS/SDS. If you choose not to follow the supplier's instructions regarding stabiliser levels and/or control temperatures, you must ensure the stabiliser levels and/or control temperatures implemented provide an equivalent or better level of stability.

Where the stability of the dangerous goods is dependent on regular dosing with a stabiliser you should ensure there are sufficient stocks kept at the premises to take account of any possible supply shortage.

If the dangerous goods must be stored at or below a control temperature that can only be maintained by refrigeration, you should provide back-up refrigeration or develop a contingency plan in the event there is loss of cooling.

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## 21.2. Isolation of dangerous goods from persons and property off the premises

### DG (S&H) Regulation 34

You must ensure the risk to persons and property not located at your premises, which arises from an incident, is eliminated or reduced.

You should comply with this duty by using separation distances and/or barriers. See *Section 20.4 - Isolation* of this Code for more information on these risk controls.

Factors to consider when determining appropriate separation distances include:

- the hazards associated with the dangerous goods and the risks these pose to persons and property nearby
- any hazards on nearby premises
- the quantity of dangerous goods stored and handled in the work area
- the type of installation and the processes applied to the dangerous goods in the work area and the associated hazards and risks
- all other activities in the work area that may increase the risk, and
- any other control measures in place that will reduce the risk.

Factors to consider when determining whether to use barriers (alone or together with separation distances) include:

- hazards associated with the dangerous goods and the risks they pose to the barrier
- extent of barrier required and its effectiveness in varied climatic conditions
- appropriate fire resistance level, depending on the potential heat load from an incident, and
- structural strength necessary to withstand weather and any overpressure resulting from an incident.

## 21.3. Interaction with other substances, plant and processes

### DG (S&H) Regulations 35 & 36

You must ensure the risk associated with the chemical and physical reaction between the dangerous goods and other substances or articles at the premises is eliminated or reduced.

Ways of doing this include:

- substituting the dangerous goods for other dangerous goods that will not react with substances or articles at the premises
- isolating the dangerous goods from other substances or articles at the premises by distance or barriers, and
- using appropriate construction materials and containers (eg atmospheric or pressure vessels) to prevent the escape of dangerous goods

Additionally, you must, so far as is reasonably practicable, ensure any structure, plant (including the materials used in the plant), system of work or activity that:

- is not used to store or handle dangerous goods at the premises, and
- is capable of interacting with the dangerous goods at the premises –

does not increase the risk associated with the storage and handling of the dangerous goods.

Ways of doing this include:

- isolating the dangerous goods from these structures and plant by barriers, and
- fitting safety-critical control devices, alarms and critical-condition shut-down devices on this plant.

## 21.4. Condition and repair of plant and structures

### DG (S&H) Regulation 37

Plant and structures used in the storage and handling of dangerous goods must be manufactured, installed, commissioned, operated, tested, maintained, repaired and decommissioned so as to eliminate or reduce risk.

To comply with this duty you should ensure plant and structures are:

- manufactured to a high standard within the design specification, from quality, durable materials that will not be adversely affected by the storage and handling of dangerous goods
- installed only after all hazards associated with the installation of such plant and structures have been identified and the risks controlled
- commissioned only after thorough testing has been carried out and agreed procedures have been developed to ensure they can be operated safely
- operated only in accordance with the agreed procedures by personnel who have received appropriate training
- maintained and repaired to ensure that no additional hazards or increased risk arise due to normal operation, wear and tear or breakdown, and
- maintained, repaired and, when the need arises, decommissioned in a manner which does not introduce additional risks.

Maintenance or repair of plant and structures may involve the use of 'hot work' processes (eg welding, grinding) that generate heat or introduce ignition sources. In these circumstances you must control the risk of fire or explosion involving the dangerous goods. A formal 'hot work permit' system is recommended. See *AS 1940:2004* Clause 9.8.6 for guidance on 'hot work' in areas where dangerous goods are stored and handled.

## 21.5. Containers for bulk dangerous goods

### DG (S&H) Regulation 38

A container and its pipework used for bulk storage of dangerous goods must be provided with stable foundations and supports and protected from corrosion.

Any pipework or equipment connected to the container must also be installed so as to prevent excessive stress on the container, pipework and equipment.

The bulk container must be inspected at intervals that are sufficient to ensure the continued integrity and serviceability of the container. The results of the inspection must be recorded and retained, for as long as the container remains in service at the occupier's premises. If you cease to be the occupier of the premises, the recorded inspection results must be delivered to the person who becomes the occupier.

Guidance on the design of different types of bulk tanks and attachments including pipework can be found in *AS 3780:2008* Clauses 5.5 to 5.7 inclusive. Guidance on static tank storage design for Class 8 corrosive liquids and Class 3 flammable and combustible liquids can be found in *AS 1940:2004* Clause 5.2

### Underground tanks

Underground tanks are commonly used as containers for bulk dangerous goods. Underground tanks pose risks to people and property from:

- failure of the structure, usually due to corrosion, allowing the gradual escape of dangerous goods into the water table and soil, and
- spills from above-ground pipework and filling points.

Dangerous goods stored in underground tanks can migrate through the water table and soil to present a risk to people and property a long way from the tank. For example, flammable or toxic liquids and vapours can accumulate in telecommunications pits or seep into building basements. Often the risks do not become evident until there has been heavy rain that causes the water table to rise and displace the dangerous goods that have accumulated in the soil around the tank.

There are many techniques available to monitor the integrity of underground tanks and detect any leaks at an early stage. They include inventory monitoring, sampling pits, sampling of ground water and land around the facility, and a range of electronic measures.

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Guidance on underground tank installations for petroleum products can be found in *AS 4897:2008 The design, installation and operation of underground petroleum storage systems* Sections 1 to 6 (inclusive).

## 21.6. Clearing decommissioned receptacles

### DG (S&H) Regulation 39

Any receptacle that has contained dangerous goods must be cleared of the dangerous goods before it is decommissioned and disposed.

In order to clear the receptacle, you must ensure:

- the receptacle is thoroughly cleaned so there is no discernible trace of the dangerous goods, or subjected to a process in which its contents are neutralised, cured or chemically deactivated, and
- the atmosphere within the receptacle is cleared as follows:
  - if the gas or vapour in the atmosphere is listed in the HSIS – so the concentration (calculated as the time-weighted average over eight hours) of the gas or vapour in the atmosphere is less than the listed concentration for the gas or vapour, or
  - if the gas or vapour in the atmosphere is Class 2.1, Class 3 or Subsidiary Risk 3 dangerous goods – so the concentration of the dangerous goods in the atmosphere is less than five per cent of the lower explosive limit for the particular good when sampled at ambient temperature, or
  - if the gas or vapour in the atmosphere is a gas or vapour to which both of the above apply – so the requirements contained above are complied with.

For example, to clear a receptacle, if the receptacle contains dangerous goods that are not fire risk dangerous goods, thorough rinsing of the receptacle with water (and neutraliser if necessary) will be appropriate.

Once you have cleared the receptacle of dangerous goods, you must then control any residual risk associated with the receptacle (eg risks associated with cutting down the receptacle to a size appropriate for disposal).

If you are developing a procedure for decommissioning of receptacles, it should cover:

- control of risks arising from any mechanical cutting, oxy-cutting, grinding or any other activities involving heat or friction – see *AS 1674.1:1997 Safety in welding and allied processes – fire precautions* Section 3 and Appendices A, B and C for guidance on working with heat
- how any waste generated will be stored or disposed of, and
- safe entry into a receptacle which is a confined space. See the WorkSafe Compliance Code: *Confined spaces* for further guidance.

Additional guidance on clearing decommissioned receptacles can be found in *AS 1940:2004* Clause 9.9 and *AS 4976:2008 The removal and disposal of underground petroleum storage tanks* Section 5.

Used packaging that has not been made free from dangerous goods should retain labels and markings that properly identify the residual hazard. When this packaging is free of dangerous goods, the labels and markings should be removed.

## 21.7. Protection from impact

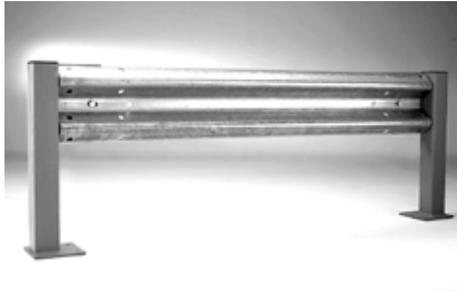
### DG (S&H) Regulation 40

You must ensure that dangerous goods and any structure and plant associated with their storage and handling are, so far as is reasonably practicable, protected against damage from impact with vehicles, mobile plant, ships or boats.

The most effective way to protect against damage by impact, is to locate the dangerous goods, structures and plant away from high traffic areas and prevent vehicle access to areas where the dangerous goods, structures and plant are located. Where vehicles are required to come close to the dangerous goods, structures or plant, the use of impact protection devices (eg railings, bollards or stanchions) should be installed, where it is reasonably practicable to do so. For example, an occupier of a petrol station may choose to install impact protection devices for petrol bowsers, vents and the roof/canopy (including supports/legs). The impact protection devices for bowsers should protect not only against the risk of petrol spillage, but also against the risks associated with damage to electrical equipment in the bower, so far as is reasonably practicable.

See Figure 4 for examples of impact protection devices.

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**Figure 4: Examples of impact protection devices**

## 21.8. Spill containment

### DG (S&H) Regulations 41 & 52

You must ensure that in each area at the premises where dangerous goods are stored or handled, provision is made for spill containment that will so far as reasonably practicable, eliminate the risk from any spill or leak of solid or liquid dangerous goods. Provision for spill containment must also be able to contain within the premises, the dangerous goods that have been spilled or leaked and any solid or liquid effluent arising from an incident.

In the case of dangerous goods contained in a tank, the spill containment for that tank must not be shared with any other dangerous goods or other substances that are not compatible with the dangerous goods in the tank.

In the event of a spill or leak of dangerous goods, you must ensure:

- immediate action is taken to reduce any risk associated with the spill or leak so far as is reasonably practicable, and
- the dangerous goods and any resulting effluent are, as soon as reasonably possible, cleaned up and disposed of or otherwise made safe.

For clarification, the duties above apply regardless of whether the dangerous goods are stored above ground (eg at a dangerous goods storage warehouse) or below ground (eg at a petrol station).

Spill containment for liquids may be achieved by:

- providing drains to a purpose built on-site catchment (eg an interceptor or remote impounding basin)
- grading the surface so that all spills are contained by the contours

- bunding the area to form a compound
- using double-walled containers, or
- enclosing a tank with a partial or full-height bund.

For example, an occupier of a petrol station dealing with minor spills from petrol bowser hoses could install raised ground humps or channels in the forecourt to prevent these spills from spreading and enable quick containment and cleanup. An occupier of a paint manufacturing factory, could bund the area where the paint is stored to form a compound and provide drains in the factory floor to enable any liquid spills to be more easily cleaned up, or drain to a catchment tank.

### Designing spill containment

When designing a spill containment system you should ensure:

- the materials used in construction or for absorption are impervious to the corrosive effects of the dangerous goods and compatible with the dangerous goods
- the risks associated with the operation of the containment system are identified and addressed
- the capacity of any compound is sufficient for the volume of liquid (including a margin for fire water) to be contained
- separate spill containment is provided where goods that are not compatible are kept within the one storage area
- absorbent materials, barriers and booms are provided where needed to contain a spill outside areas where physical containment is provided
- contaminated firewater can be removed during an incident if needed, and
- there is a way to remove any rainwater that may accumulate in the area.

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If the design and location of your spill containment system may affect the operations of emergency services (eg the location of a remote impounding basin will limit the deployment of firefighting equipment) you should consult with the emergency services authority.

## Bunding

Bunding is the most frequently specified system for containing dangerous goods spillages in storage and handling facilities. It has the advantage of being able to be retrofitted to existing buildings and outdoor installations. Bunding is the preferred risk control system for above ground bulk storage installations. For specially constructed banded stores, gently sloping floors away from entries may avoid the need for ramps. However, this will not necessarily be appropriate for stores involving high-rise racking, because it may lead to load instability for materials handling equipment (eg forklifts) used to place loads on the racking. Bunds located outdoors should be constructed with additional capacity to deal with rainwater and run off and with a secure system for the removal of that water.

See Figure 5 for examples of bunds.

## Drains, tanks, sumps and external pits

Draining spilled material to an underground tank, sump or external pit is a common spill containment method and may be used to avoid the risks associated with accessing banded stores using forklifts. However, the tank, sump or pit can introduce other potential hazards, as can the network of associated drains, and these must be considered and dealt with.

Generally each such containment system should be exclusive for the effluent from one store or work area unless all the dangerous goods are compatible and effective

provision is made to prevent flashback. These containment systems should, so far as is reasonably practicable, be prevented from collecting rainwater. Given these systems are frequently out of sight, controls need to be in place to ensure they are fully available for use when required.

Further guidance on spill containment can be found in the following standards:

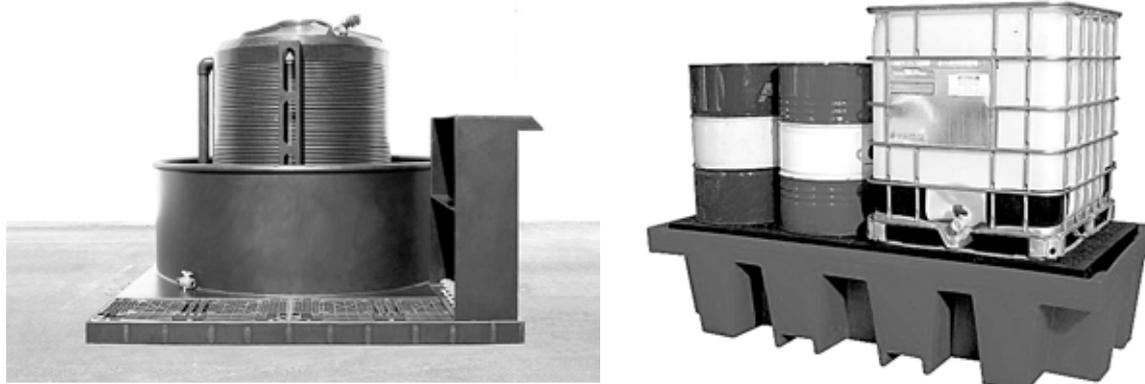
- *AS 1940:2004* Clause 5.8, and
- *AS 3780:2008* Clause 5.4.

## Equipment for spill containment and clean-up

You must also ensure equipment and materials appropriate for persons to use for the containment and clean-up of reasonably foreseeable escapes, spills or leaks of dangerous goods are kept on the premises, and accessible at all times to persons on the premises.

The equipment required will vary depending on the types and quantities of dangerous goods at the premises and may include:

- overpacks such as oversized drums for containing leaking containers
- absorbent material suitable for the substances likely to be spilled
- booms, plates and flexible sheeting for preventing spillage from entering drains and waterways
- neutralising agents (eg lime or soda ash)
- suitable pumps and hoses for removal of spilled material, and
- hand tools (eg mops, buckets, squeegees and bins) and suitable PPE.



**Figure 5: Bund examples**

## 21.9. Transfer of dangerous goods

### DG (S&H) Regulation 42

The transfer of dangerous goods refers to any process that involves:

- filling, loading, pumping or pouring of dangerous goods into a container, or
- discharging, unloading, pumping or pouring of dangerous goods from a container.

You must ensure the risk associated with the transfer of dangerous goods is eliminated or reduced.

In deciding on measures to control the risk, you must (as relevant) have regard to:

- the need to control spills and leaks, minimise static electricity, and control vapour generation, and
- how compatible the pipework at the premises is with the dangerous goods being transferred.

Potential risk control measures include:

- ensuring there is spill containment that can hold at least the quantity of dangerous goods in the largest container
- bonding or earthing the container being filled and any transfer equipment to avoid risks associated with static electricity
- undertaking the transfer in a manner that reduces the generation of any vapours and avoids splashing or spillage of the dangerous goods
- ensuring the place where the transfer is carried out is:
  - set aside solely for that purpose
  - not within the storage area but adjacent to it
  - free of ignition sources, and
  - free of obstructions and with sufficient room to enable the transfer to be carried out and to hold containers and associated equipment
- keeping any decontamination materials or clean-up equipment close by
- keeping containers closed when not in use, and
- ensuring the container receiving the dangerous goods is suitable and won't be damaged by the dangerous goods. For example, don't use a plastic container that could be softened or made brittle by the dangerous goods, and don't use a normal metal container that could be corroded by acid for acidic dangerous goods.

If dangerous goods are transferred into a container used for the bulk storage of dangerous goods, you must also ensure so far as is reasonably practicable, that engineering controls are used to control the risk associated with overfilling the container. For example, fitting bulk containers with sensors for liquid levels.

## 21.10. Ignition sources and hazardous areas

### DG (S&H) Regulation 43

You must ensure, so far as is reasonably practicable, that ignition sources are not present in any hazardous area at the premises.

A **hazardous area** is an area where an explosive gas atmosphere is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment. An explosive gas atmosphere is more likely to be present if you store and handle Class 2.1 or Class 3 dangerous goods or dangerous goods with a Subsidiary Risk of 2.1 or 3. An explosive gas atmosphere is also associated with the storage and handling of some Class 4 dangerous goods and some dangerous goods with a Subsidiary Risk of 4. However, dangerous goods in other classes with other subsidiary risks may also give rise to an explosive gas atmosphere. For example, anhydrous ammonia is a Class 2.3 dangerous good. While this classification does not indicate a flammability risk, anhydrous ammonia vapour can form an explosive gas mixture with air if a particular concentration is released within a confined space.

For further guidance on hazardous areas see *AS/NZS 60079.10.1: 2009 Explosive atmospheres - classification of areas - explosives gas atmospheres* Sections 4 and 5 as well as Annexures A, B and ZA.

An **ignition source** is any source of energy sufficient to ignite a flammable atmosphere. Three key ignition sources are electrical equipment (eg power outlets, switches, lighting, appliances), static electricity and lightning.

Other ignition sources include:

- sparks from grinding and welding
- battery powered equipment
- naked flames (eg from blow torches, shrink wrapping equipment, stoves, gas or oil heaters, pilot lights, driers, cigarettes, lighters and matches)
- heat from appliances or from chemical or biological reaction vessels

# Duties of occupiers

- friction from moving parts (eg belts or fan blades rubbing nearby surfaces)
- internal combustion engines and vehicles, and
- radio frequency radiation from radio transmitters and mobile phones.

## Electrical equipment

The ignition potential of electrical equipment can be reduced by:

- containment of ignition within suitable electrical equipment or a suitable enclosure
- reducing circuit energy to limit the potential for sparking
- preventing contact with flammable vapours or gases through pressurisation or oil immersion of these dangerous goods, or
- using intrinsically safe items.

Further guidance on the selection and installation of electrical equipment in hazardous areas can be found in *AS/NZS 60079.14: 2009 Explosive atmospheres – electrical installations design, selection and erection* Section 5.

Additional guidance on the inspection and maintenance of electronic equipment in hazardous areas can be found in *AS/NZS 60079.17: 2009 Explosive atmospheres – electrical equipment inspection and maintenance* Clauses 4.3, 4.4, 4.6 and 4.8.

## Static electricity

Static electricity may be generated by:

- movement of (eg pouring, pumping, stirring and high velocity flow) of dangerous goods, particularly movement of dry powders and liquids of low electrical conductivity
- dry air streams
- droplets or solid contaminants in gas streams
- personnel movement, especially when wearing, putting on or removing clothing and footwear of low conductivity. Some protective clothing (eg those made of synthetic fibres like polyester) may not be anti-static and this should be considered when selecting clothing for workers working in these areas
- application and removal of plastic wrap
- particulate or aerosol spray, including spray painting or the rapid discharge of a carbon dioxide extinguisher, and
- moving plant.

To guard against static electricity:

- all tanks, pipework, transfer systems and process plant associated with the storage and handling system should be earthed or otherwise protected
- anti-static additives, velocity restrictions or other controls should be used with low conductivity liquids, and
- anti-static clothing and anti-static footwear should be worn by workers working in hazardous areas.

See *AS/NZS 1020:1995 The control of undesirable static electricity* Sections 16 and 17 and Clause 20.4 as well as Appendix B, for further guidance on protecting against static electricity.

## Lightning

To guard against lightning, you should design the plant and structures which contain fire risk dangerous goods (eg flammable gases and liquids) so these are less susceptible to contact from lightning and add lightning protection devices. See *AS/NZS 1768: 2007 Lightning protection* Sections 2 and 7 as well as Appendix A, for further guidance on protecting against lightning.

## Ignition sources outside hazardous areas

While there is no specific duty in relation to ignition sources outside hazardous areas, you are required to control the risks associated with these ignition sources as part of your general duty to control risk at your premises. You should ensure that all ignition sources outside hazardous areas are identified and eliminated or reduced where there is any likelihood of an incident due to a spill or release of fire risk dangerous goods.

An example of a situation where an ignition source outside the hazardous area should be eliminated is a gas fired furnace located in the likely path that flammable vapour would follow in the event of a spill of flammable liquid. Flammable liquid vapours are heavier than air and may flow by gravity along natural channels and drains quite long distances before dispersing.

Where a naked flame or ignition source is required in an activity adjacent to a hazardous area, a formal 'hot work permit' system is recommended.

## 21.11. Ventilation and atmospheric emissions

### DG (S&H) Regulation 44

You must ensure the risk associated with flammable, explosive or asphyxiant atmospheric conditions is eliminated or reduced.

The risk associated with a flammable, explosive or asphyxiant atmosphere may be eliminated or reduced by installing a ventilation system or undertaking purging. Inerting may also be used to control the risk associated with a flammable or explosive atmosphere, however it may lead to an asphyxiant atmosphere.

### Ventilation

A ventilation system involves the continuous introduction, extraction or recirculation of air in a confined space by natural or mechanical means.

When designing a ventilation system, you should consider the following:

- a ventilation system should be exclusive to the particular building, room or space. Where this is not possible, the system may be linked to another area provided there will not be an increased risk arising from incompatible goods or any other relevant hazard
- ventilation systems should be suitable for the types of dangerous goods on the premises. For example, where there are dangerous goods with vapours or gases heavier than air, fumes should be removed from a low point above any spill containment. If the dangerous goods are flammable, the ventilation system should be flameproof, and
- local exhaust ventilation (which removes airborne contaminants from the working environment before they reach the breathing zone of persons in the area) is usually more effective than general ventilation. General or dilution ventilation has limitations and should only be used for contaminants of low toxicity or where the quantity of contaminants is relatively small.

### Local exhaust ventilation

When installing a local exhaust ventilation system:

- extraction vents should be located and should have sufficient capacity, to prevent the escape of contaminants into the work area under all atmospheric conditions
- discharge points should be located to prevent further contamination of work areas
- extraction ducting should not be linked to multiple items of plant if there is any likelihood of fire spreading through the ducting
- provision against flash back may be required, and
- the exhaust system should be resistant to corrosion by the vapours, mist and dusts being exhausted.

### General/dilution ventilation

When installing a general/dilution ventilation system:

- given many dangerous goods vapours are heavier than air, to prevent build-up of hazardous concentrations, vents should normally be located at a low level immediately above any spill containment
- for lighter than air gases the ventilation arrangement should provide for high level venting
- high level ventilation may also be necessary for temperature control
- vents should be located away from any potential external ignition sources
- you should also be mindful that vents in a screen wall will reduce any fire protection or vapour barrier effects that would otherwise be obtained from having the screen wall
- inlet and outlet vents should normally be located on opposite sides of the store to provide laminar airflow across the store, and
- where both inlet and exhaust vents are mechanically assisted, capacities and rates should be adjusted to ensure the pressure inside the dangerous goods store does not exceed that outside. This is particularly important where there are offices or other work areas adjoining the store, because if the pressure inside the store exceeds that outside, this may result in contaminated air flow from the store into these other offices or work areas.

Further guidance on ventilation can be found in:

- AS 1940:2004 Clause 4.5, and
- AS 4332:2004 Clause 4.3.

## Purging and inerting

Purging involves removing contaminants inside a confined space by replacing the contaminants with air. Purging should be undertaken in a manner that will ensure any gases removed from the confined space are exhausted to a location where they will not be hazardous, and will not cause rupture or collapse of the space due to pressure differentials.

Inerting involves removing the oxygen inside a confined space by replacing the oxygen with a non-flammable gas (eg nitrogen, carbon dioxide). Given inerting may create an asphyxiant atmosphere, safe entry procedures should be developed for workers who need to enter the confined space. These may require atmospheric sampling and monitoring, or the use of breathing protection.

It is important to note that displacement of contaminants by purging or inerting may only be temporary. For example, flammable liquids in the seams of a steel tank may leach out in vapour form and recreate the flammable atmosphere. Where it is possible that flammable contaminants will leach back out into the confined space, you should consider whether it will be necessary to re-purge the space or maintain ventilation.

## 21.12. Security

### DG (S&H) Regulation 32

You must, so far as is reasonably practicable, prevent access to the premises by unauthorised persons.

To comply with this duty you should consider:

- fencing or enclosure of areas where dangerous goods are stored or used
- locks on doors, windows and other openings to buildings, rooms, compartments or containers in which dangerous goods are stored
- installation of alarm systems
- supervision of areas where the dangerous goods are stored
- CCTV for areas where the dangerous goods are stored, and
- security checks on all vehicles entering or leaving the premises.

When developing security systems and procedures, you should consider the:

- nature of the hazards and the levels of risk
- likelihood of sabotage and other criminal activities
- integrity and reliability of the security system hardware and design, and
- back-up support for security systems and personnel.

You should also provide workers with information on the security systems and procedures to ensure these are effectively used and implemented.

## 22. Designing out risk

### DG (S&H) Regulation 29

You must not use new premises, or new plant, processes or systems of work at a premises, for the storage and handling of dangerous goods unless you have first ensured these have been designed to eliminate or reduce risk.

Premises, plant, processes and systems of work are new if:

- they have not previously been used for the storage and handling of dangerous goods, or
- they have been previously used for the storage and handling of dangerous goods, but they will be changed in a way that ought reasonably be expected to create a new or different hazard or risk associated with that use.

### 22.1. Design of new premises

When relocating to or designing new premises, you must ensure the design of the premises will eliminate or reduce the risks associated with the storage and handling of dangerous goods.

In determining the safest design, you should consider the need to prevent the escape of materials, maintenance requirements, impact protection, spill containment, location of ignition sources and ventilation. Segregation, lighting and access may also be relevant depending on your circumstances and are covered in more detail below.

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## Segregation

When different types of dangerous goods are stored at the same premises, they should be separated from dangerous goods they are not compatible with by distance and/or barriers. Systems and procedures should be developed and enforced to ensure the segregation is maintained at all times. Marking out those parts of the storage area where particular types of dangerous goods are to be kept is one way of supporting those systems and procedures.

Incompatible dangerous goods that should be kept separate include:

- concentrated acids from alkalis (explosion hazard)
- cyanides from acids (toxicity hazard)
- calcium hypochlorite from isocyanurate pool chlorine products (explosion and fire hazard), and
- goods with a Class or Subsidiary Risk of 2.1, 3, 4.1, 4.2, 4.3 or C1 combustible liquids, from Class 5.1 oxidising agents (fire and explosion hazard).

See Appendix 2 of this Code for a segregation chart.

## Lighting

You should ensure:

- adequate natural or artificial lighting is provided in all areas where dangerous goods are stored or handled and in access ways
- the only artificial lighting used in a room or space where dangerous goods are stored or handled is electric lighting, and
- emergency exit lighting is provided if necessary.

## Access

You should ensure easy access to and from the premises and all work areas by having:

- routes kept clear at all times
- external access routes kept clear for vehicular access, including emergency vehicles
- doors and gates unlocked when they may be required as exit points, and
- outward-opening doors, where appropriate.

Clear access to equipment used to contain and clean-up incidents and firefighting equipment should be provided at all times.

Further guidance on the design of premises for the storage and handling of dangerous goods can be found in:

- *AS 1940:2004* Sections 3 to 5
- *AS 3780:2008* Sections 4 and 5
- *AS/NZS 3833:2007* Sections 5 and 6, and
- *AS 4332:2004* Section 4.

Appendix 3 of this Code also provides examples of the design of premises for the storage and handling of dangerous goods.

## 22.2. Design of new processes

You must design out risk associated with a chemical or physical process by adopting the appropriate engineering controls, work methods and systems of work. If a chemical process is involved, you may need to consider reaction pathways. Complexity, equipment, efficiency, by-products, cost, reliability and energy demand will influence the selection of a particular reaction pathway. Where a physical process is involved, consider the range of alternatives. For example, evaporation may be preferable to freeze drying, which involves the reduction of temperatures and pressures.

## 23. Risk controls for transit and transport storage areas

Transit storage is short term storage for a period of not more than five consecutive days at a location where dangerous goods are held while they are awaiting:

- loading for dispatch after their removal from storage areas
- being placed in storage after receipt and unloading, or
- transfer within a premises for a specific purpose (eg manufacturing).

Transport storage areas are those areas:

- where dangerous goods in transit may be stored while awaiting further transport
- where dangerous goods that have been kept in permanent storage areas are assembled into transport loads and kept while awaiting dispatch, and
- that provide for the short term handling of dangerous goods either prior to transport or relocation or more permanent storage within a premises.

Examples of transit and transport storage areas include:

- locations inside a building (eg a transport depot) where packages or intermediate bulk containers are held awaiting loading

# Duties of occupiers

- external areas where loaded freight or tank containers are held awaiting further transport, and
- areas where loaded vehicles (including trailers and rail wagons) are held in transit.

Premises with transit and transport storage areas include ports, rail yards and road transport depots.

Transit and transport storage areas are not intended to substitute for more permanent storages of dangerous goods. The quantity of dangerous goods stored in such areas should be kept to the minimum necessary to receive and dispatch dangerous goods in an efficient manner.

In order to control risks in these areas, you should ensure:

- the length of time that dangerous goods are held does not exceed five consecutive days
- all dangerous goods that are assembled in loads ready for transport are packaged or contained, marked, stowed, secured, placarded, segregated and documented according to the ADG Code
- incompatible dangerous goods are segregated according to particular transport mode in the ADG Code
- dangerous goods are kept apart from foodstuffs (including stock feed), so as to avoid any potential contamination
- ignition sources are controlled
- provision is made for dealing with spills, and
- appropriate fire protection is provided.

In relation to placarding, it may be more convenient to use frames for slip-in/slip-out labels that are commonly found on vehicles for the transport of dangerous goods.

For further guidance on the storage and handling of dangerous goods in transit and transport storage areas at ports, see *AS 3846:2005 The handling and transport of dangerous cargoes in port areas* Sections 2, 5, 6, 8 and 9. Further guidance on the storage and handling of dangerous goods in transit storage can be found in *AS 1940:2004* Clause 3.9, *AS 3780:2008* Section 3, *AS/NZS 3833:2007* Section 4, and *AS 4332:2004* Section 3.

## 24. Fire protection systems

**DG (S&H) Regulations** 53 & 54

You must ensure there is a fire protection system for your premises that:

- is designed and constructed for the types and quantities of dangerous goods at your premises and the conditions under which these are stored and handled, and
- uses fire fighting media (eg water, foam or dry agent) which is compatible with the dangerous goods at your premises and effective in controlling incidents involving these dangerous goods. For example, water should not be used with Class 4.3 'dangerous when wet' dangerous goods.

You are also required to ensure the fire protection system for your premises is:

- properly installed, tested and maintained
- at all times accessible to persons on the premises and to the emergency services authority, and
- capable of being used without adaptation or modification, with the equipment used by the emergency services authority.

In addition to the information below, guidance on fire protection systems can be found in:

- *AS 1940:2004* Section 11
- *AS 3780:2008* Section 8
- *AS/NZS 3833:2007* Section 9, and
- *AS 4332:2004* Section 7.

### 24.1. Advice from the emergency services authority

If the quantity of dangerous goods stored and handled at your premises is in excess of the 'Fire Protection Quantity' in Schedule 2 of the DG (S&H) Regulations you are required to undertake the duties in (a) to (c) below.

The requirement in these duties to 'have regard to' the advice of the emergency services authority, means you need to ensure the initial design of the fire protection system, alterations to this design and specified modifications to premises, contain either the components described in the advice or other components that provide an equivalent or better level of safety.

# Duties of occupiers

## (a) Initial design

You must obtain written advice from the emergency services authority in relation to the initial design of the fire protection system and have regard to that written advice when developing the system.

## (b) Altering design

You must obtain written advice from the emergency services and have regard to that written advice before altering the fire protection system.

## (c) Modifications to premises

You must also obtain written advice from the emergency services authority in relation to any proposed modifications to the:

- buildings or structures on the premises
- types or quantities of dangerous goods stored or handled at the premises, or
- plant or processes associated with the storage or handling of dangerous goods on the premises –

that will require a review of the risk control measures.

You must have regard to that written advice when undertaking the proposed modifications.

## 24.2. Design and construction

General considerations

When designing and constructing the fire protection system you should take into consideration the:

- chemical and physical properties of the dangerous goods at your premises
- total fire load of the area being protected
- particular hazards of the dangerous goods and the quantities being stored and handled
- location, design, type of construction and total floor area of the building or storage and handling area
- operations at the premises, with particular attention to the:
  - extent of the containment of dangerous goods provided
  - how the dangerous goods are stored and handled (chemical and physical processes and transport systems), and
  - storage configuration, height and density

- impact of hazards external to the storage and handling area, including beyond the boundaries of the premises
- workers available to operate the system and their capabilities
- need to protect external facilities, and
- need for the fire protection system to remain in operational condition itself in the event of a fire.

## Specific considerations

When designing and constructing the fire protection system, you should consider the matters in (a) to (g) below.

### (a) Water supply

The water supply should be sufficient to supply both the fire protection equipment at the premises and any additional equipment used to control a fire at the premises by the emergency services authority. Where sufficient water is not available from the main water supply, it may be necessary to supplement this with additional water storage and/or pumps or, where permitted by the appropriate regulatory authorities, by drawing fire service water from alternative sources such as rivers or dams. The adequacy of the water supply should be checked with the emergency services authority.

Booster systems may need to be installed to provide sufficient pressure for large-scale firefighting. This may require installation of fixed or portable pumping equipment, or an appropriate number of booster connections and feed hydrants, together with an approved hard standing area for the emergency services authority pumping equipment.

### (b) Fire alarm systems

Fire alarm systems should be installed so that:

- automatic systems are also capable of being manually activated at clearly identified manual alarm call points at convenient and safe locations near work areas
- the alarm signal is sufficiently distinguishable from any other signals to permit ready recognition and clearly audible throughout the storage installation
- where high noise levels or the use of protective clothing may prevent the recognition of an alarm signal, an effective alternative alarm is provided (eg a visual alarm), and
- the system remains operable when the main power supply fails.

# Duties of occupiers

Alarm systems for larger dangerous goods storage and handling installations should be directly linked to the emergency services authority.

## (c) Fire hose reels

Fire hose reel systems should be located so that every location in the building can be reached by at least one hose, allowing for all obstacles, and so that it is possible to reach all installations, including to the top of rack storage.

Where foam hose reels are installed, they should be capable of producing foam to the manufacturer's specifications and suitable for the risks involved. A hose reel that is equipped with foam making capabilities should be identified by conspicuous signage. Foam hose reels should be regularly checked to ensure they are within their use by dates.

## (d) Fire hydrants

Hydrant hose systems may be substituted for fire hose reels.

The hose connection points for fire hydrants should have fittings that allow connection to the emergency services authority's mobile appliances without the need to use adaptors.

## (e) Monitors

The installation of monitors may be appropriate where fire control requires the direction of large quantities of fire or cooling water at a fixed dangerous goods installation, with minimum exposure of firefighters. Monitors should be installed in consultation with the emergency services authority.

The following matters should be taken into account when determining the specifications of the monitors and their location:

- expected water flow capacity – an allowance of 50 per cent over any calculated capacity should be provided to take account of adverse wind conditions
- type of nozzle that will be provided – fixed or variable pattern and whether it should supply foam as well as water
- location of the monitor relative to the installation being protected. Monitors should be installed in accordance with the manufacturer's specifications, and
- anticipated heat flux at the monitor location. In situations where the heat flux is likely to exceed  $2\text{kW/m}^2$ , the provision of radiant heat protection for personnel operating the monitor should be considered. The

emergency services authority is able to provide advice on the heat flux levels that should be used in determining the placement and operating parameters for any monitors.

## (f) Automatic sprinkler systems

Where automatic foam sprinkler systems are required, advice should be obtained from potential suppliers and the relevant emergency services authority.

## (g) Portable fire extinguishers

Portable fire extinguishers should be clearly visible, unobstructed and readily available to control the relevant risk. They should also be protected by some sort of box or casing so they are not adversely affected by hazardous or climatic conditions.

Where powder and foam extinguishers are likely to be used together in an emergency, they must be compatible.

It is important to be aware of the following regarding portable fire extinguishers:

- foam extinguishers should be used for particular dangerous goods. For example, alcohol-compatible foam should be used for alcohols and other polar (water miscible) solvents
- while carbon dioxide extinguishers may minimise damage to electrical equipment and limit the clean-up required, these have a poor 'knock down' short discharge range and may be ineffective where there is significant air movement. Depending on the circumstances, dry powder or vapourising liquid may be a better alternative
- carbon dioxide extinguishers and acidic extinguishers such as those based on ammonium phosphate, should not be used where there are cyanides present, and
- carbon dioxide extinguishers should not be used on fires involving magnesium or titanium metals.

## 24.3. Maintenance and testing

The fire protection system must be inspected and tested at regular intervals to ensure it remains operational. Retaining maintenance and testing records is not mandatory but may assist you in demonstrating compliance with the DG (S&H) Regulations.

# Duties of occupiers

## 24.4. System issues

If any of the components of the fire protection system are rendered inoperative or unserviceable (eg because they have expired, are undergoing maintenance, or are broken), you must ensure:

### (a) The implications of this are assessed

The assessment does not need to be recorded. However, if the implications include a significant reduction in the effectiveness of the fire protection system, you must notify the emergency services authority regarding the condition of the fire protection system.

### (b) Alternative measures are taken to control (to the same level of effectiveness) those risks that were controlled when the system was functioning fully

Alternative control measures may include:

- reducing the quantities of dangerous goods at the premises
- modifying or ceasing all or part of the operations if the risk is high
- establishing an alternative temporary fire protection system, or
- providing additional or alternative fire protection equipment.

Depending on the circumstances, it may be advisable to notify the emergency services authority and obtain their advice on alternative measures.

### (c) The system is returned to full functioning as soon as possible

In the simple case of a fire extinguisher not working, this may involve having the extinguisher serviced or replaced. For more complex fixed fire protection issues, making the system fully operational again may take time.

## 25. Emergency preparation and response

### 25.1. Emergency plans

#### DG (S&H) Regulation 55

If the quantity of dangerous goods stored or handled at your premises exceeds the 'Manifest Quantity' in Schedule 2 of the DG (S&H) Regulations, you must develop, implement and maintain a written emergency plan which reduces the risk associated with an **emergency**, so far as is reasonably practicable.

An **emergency** is an event that exposes a person or property in the vicinity of the event to an immediate risk through:

- an explosion, fire, harmful reaction or the evolution of flammable, corrosive or toxic vapours involving dangerous goods, or
- the escape, spillage or leakage of any dangerous goods.

The purpose of an emergency plan is to minimise the effects of any emergency that occurs at a premises where larger quantities of dangerous goods are stored and handled. While the emergency plan should be capable of dealing with the worst-case scenario, it should mainly focus on the more likely events. The emergency plan should be sufficiently flexible to ensure that an emergency response can be varied according to the severity and type of emergency or near miss.

### Content

When developing the emergency plan, you must request the written advice of the emergency services authority and have regard to that written advice. The requirement to 'have regard to' the advice of the emergency services authority, means that your plan must contain the components specified in the advice or other components which provide an equivalent or better level of safety.

The emergency plan must clearly describe the location of the manifest.

You should consider including the information in (a) to (e) below, in the emergency plan for your premises:

# Duties of occupiers

## (a) Information on the premises and hazards at the premises

- Name, address and nature of operations (eg manufacturing, warehousing).
- Detailed plan of the premises and surrounding area.
- Inventory of dangerous goods named in Schedule 2 of the DG (S&H) Regulations.
- Maximum/minimum number of persons expected on the premises.
- Infrastructure likely to be affected by an incident.
- Description of measures in place to control the consequences of each hazard and major incident (eg fire barriers, separation distances, drainage tanks).

## (b) Information on the command structure and personnel at the premises

- Details of workers to contact in the event of an emergency (eg Fire Wardens, First Aiders).
- Roles and responsibilities of workers for implementing the plan.

## (c) Information on procedures for the premises

- Procedures for raising the alarm in the event of an emergency.
- Procedures for safe evacuation and accounting for personnel.
- Details of isolation points for essential services (eg the locations where the gas and electricity for the premises can be turned off).
- Procedures for containment of any incident.
- Procedures for decontamination following an incident.

## (d) Information on notifications and reporting for the premises

- Details of on site communication systems (eg phones, radios).
- Arrangements for 'mutual emergency assistance' between adjacent facilities.
- Triggers for reporting the incident to the emergency services authority (see *Section 25.4 - Reporting incidents* in this Code for potential triggers).

- Contact details for the emergency services authority and other relevant entities (eg water, gas and electricity providers).
- Details of onsite and offsite warning systems (eg fire alarms, evacuation alarms).

## (e) Information on resources at the premises

- Details of emergency resources on site (eg the location of fire extinguishers).
- Arrangements for obtaining additional external resources.

## Testing, review and revision

The emergency plan should be tested when first devised, after each modification and at regular intervals. Testing should involve practice drills with simulated emergencies and include all persons likely to be involved in carrying out the plan.

Emergency plans must be reviewed and revised whenever there is a change of circumstances on or off the premises (eg a wood yard opens up next door and the dangerous goods stored on your premises are highly flammable) and consequently the plan no longer reduces the risk associated with an emergency, so far as reasonably practicable.

At a minimum, emergency plans must be reviewed at intervals of not more than five years from the date the plan was developed or last reviewed.

## Communication and accessibility

The emergency plan must be communicated to workers at your premises who may be exposed to risk as a result of an emergency. This will normally be all workers at the premises. It must also be communicated to persons in management or control of adjacent premises, if persons or property on such premises may be exposed to risk as a result of an emergency.

If members of the local community will potentially be affected by an emergency at the facility, you may consider sharing any relevant aspects of the emergency plan with them (eg if your emergency plan contains any particular action that members of the local community should take).

The emergency plan should be in a readily accessible form. This may be either a hard or soft copy format. The location of the emergency plan should be well known to workers and discussed with the emergency services authority whenever there is a review or update. It is recommended that a copy be made available to the emergency services authority.

# Duties of occupiers

## 25.2. Emergency procedures

Even if you are not required to develop an emergency plan, you should develop emergency procedures for all foreseeable emergencies (eg fire, spillage of dangerous goods, vapour release, and uncontrolled reaction). The difference between an emergency plan and an emergency procedure is that an emergency procedure is a less comprehensive version of an emergency plan. Many effective emergency procedures are simple one-page documents in point form, suitable for display on signs or carrying as a pocket card.

Emergency procedures will vary depending on circumstances at the premises but should contain at a minimum:

- the means of raising the alarm
- triggers for reporting the incident to the emergency services authority (see *Section 25.4 – Reporting incidents* in this Code for potential triggers)
- contact details of the emergency services authority and other relevant bodies (eg water, gas and electricity providers), and
- actions to be taken in an emergency.

Such actions may include:

- immediately notify supervisor
- warn other people
- avoid contact with contaminated material
- avoid breathing gas and fumes, and
- stop leakage if safe to do so.

## 25.3. Responding to an emergency

### DG (S&H) Regulations 62–64

As an occupier you are required to respond immediately to emergencies at your premises, investigate incidents and review and revise risk controls taking into account the results of investigations. You may also report the incident to the emergency services authority who can assist you in controlling the risks associated with the incident.

## Immediate response

You must respond to an emergency at your premises by ensuring:

- immediate action is taken to assess and control any risk associated with the emergency, including making any plant or equipment associated with the emergency and the surrounding area safe so far as is reasonably practicable
- only people who are essential to assessing and controlling the risk remain in the vicinity of the emergency, and
- the risk to persons who remain in the vicinity of the emergency is reduced so far as is reasonably practicable.

## Investigation and review

After an incident has occurred, you must ensure it is investigated. The investigation must so far as possible, determine the cause or likely cause of the incident.

The system for investigating incidents should:

- be prepared in consultation with workers and any HSRs
- be documented so that it is readily understood by people who may be affected, and
- inform workers, HSRs and other relevant people of the results of the investigation.

You are required to prepare a record of the incident investigation, keep it for at least five years and have it readily available on request by WorkSafe.

Following the investigation, you must review any risk controls measures, taking into account the investigation results. If the review identifies deficiencies in the risk control measures, you must alter those measures or implement new measures.

## 25.4. Reporting incidents

You should report an incident that occurs at your premises to the emergency services authority where:

- a person is injured or exposed to an immediate risk to health or safety as a result of the incident, at your premises or an adjacent premises
- there is damage to property as a result of the incident, at your premises or an adjacent premises
- there is potential for the incident to escalate in seriousness and endanger or injure a person or damage property, at your premises or an adjacent premises
- the incident may lead to environmental damage beyond

# Duties of occupiers

your premises, or

- you are unsure about your ability to control risks associated with the incident.

It is not mandatory for an occupier to report incidents to the emergency services authority, however in the circumstances above doing so will assist in satisfying your general risk control duties.

You should also note that Part 5 of the OHS Act requires an employer and self employed person to report specified spills of dangerous goods to WorkSafe.

## 26. Larger quantity duties

Larger quantity duties only apply to occupiers who store and handle dangerous goods in excess of the manifest, placarding and fire protection quantities in Schedule 2 of the DG (S&H) Regulations. These larger quantity duties are outlined above in Sections 24.1 and 25.1 of the Code and below in the Code in Sections 26.1, 26.2 and 26.3.

### 26.1. Manifest

#### DG (S&H) Regulations 45 & 46

You must ensure a manifest is prepared if the quantity of dangerous goods stored or handled at your premises exceeds the 'Manifest Quantity' in Schedule 2 of the DG (S&H) Regulations.

The principal purpose of a manifest is to provide the emergency services authority with information about the quantity, type and location of dangerous goods stored and handled on the premises, to enable them to respond quickly and appropriately if called to an incident.

The manifest must be kept on the premises in a place that is easily accessible to the emergency services authority. It should be housed in a weatherproof holder and located near the outer warning placard at the front of the premises, unless an alternate location is agreed to by the emergency services authority.

The manifest must include the information specified in (a) to (h) below and must be revised as soon as possible after a change in any of this information.

#### (a) General information

- Name of the occupier of the premises.
- Address of the premises.

- Date when the manifest was prepared or last revised.

#### (b) Emergency contacts

Contact information for at least two persons who may be contacted in the event of an incident.

#### (c) Summary information about classes of dangerous goods

A summary list that specifies the maximum quantity of the following dangerous goods at the premises:

- each packing group of each class of dangerous goods that has packing groups
- each class of dangerous goods that does not have packing groups
- C1 combustible liquids, and
- each type of goods too dangerous to be transported.

#### (d) Dangerous goods stored in bulk other than in intermediate bulk containers

In relation to each container other than an intermediate bulk container (IBC) and each other storage of dangerous goods in bulk at the premises:

- the identification number or code
- the type and capacity
- for dangerous goods other than C1 combustible liquids or goods too dangerous to be transported – the proper shipping name, UN Number and class
- for C1 combustible liquids – the product name and the statement 'Combustible Liquid', and
- for goods too dangerous to be transported – the name of the goods in Appendix A of the ADG Code and the statement 'Goods too dangerous to be transported'.

# Duties of occupiers

## (e) Packaged dangerous goods

In relation to each storage area that contains packaged dangerous goods or dangerous goods in IBCs and that is required to be placarded under the DG (S&H) Regulations:

- the identification number or code for the storage area
- for dangerous goods of Packing Group I or Class 2.3 that are likely to be kept in the area, the:
  - proper shipping name of the dangerous goods that are assigned to a class
  - class, and
  - maximum quantity of each of the dangerous goods likely to be kept
- for goods too dangerous to be transported that are likely to be kept in the area, the:
  - name of the dangerous goods in Appendix A of the ADG Code
  - statement 'Goods too dangerous to be transported', and
  - maximum quantity of each of the dangerous goods likely to be kept, and
- for other dangerous goods that are likely to be kept in the area:
  - for dangerous goods with an assigned class – the class
  - for C1 combustible liquids – the statement 'Combustible Liquid', and
  - in any case, the maximum quantity of each class and the maximum quantity of C1 combustible liquids.

## (f) Dangerous goods in manufacture

In relation to each area where dangerous goods are manufactured:

- the identification number or code of the manufacturing area
- for dangerous goods with an assigned class – the class and maximum quantity of each class
- for goods too dangerous to be transported – the statement 'Goods too dangerous to be transported' and the maximum quantity of those goods, and
- for C1 combustible liquids – the statement 'C1 combustible liquid' and the maximum quantity of those liquids.

## (g) Dangerous goods in transit

If in relation to any dangerous goods in transit at the premises, there are dangerous goods transportation documents that comply with the ADG Code available for the goods, the information required in (c), (d) and (e) above may be provided in the form of a compilation of these transportation documents.

## (h) Plan of premises

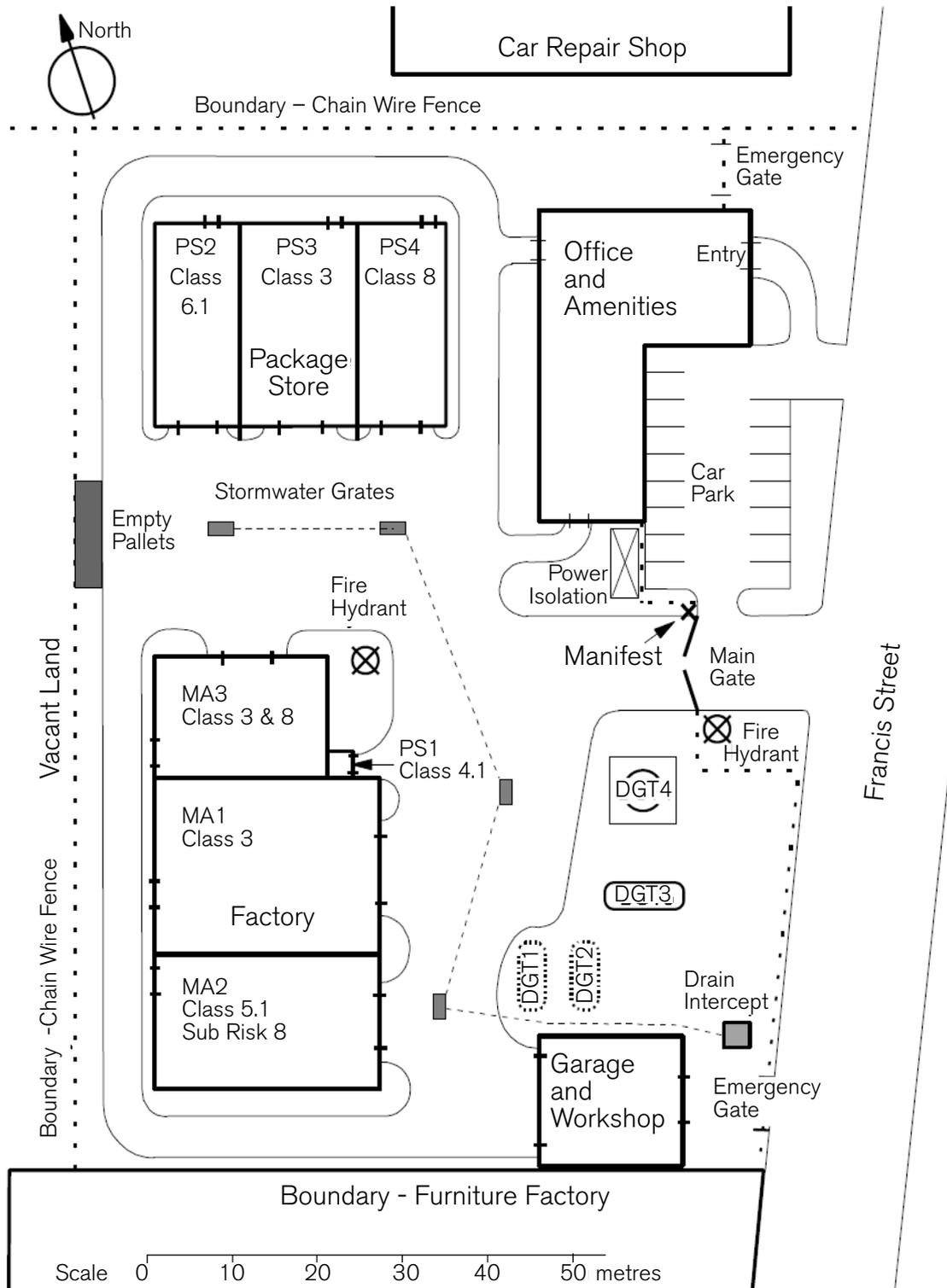
A plan of the premises that:

- I. shows the location of the:
  - containers and other storages of dangerous goods in bulk other than in IBCs
  - storage areas for packaged dangerous goods and dangerous goods in IBCs, and
  - areas where dangerous goods are manufactured
- II. includes a written description of the location of the items in paragraph I and of the areas where dangerous goods in transit may be located
- III. provides the identification number or code for the items and areas referred to in paragraph II
- IV. provides a legend for the identification numbers and codes referred to in paragraph III
- V. shows the location of:
  - the main entrance and the other points of entry to the premises
  - essential site services, including fire services (eg fire hydrants, fire extinguishers and hose reels) and isolation points for fuel and power
  - the manifest, and
  - all drains on the site, and
- VI. describes the nature of the occupancy of adjoining sites or premises.

See Appendix 9 of this Code for a sample manifest (without a plan). See Figure 6 for a sample plan.

**Note:** When preparing a manifest, you should be wary of including information that is not required in (a) to (h) above. Providing unnecessary and excessive information in the manifest may make it more difficult for the emergency services authority to respond in a timely and appropriate manner to incidents.

# Duties of occupiers



**Figure 6: Sample plan of premises**

# Duties of occupiers

## 26.2. Placards

DG (S&H) Regulations 47-51

### Outer warning placards

Outer warning placards provide visual warning of dangerous goods hazards at the premises for the emergency services authority, so it is important they can be easily seen by people approaching the premises.

You must display 'HAZCHEM' outer warning placards at your premises, if the quantities of dangerous goods stored and handled at your premises exceed the 'Placarding Quantity' in Schedule 2 of the DG (S&H) Regulations.

#### Exception

This requirement does not apply if your premises are a retail outlet and the dangerous goods are a flammable gas or liquid used to refuel a vehicle (eg a service station).

#### Location

If your premises are:

- an educational institution (eg school, university) or a farm – outer warning placards need only be displayed at the main road entrance
- not an educational institution or a farm – outer warning placards must be displayed at all road and rail entrances.

You may only display outer warning placards in a different location if you have obtained written agreement for this from the emergency services authority.

If your premises consist of a building set back from the street meaning that placarding at the street entrance would be neither effective nor practical, you may seek to obtain written agreement for outer warning placards to be displayed at each entrance to the building that may be used by the emergency services.

#### Form

The dimensions, design, layout, content and colour of the placard must be in accordance with Schedule 4 of the DG (S&H) Regulations. If the Australian standards referred to in Schedule 4 are replaced or revised subsequent to the publication of this Code, you must use the new version of the standard within 12 months of the revision or replacement. See Figure 7 for a sample outer warning placard. The placard must be kept clean, in good order and unobstructed.



Figure 7: Sample outer warning placard

# Duties of occupiers

## Other types of placards

You must ensure:

- any container or other storage of dangerous goods in bulk, and
- any storage of packaged dangerous goods that exceeds the prescribed 'Placarding Quantity' in Schedule 2 of the DG (S&H) Regulations—

is identified with the relevant placard from Schedule 4 of the DG (S&H) Regulations.

### Exception

This requirement does not apply to:

- dangerous goods in bulk in any container including an IBC, intended for transport and marked in accordance with the ADG Code
- C1 combustible liquids in bulk in a quantity not exceeding 10 000L that are isolated from other dangerous goods, and
- dangerous goods of Class 2.1 or 3 or C1 combustible liquids, that are stored in an underground tank at a retail outlet where they are used to refuel vehicles (eg a service station).

## Location

A placard for bulk storage of dangerous goods must be located on or adjacent to each container or storage.

A placard for packaged dangerous goods that exceed the prescribed 'Placarding Quantity' in Schedule 2, must be located:

- at the entrance to any building in which the dangerous goods are stored
- at the entrance to each room or other closed or walled section of the building in which the dangerous goods are stored, and
- adjacent to any external storage area where the dangerous goods are stored.

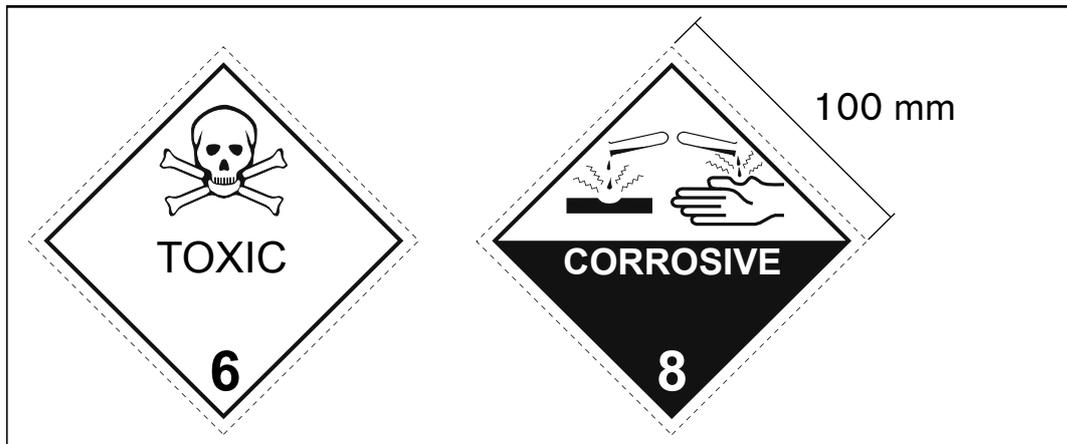
However, you may locate these placards in different locations if you obtain written agreement to do so from the emergency services authority.

## Form

The dimensions, design, layout, content and colour of the placard must be in accordance with Schedule 4 of the DG (S&H) Regulations. If the Australian standards referred to in Schedule 4 are replaced or revised subsequent to the publication of this Code, you must use the new version of the standard within 12 months of the revision or replacement. See Figures 8 and 9 for sample placards.



**Figure 8: Sample placard for bulk dangerous goods**



**Figure 9: Sample placard for packaged dangerous goods**

## Additional requirements/information

Placards at your premises must be:

- located where they will be:
  - clearly legible by persons approaching the placard, and
  - separate from any other sign or writing which contradicts, qualifies or distracts attention from the placard, and
- revised if necessary, immediately following any change to the type or quantity of dangerous goods stored or handled at the premises.

You may comply with placarding requirements in this Code by keeping in place placards:

- that were installed immediately before the commencement day of the DG (S&H) Regulations, and
- which are in accordance with the Dangerous Goods (Storage and Handling) Interim Regulations 2011 – provided these placards are still legible.

See Appendix 4 of this Code for examples of compliant placarding in different circumstances.

## 26.3. Notification

### DG (S&H) Regulation 66

If you store and handle dangerous goods in excess of the 'Manifest Quantity' in Schedule 2 of the DG (S&H) Regulations and are not an operator of a major hazard facility licensed or registered under the OHS Regulations,

you must ensure WorkSafe is notified of the presence of those goods.

This notification must be given within 14 days after the obligation to notify arises and must contain:

- your name (ie name of the occupier)
- the physical address of the premises where the dangerous goods are stored and handled (this should be as specific as possible)
- your contact details (ie occupier's contact details)
- the nature of the principal activities involving the dangerous goods
- the class and the maximum quantity of the dangerous goods stored and handled in bulk or as packaged dangerous goods
- descriptions and details of the maximum quantity of any C1 combustible liquids stored and handled in bulk or as packaged dangerous goods, and
- the product name and the maximum quantity of goods too dangerous to be transported.

You must ensure WorkSafe is provided with further notification, containing the above information every five years, or at such longer intervals as specifically permitted by WorkSafe.

# Appendix 1

## Other Victorian legislation

Other Victorian legislation that may be relevant to the storage and handling of dangerous goods includes the:

- Building Regulations 2006
- *Dangerous Goods Act 1985*
- Dangerous Goods (Explosives) Regulations 2011
- Dangerous Goods (HCDG) Regulations 2005
- Dangerous Goods (Transport by Road and Rail) Regulations 2008
- *Electricity Safety Act 1998*
- Electricity Safety (Equipment) Regulations 2009
- *Environment Protection Act 1970*
- Environment Protection (Industrial Waste Resource) Regulations 2009
- *Gas Safety Act 1997*
- *Occupational Health and Safety Act 2004*
- Occupational Health and Safety Regulations 2007

**Note:** This is not a comprehensive list and you will need to check whether there is any additional Victorian legislation that also applies to your particular dangerous goods storage and handling situation.

# Appendix 2

## Segregation chart

This Appendix may be used as guidance, in the absence of more detailed compatibility information, to assess the compatibility between different classes of dangerous goods. However in all cases, reference to specific recommendations contained within each product's MSDS must also be considered.

CLASS	2.1 	2.2 	2.3 	3 	4.1 	4.2 	4.3 	5.1 	5.2 	6.1 	8 	9 
2.1 	A	E	C	B	B	D	B	D	D	C	B	B
2.2 	E	A	B	E	E	E	E	B	E	B	B	B
2.3 	C	B	A	C	C	C	C	C	C	B	B	B
3 	B	E	C	A	B	D	B	D	D	C	B	B
4.1 	B	E	C	B	A	D	B	D	D	C	B	B
4.2 	D	E	C	D	D	A	B	D	D	C	B	B
4.3 	B	E	C	B	B	B	A	D	D	C	D	B
5.1 	D	B	C	D	D	D	D	A	D	F	D	F
5.2 	D	E	C	D	D	D	D	D	A	F	D	F
6.1 	C	B	B	C	C	C	C	F	F	A	B	B
8 	B	B	B	B	B	B	D	D	D	B	G	B
9 	B	B	B	B	B	B	B	F	F	B	B	A

In this table, combustible liquids should be assessed, for the purposes of determining compatibility, as a class 3

## Appendix 2

### Segregation chart

#### Letters A–G have the following meaning:

<b>A</b>	Dangerous goods of the same class, which have similar primary hazards, are usually considered to be compatible.
<b>B</b>	With few exceptions, which should be indicated in MSDS information, goods of these classes are usually non-reactive with each other. Consideration however must still be given to compatibility risk. For example, in the case of a spill, leak or fire, the presence of the second class may lead to different hazards or increased risk and additional control measures may be required.
<b>C</b>	While these two classes are usually non-reactive with each other, consideration of escalation of hazardous scenarios should be undertaken. For example, in the event of a fire, the risk of release of toxic gases or vapours may be increased.
<b>D</b>	Dangerous goods of these two classes are likely to interact with each other in such a way as to significantly increase risk. In some cases, interaction may result in fire, explosion or release of toxic or corrosive vapours. For those that do not interact, a fire involving one may be violently accelerated by the presence of the other. These classes should not be kept together or near each other unless it can be demonstrated that the risks are fully controlled.
<b>E</b>	If the Class 2.2 has a subsidiary risk 5.1, then this is <b>D</b> , otherwise it is <b>B</b>
<b>F</b>	If the Class 6.1 or 9 is fire risk dangerous goods, then this is <b>D</b> , otherwise it is <b>B</b> .
<b>G</b>	If one material is a concentrated strong acid and the other is a concentrated strong alkali, then this is <b>D</b> , otherwise it is <b>A</b> .

# Appendix 3

## Examples of designing dangerous goods stores

### Example 1 – a dangerous goods store at a golf course

Golf course management wants to establish a free standing dangerous goods store at the golf course for up to 7000L of Class 3, Packing Group II and III flammable liquids in 5L, 20L & 205L drums. There are no plans to open or decant the drums inside the store. *AS 1940:2004*, Section 4 provides guidance on the design of this type of store. All references to clauses and tables in this example are references to clauses and tables in Section 4 of this standard.

#### General construction

Any wall or roof should be masonry, concrete, or a structure sheeted with non-combustible material (Clause 4.4.1(a))

#### Separation distances

The store should be constructed:

- at least 6m away from the side property boundary adjoining a private residential house. (Clause 4.3.1(a) and Table 4.1)
- at least 6m away from the golf course ground keeper's workshop (which is considered to be an onsite protected place) (Clause 4.3.1(b) and Table 4.1)

The store should be located at least 3m away from any public places (Clause 4.3.1(c) and Table 4.2). Given the store will be located in an area the general public (ie golfers) access, to provide the suggested 3m distance, a chain wire security fence with locked gate will be installed.

#### Spill containment

Spill containment should be provided for the volume of the largest package plus 25 per cent of the storage capacity up to 10 000L (Clause 4.4.3(d)). Given the store will contain packaged flammable liquids in drums with a 205L capacity, spill containment for (205L plus 25 per cent of 7000L ie 1955L should be provided).

#### Ventilation

At least three vents of at least 0.1m<sup>2</sup> free air opening should be installed on the two longest walls just above the determined bund level (Clause 4.5.4.1(e) and 4.5.4.2).

Figure 10 provides a diagram of what the store would look like.

# Appendix 3

## Examples of designing dangerous goods stores

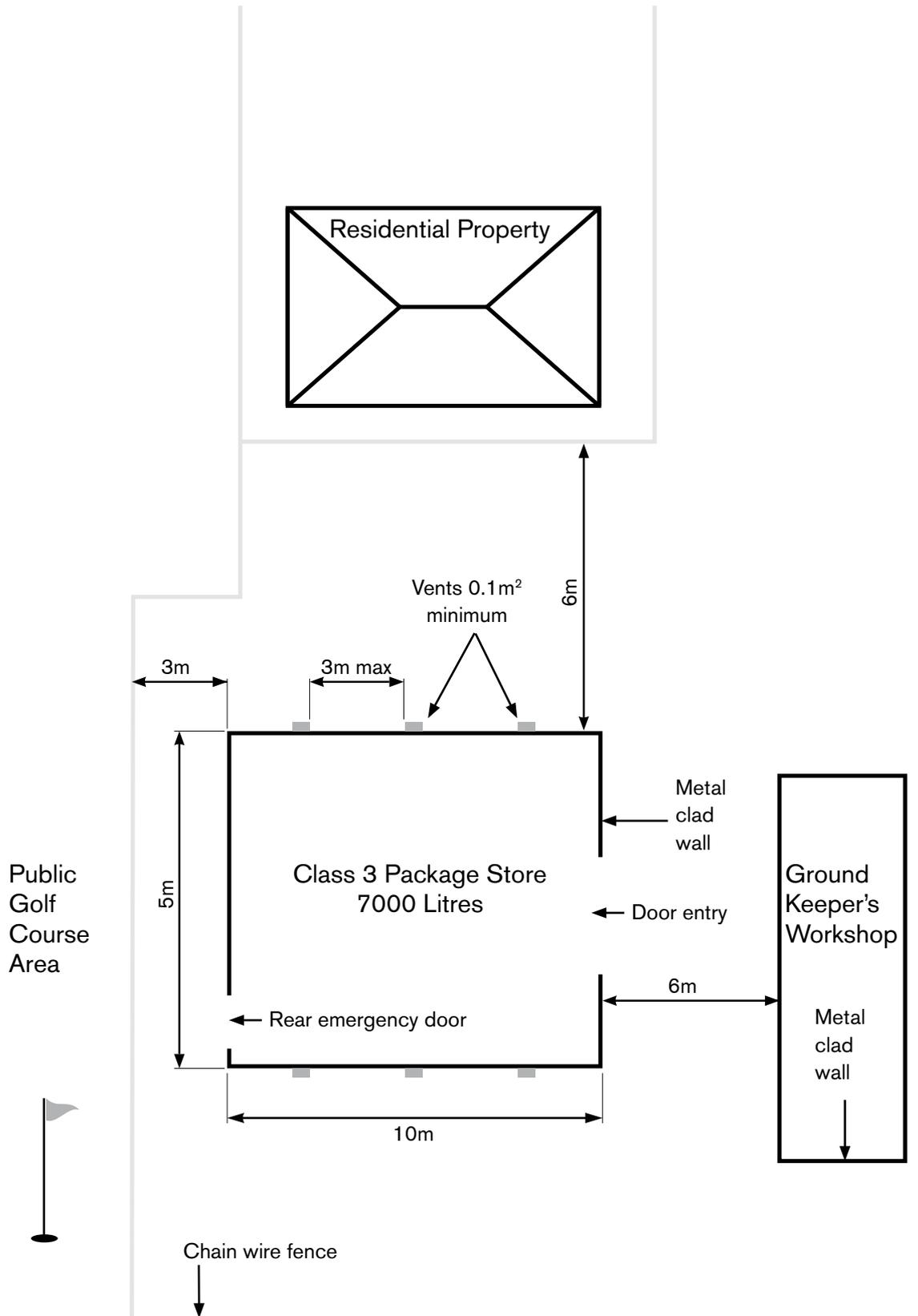


Figure 10: Store at golf course

## Appendix 3

### Examples of designing dangerous goods stores

#### Example 2 – a dangerous goods store at the premises of an engineering company

An engineering company wants to locate a free standing gas cylinder store at their premises. The store will hold cylinders containing Class 2.2 Subsidiary Risk 5.1 gases (eg oxygen) and cylinders containing Class 2.1 gases (eg acetylene and propane). In total the store will hold up to 2000L of these gases. AS 4332:2004 Section 4 provides guidance on the design of this store. All references to clauses and tables in this example are references to clauses and tables in Section 4 of this standard.

#### Separation distances

Given the store will hold up to 2000L of Class 2.2 and 2.1 gases, a 3m separation distance should be provided between the store and protected places both on site and off site and between the store and other dangerous goods (Clause 4.4.2.1(a) and Table 4.1).

Considering the store will hold both Class 2.1 and Class 2.2 Subsidiary Risk 5.1 gases, provisions should be made for these gases to be separated within the store by a distance of at least 3m. This may be measured in a horizontal plane around an intervening screen wall having a fire resistance level (**FRL**) of at least 120/120/120 and being of a height that extends 0.5m above the height of the cylinders of Class 2.2 gases (Clause 4.4.3(a), Table 4.2).

#### Other requirements

Section 4 indicates that if the store will be located adjacent to the engineering building wall which is made of metal clad, this wall should be upgraded to achieve a FRL of 240/240/240 (Clause 4.4.2.2(c)).

Given the store will not be enclosed in anyway, ventilation has been achieved.

Figure 11 provides a diagram of what the store would look like.

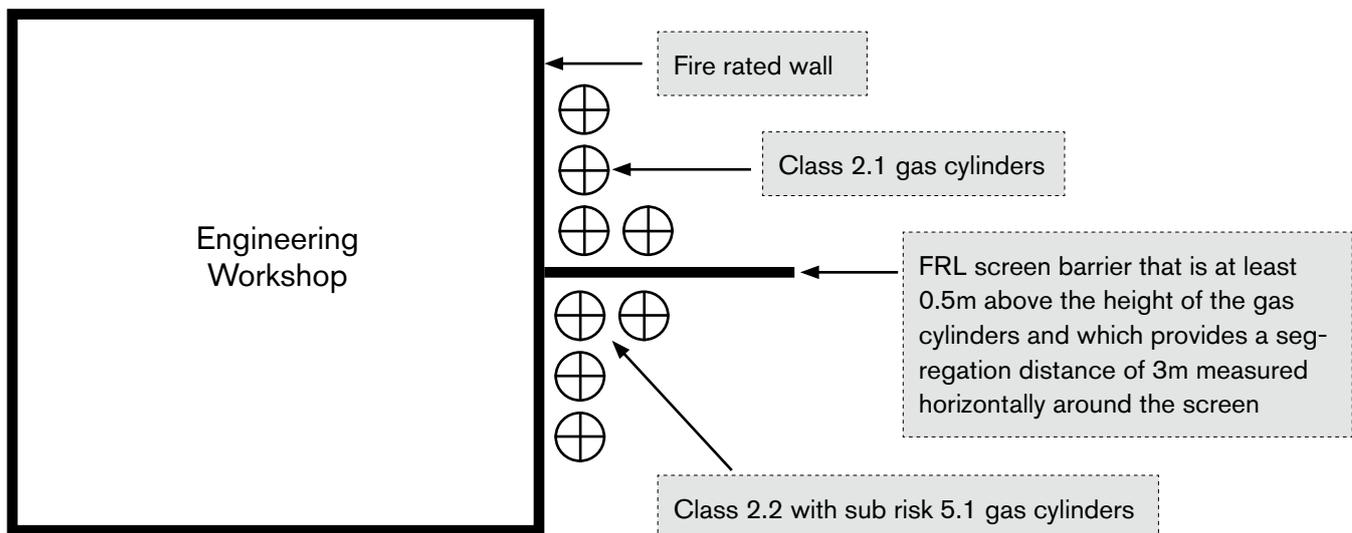


Figure 11: Store at engineering premises

# Appendix 4

## Examples of placarding premises with dangerous goods

**Note:** The examples in this Appendix are based on the assumption that the quantities of dangerous goods stored and handled at the relevant premises exceed the 'placarding quantity' in Schedule 2 of the DG (S&H) Regulations.

### Example 1 – Placarding a paint shop

A retail shop sells Class 3 and Class 8 packaged paint and paint related products.

To comply with the placarding requirements:

- an outer warning placard must be placed adjacent to the vehicle entry point, and
- placards for packaged dangerous goods other than C1 combustibles, must be placed at the front customer entry door and the side goods delivery door.

Figure 12 demonstrates how the premises should be placarded.

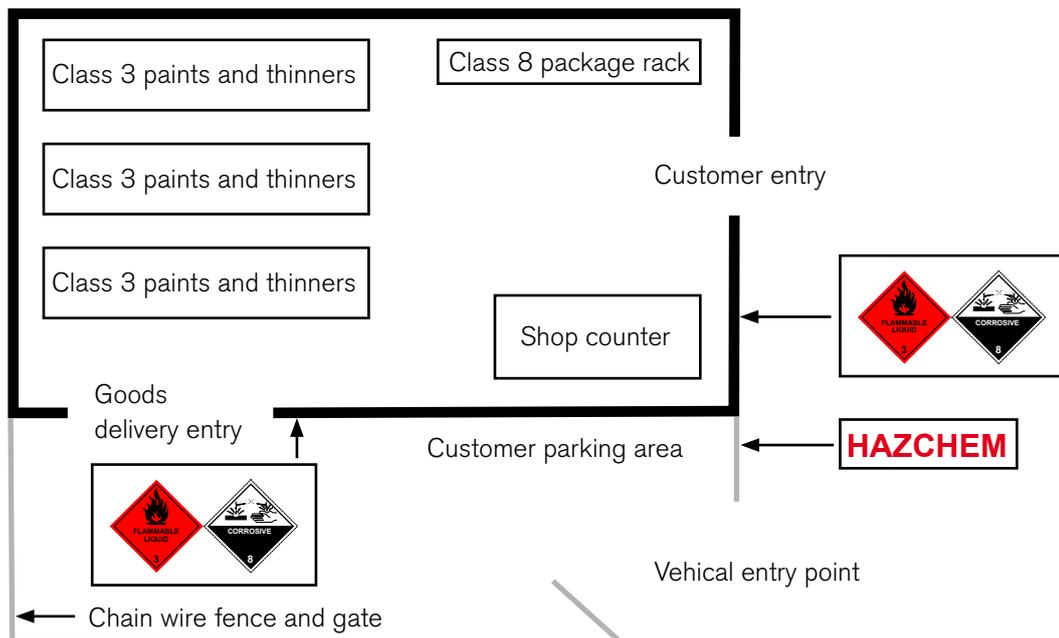


Figure 12: Placarding for a paint shop

## Appendix 4

### Examples of placarding premises with dangerous goods

#### Example 2 – Placarding a paint factory premises

To comply with the placarding requirements for the factory premises, the following is required:

- outer warning placards must be placed adjacent to each of the two vehicle entry points
- placards for packaged dangerous goods other than C1 combustibles must be placed adjacent to each entry into

the factory. These must also be placed adjacent to each entry into the raw material store and finished goods store, and

- placards for dangerous goods in bulk must be placed on each of the above ground bulk tanks. These placards also need to be placed on or adjacent to underground bulk tanks.

Figure 13 demonstrates how this factory should be placarded.

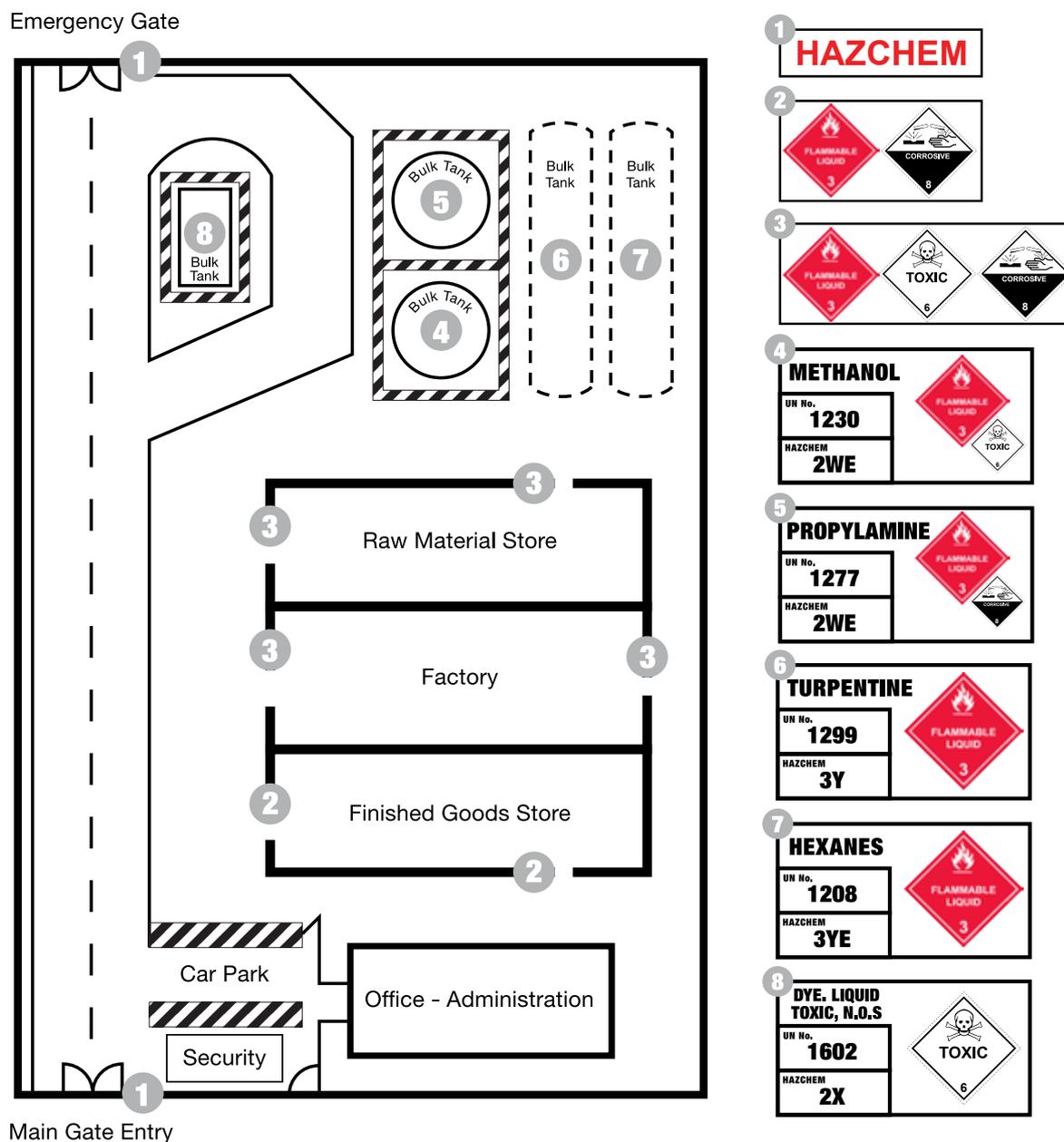


Figure 13: Placarding for a paint factory

## Appendix 4

### Examples of placarding premises with dangerous goods

#### Example 3 – Placarding a research and development lab

To comply with the placarding requirements for the laboratory premises, the following is required:

- an outer warning placard must be placed adjacent to the vehicle entry point
- placards for packaged dangerous goods other than C1 combustibles must be placed at the entry points to the lab building which contains storages of packaged dangerous goods.

- placards for packaged dangerous goods other than C1 combustibles must be placed at the entrance to each room in the lab building which contains storages of packaged dangerous goods.

Figure 14 demonstrates how this lab should be placarded.

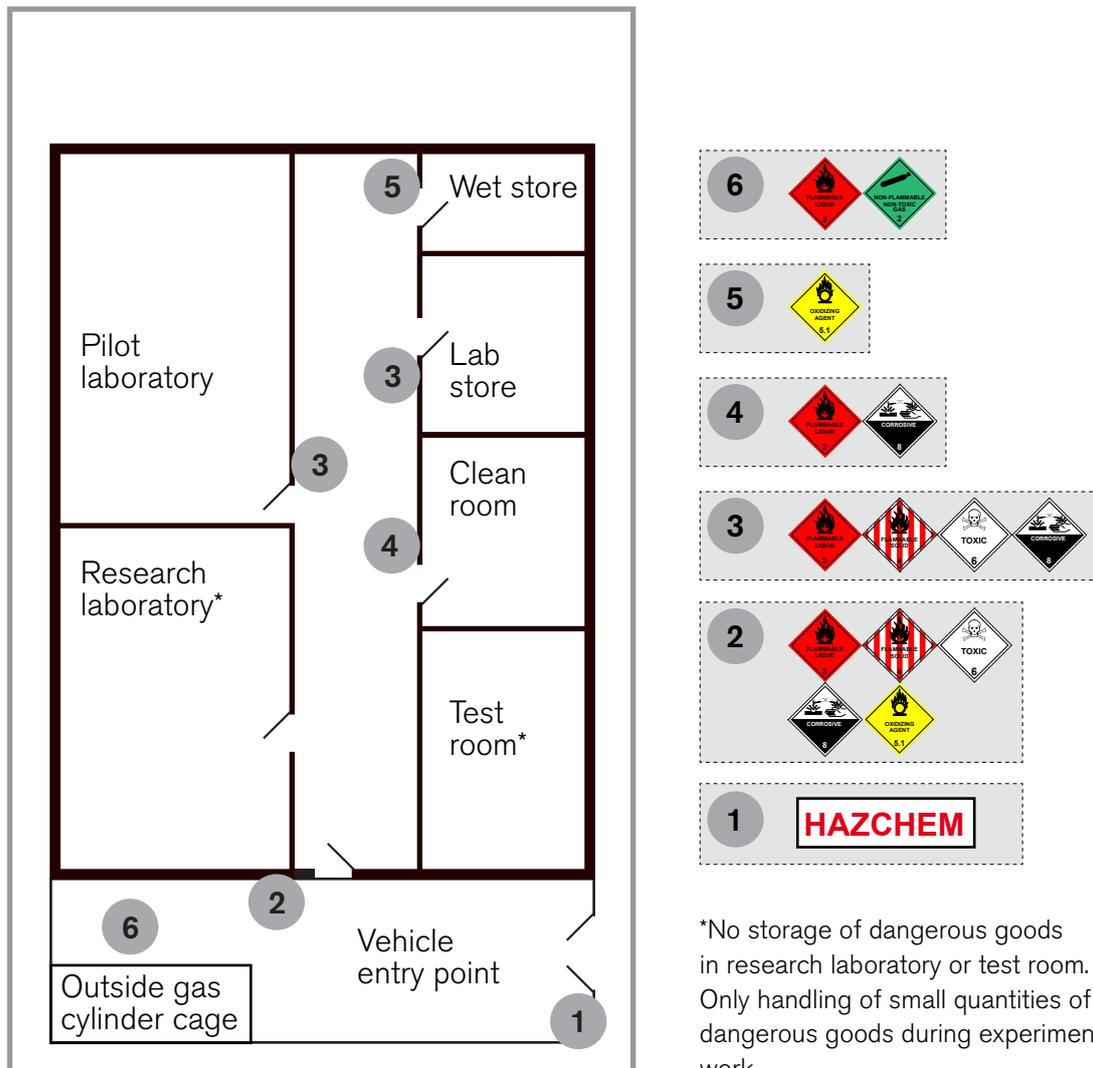


Figure 14: Placarding for a laboratory

# Appendix 5

## Other standards, codes and publications

This Appendix provides an overview of sources for further information on various aspects of the safe storage and handling of dangerous goods. It is not mandatory for duty holders to review and comply with any or all of the publications in this Appendix for the purposes of complying with the DG (S&H) Regulations. Please refer to the most current version of these publications.

### Preparation of MSDS/SDS

*National code of practice for the preparation of material safety data sheets 2nd edition* National Occupational Health and Safety Commission

*Preparation of safety data sheets for hazardous chemicals* Safe Work Australia

### Standards applicable to all classes of dangerous goods

AS/NZS 2243.1	<i>Safety in laboratories – planning and operational aspects</i>
AS/NZS 2243.2	<i>Safety in laboratories – chemical aspects</i>
AS/NZS 2243.10	<i>Safety in laboratories – storage of chemicals</i>
AS 1530.4	<i>Methods for fire tests on building materials, components and structures – fire-resistance test of elements of construction</i>
AS/NZS 3833	<i>The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers</i>
HB76	<i>Dangerous goods - initial emergency response guide</i>
AS/NZS 60079.14*	<i>Explosive atmospheres – electrical installations design, selection and erection</i>
AS/NZS ISO 31000	<i>Risk management – principles and guidelines</i>
AS IEC 61882	<i>Hazard and operability studies (HAZOP studies) – application guide</i>
AS/NZS 60079.29.2*	<i>Explosive atmospheres – gas detectors – selection, installation, use and maintenance of detectors for flammable gases and oxygen</i>
AS/NZS 4114.1*	<i>Spray painting booths, designated spray painting areas and paint mixing rooms – design, construction and testing</i>

\*more applicable to fire risk dangerous goods

AS/NZS 1680.1	<i>Interior and workplace lighting – general principles and recommendations</i>
AS/NZS 1768	<i>Lightning protection</i>
AS/NZS 1020	<i>The control of undesirable static electricity</i>
AS 3745	<i>Planning for emergencies in facilities</i>

### Standards specific to a particular class of dangerous goods or specific types of dangerous goods within a class

<b>Class 2</b>	<b>Gases</b>
AS 3814	<i>Industrial and commercial gas-fired appliances</i>
AS/NZS 2739	<i>Natural gas (NG) fuel systems for vehicle engines</i>
AS/NZS 5601.1	<i>Gas installations - general</i>

## Appendix 5

### Other standards, codes and publications

AS/NZS 1596	<i>The storage and handling of LP gas</i>
AS 1894	<i>The storage and handling of non-flammable cryogenic and refrigerated liquids</i>
AS/NZS 2022	<i>Anhydrous ammonia – storage and handling</i>
AS 2030.1	<i>Gas cylinders – general requirements</i>
AS 2809.3	<i>Road tank vehicles for dangerous goods – road tank vehicles for compressed liquefied gases</i>
AS 2337.1	<i>Gas cylinder test stations – general requirements, inspection and tests - gas cylinders</i>
AS/NZS 1677	<i>Refrigerating Systems</i>
AS/NZS 2927	<i>The storage and handling of liquefied chlorine gas</i>
AS 3961	<i>The storage and handling of liquefied natural gas</i>
AS 4332	<i>The storage and handling of gases in cylinders</i>
AS 4289	<i>Oxygen and acetylene gas reticulation systems</i>
AS/NZS 60079.10.1	<i>Explosive atmospheres - classification of areas - explosive gas atmospheres</i>
AS1482	<i>Electrical equipment for explosive atmospheres - Protection by ventilation - Type of protection</i>

#### **Class 3 Flammable liquids**

AS 1692	<i>Steel tanks for flammable and combustible liquids</i>
AS 1940	<i>The storage and handling of flammable and combustible liquids</i>
AS 4897	<i>The design, installation and operation of underground petroleum storage systems</i>
AS 4976	<i>The removal and disposal of underground petroleum storage tanks</i>
AS 1674.1	<i>Safety in welding and allied processes – fire precautions</i>
AS/NZS 2106.0	<i>Methods for the determination of the flashpoint of flammable liquids (closed cup) - general</i>
AS/NZS 60079.10.1	<i>Explosive atmospheres - classification of areas - explosive gas atmospheres</i>
ISO 2592	<i>Determination of flash and fire points – Cleveland open cup method</i>
AS1482	<i>Electrical equipment for explosive atmospheres - protection by ventilation - type of protection</i>

#### **Class 4 Flammable solids, substances liable to spontaneous combustion and substances which in contact with water emit flammable gases**

AS/NZS 5026	<i>The storage and handling of Class 4 dangerous goods</i>
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#### **Class 5 Oxidising substances and organic peroxides**

AS 2714	<i>The storage and handling of organic peroxides</i>
AS 4326	<i>The storage and handling of oxidizing agents</i>

#### **Class 6 Toxic substances**

AS/NZS 4452	<i>The storage and handling of toxic substances</i>
AS/NZS 4081	<i>The storage and handling of liquid and liquefied polyfunctional isocyanates</i>

## Appendix 5

### Other standards, codes and publications

#### **Class 8**                      **Corrosive substances**

AS 3780                      *The storage and handling of corrosive substances*

#### **Class 9**                      **Miscellaneous dangerous substances and articles**

AS/NZS 4681              *The storage and handling of Class 9 (miscellaneous) dangerous goods and articles*

#### **Standards applicable to a particular industry or situation**

AS 2507                      *The storage and handling of agricultural and veterinary chemicals*

AS 3846                      *The handling and transport of dangerous cargoes in port areas*

#### **Standards and codes regarding design requirements**

AS 2865                      *Confined spaces*

AS/NZS 2982              *Laboratory design and construction*

AS 3873                      *Pressure equipment – operation and maintenance*

'BCA'                          *Building Code of Australia*

#### **Fire protection standards**

##### **General**

AS/NZS 1221              *Fire hose reels*

AS 1319                      *Safety signs for the occupational environment*

AS 1603.5                  *Automatic fire detection and alarm systems – manual call points*

AS 1670                      *Fire detection, warning, control and intercom systems – system design, installation and commissioning (whole series)*

AS 1851                      *Routine service of fire protection systems and equipment*

AS 2118.1                  *Automatic fire sprinkler systems – general systems*

AS 2419                      *Fire hydrant installations (whole series)*

AS 2441                      *Installation of fire hose reels*

AS 2941                      *Fixed fire protection installations – pumpset systems*

NFPA 11                      *Low expansion foam*

NFPA 11A                  *Medium and high expansion foam*

NFPA 11C                  *Mobile foam apparatus*

NFPA 17                      *Dry chemical extinguishing systems*

NFPA 12                      *Carbon dioxide extinguishing systems*

##### **Fire extinguishers**

AS/NZS 1841.1              *Portable fire extinguishers – general requirements*

AS/NZS 1841.2              *Portable fire extinguishers – specific requirements for water type extinguishers*

AS/NZS 1841.3              *Portable fire extinguishers – specific requirements for wet chemical type extinguishers*

## Appendix 5

### Other standards, codes and publications

**Note:** Wet chemical extinguishers covered by AS/NZS 1841.3 are designed for fires involving cooking oils and fats, many of which are combustible liquids.

AS/NZS 1841.4	<i>Portable fire extinguishers – specific requirements for foam type extinguishers</i>
AS/NZS 1841.5	<i>Portable fire extinguishers – specific requirements for powder type extinguishers</i>
AS/NZS 1841.6	<i>Portable fire extinguishers – specific requirements for carbon dioxide type extinguishers</i>
AS/NZS 1841.7	<i>Portable fire extinguishers – specific requirements for vaporizing liquid type extinguishers</i>
AS/NZS 1850	<i>Portable fire extinguishers – classification, rating and performance testing</i>
AS 1851	<i>Routine service of fire protection systems and equipment</i>
AS 4265	<i>Wheeled fire extinguishers</i>
AS 2444	<i>Portable fire extinguishers and fire blankets – selection and location</i>

#### **Standards applicable to the design and specification for electrical equipment and wiring**

AS/NZS 1020	<i>The control of undesirable static electricity</i>
AS/NZS 1768	<i>Lightning protection</i>
AS 1482	<i>Electrical equipment for explosive atmospheres – protection by ventilation – type of protection</i>
AS/NZS 3000	<i>Electrical installations (known as the Australian/New Zealand wiring rules)</i>
AS/NZS 60079.14	<i>Explosive atmospheres – electrical installations design, selection and erection</i>
AS/NZS 60079.17	<i>Explosive atmospheres – electrical installations inspection and maintenance</i>
AS/NZS 60079.10.2	<i>Explosive atmospheres – classification of areas – combustible dust atmospheres</i>

# Appendix 6

## Chemical and physical properties of dangerous goods

This list identifies many of the inherently hazardous properties of dangerous goods that may create hazards under some circumstances.

### A. General physical properties

Compressed gas  
Gas dissolved under pressure  
Liquefied gas  
Cryogenic liquid  
Mobile liquid  
Viscous liquid  
Volatile liquid  
Liquid with solids in solution/suspension  
Finely divided solid  
Granular/flaked solid  
Caked or undivided solid  
Solubility in water  
Boiling point/range  
Melting point/range  
Odour  
Electrical conductivity/resistance  
Relative density at 20 °C  
Relative density at other relevant temperature  
Pressure as packed  
Vapour pressure at 20°C  
Vapour pressure at other relevant temperature  
Polarity  
pH as stored and handled  
pH of 1 per cent solution

### B. Flammability properties

Flash point (closed cup)  
Flash point (open cup)  
Fire point  
Auto ignition temperature

Flammability range LEL & UEL  
Evolves/produces hazardous combustion products  
Explosion potential

### C. Biological properties

Exposure limits/toxicity  
Irritant/sensitiser  
Carcinogen (known/suspected)  
Mutagen

### D. Corrosivity properties

Skin  
Metal  
Other material

### E. Reactivity properties

With air  
With water  
With other material (details)  
Self reactive  
Decomposition conditions  
Hazardous decomposition effects  
Hazardous decomposition products  
Polymerisation potential  
Hazardous polymerisation effects  
Inhibitor required  
Phlegmatiser required  
Self accelerating decomposition temperature (S.A.D.T.)  
Control temperature

### F. Sensitivity

To shock  
To heat  
To radiation  
To friction

# Appendix 7

## Equivalent classes and categories under the ADG Code and GHS

ADG classes and packing group (PG)	GHS categories
Class 2.1	Flammable gases Category 1 Flammable aerosols Category 1 and 2
Class 2.2	Oxidising gases Category 1 Gases under pressure <ul style="list-style-type: none"> <li>▪ Compressed gases</li> <li>▪ Liquefied gases</li> <li>▪ Refrigerated liquefied gases</li> <li>▪ Dissolved gases</li> </ul>
Class 2.3	Acute toxicity: inhalation categories 1-4 (Note: Category 4 only up to LC of 5000 ppmV) Skin corrosion/irritation categories 1A-C
Class 3 PG I	Flammable liquids Category 1
Class 3 PG II	Flammable liquids Category 2
Class 3 PG III	Flammable liquids Category 3
Class 4.1 self-reactive substances types A-G	Self reactive substances type A-F. Type G are not classified under model work health and safety regulations as hazardous chemicals.
Class 4.1 PG II	Flammable solids Category 1
Class 4.1 PG III	Flammable solids Category 2
Class 4.2 PG I	Pyrophoric liquids Category 1 Pyrophoric solids Category 1
Class 4.2 PG II	Self-heating substances Category 1
Class 4.2 PG III	Self-heating substances Category 2
Class 4.3 PG I	Substances and mixtures which in contact with water emit flammable gases, Category 1
Class 4.3 PG II	Substances and mixtures which in contact with water emit flammable gases, Category 2
Class 4.3 PG III	Substances and mixtures which in contact with water emit flammable gases, Category 3
Class 5.1 PG I	Oxidising solids, oxidising liquids, Category 1
Class 5.1 PG II	Oxidising solids, oxidising liquids, Category 2
Class 5.1 PG III	Oxidising solids, oxidising liquids, Category 3
Class 5.2 organic peroxides types A-G	Organic peroxides types A-F. Type G are not classified under model work health and safety regulations as hazardous chemicals.

## Appendix 7

### Equivalent classes and categories under the ADG Code and GHS

Class 6.1 PG I	Acute toxicity: oral Category 1 Acute toxicity: dermal Category 1 Acute toxicity: inhalation Category 1 (dusts, mists, vapours)
Class 6.1 PG II	Acute toxicity: oral Category 2 Acute toxicity: dermal Category 2 Acute toxicity: inhalation Category 2 (dusts, mists, vapours)
Class 6.1 PG III	Acute toxicity: oral Category 3 Acute toxicity: dermal Category 3 Acute toxicity: inhalation Category 3 (dusts, mists, vapours)
Class 8 PG I	Skin corrosion Category 1A
Class 8 PG II	Skin corrosion Category 1B
Class 8 PG III	Skin corrosion Category 1C Corrosive to metals Category 1
Class 9	Class 9 dangerous goods are not classified under the work health and safety laws
Goods too dangerous to be transported	Self reactive substances type A Organic peroxides type A Unstable explosives
C1 combustible liquids (flash point 60-93°C)	Flammable liquids Category 4 (flash point 60-93°C)

**Note:** Depending on packaging method, self reactive substances and organic peroxides type A will either be classified under the ADG Code as 'Goods too dangerous to be transported' or their comparative classes (4.1 or 5.2).

# Appendix 8

## Equivalent pictograms under the ADG Code and GHS

Type of dangerous goods	ADG Code	GHS
Flammable gases Class 2.1	 	
Non-flammable, non-toxic gases Class 2.2	 	
Toxic gases Class 2.3		
Flammable liquids Class 3	 	
Flammable solids, self-reactive substances and solid desensitized explosives Class 4.1		
Substances liable to spontaneous combustion Class 4.2		
Substances which in contact with water emit flammable gases Class 4.3	 	

## Appendix 8

### Equivalent pictograms under the ADG Code and GHS

Oxidizing substances Class 5.1		
Organic peroxides Class 5.2	 	
Toxic substances Class 6.1		
Corrosive substances Class 8		
Miscellaneous dangerous substances and articles Class 9		No equivalent
Environmental hazard (ADG Code) / hazard to aquatic environment (GHS)		

# Appendix 9

## Sample manifest form

### DANGEROUS GOODS AND COMBUSTIBLE LIQUIDS MANIFEST

Occupier: .....

Address of premises: .....

Date of preparation: .....

Site plan number: .....

#### Emergency contacts

NAME	POSITION	TELEPHONE
		B/H A/H
		B/H A/H
		B/H A/H

#### 1. BULK STORAGE

Tank Id No.	Dangerous goods					Tank	
	Name	Class	Sub Risk/s	UN No.	PG	Type	Capacity
DG T1	Petrol	3	n/a	1203	II	u/g	30,000L
DG T3	LP gas	2.1	n/a	1075	n/a	a/g	3,000L
DG T4	Hydrogen peroxide	5.1	8	2014	II	a/g	18,000L

u/g – underground

a/g – aboveground

n/a – not applicable

# Appendix 9

## Sample manifest form

### 2. PACKAGE STORAGE AREAS

#### 2.1 Packaged dangerous goods of Packing Group I or Class 2.3

Storage area	Dangerous goods					Quantity	
	Name	Class	Sub Risk(s)	UN No.	PG	Average	Maximum
PS1	Sodium picramate	4.1		1349	I	20kg	50kg

#### 2.2 Other packaged dangerous goods

Storage area	Class	Sub Risk(s)	Packing Group	Average quantity	Maximum quantity
PS2	6.1		III	10,000kg/L	15,000kg/L
PS3	3		II	15,000L	20,000L
	3		III	15,000L	25,000L
	3	8	III	600L	1,000L
	C1			15,000L	20,000L
PS4	8		II	8,000kg/L	12,000kg/

### 3. MANUFACTURING AREAS

Area	Class	Sub Risk(s)	Packing Group	Maximum quantity
MA1	3		II	2,000L
	3		III	10,050L
MA2	5.1	8	II	1,500L
MA3	3		II	200L
	3		III	25L
	8		II	100L
	8		III	2,000L

# Appendix 10

## Glossary

There are a number of key terms used throughout this Code. Some of these terms come from the DG (S&H) Regulations. Others are found in the Dangerous Goods (Transport by Road and Rail) Regulations 2008, DG Act, OHS Regulations or Australian/New Zealand Standards. They are reproduced here for your convenience.

Where the definition of a term below incorporates an Australian or Australian/New Zealand Standard and this standard is revised or replaced subsequent to the publication of this Code, you should start using the definition with the new standard within 12 months of the revision or replacement.

**Act** – *Dangerous Goods Act 1985 (Vic)*.

**ADG Code** – Australian Code for the Transport of Dangerous Goods by Road and Rail (Seventh edition or subsequent edition), as in force from time to time.

**Boiling point** – has the same meaning as in *AS 1940: 2004*. It means the point at which it is no longer possible to achieve the rate of temperature rise required by *ISO 2592: 2000 Determination of flash and fire points – Cleveland open cup method*, for the determination of fire point.

**Bulk** – any quantity of dangerous goods that is:

- in a container with a capacity exceeding 500L or net mass of more than 500kg, or
- if the dangerous goods are a solid - an undivided quantity exceeding 500kg.

**C1 combustible liquid** –

- liquid dangerous goods with a flash point higher than 60°C, but not higher than 93°C, and a fire point less than the boiling point, or
- a combustible liquid that is declared under regulation 10 of the Dangerous Goods (Storage and Handling) Regulations 2012 to be a C1 combustible liquid.

**Capacity** – in relation to a container, means the internal volume expressed in L of a container at 15°C.

**Class** – the class to which dangerous goods belong in accordance with regulation 40 of the Dangerous Goods (Transport by Road or Rail) Regulations 2008.

**Class label** – a label of a type specified in the ADG Code for the class of dangerous goods.

**Combustible liquid** – any liquid dangerous goods with a flash point higher than 60°C.

**Compatible** – in relation to two or more substances or items, means they will not react together to cause a fire, explosion, harmful reaction or the evolution of flammable, corrosive or toxic vapours.

**Compound** – an area bounded by ground contours or by a bund (ie an embankment or wall), and intended to retain spillage or leakage. This includes the floor of the compound.

**Confined space** – a space in any vat, tank, pit, pipe, duct, flue, oven, chimney, silo, reaction vessel, container, receptacle, underground sewer or well, or any shaft, trench or tunnel or other similar enclosed or partially enclosed structure, if the space:

- is, or is intended to be, or is likely to be, entered by any person
- has a limited or restricted means for entry or exit that makes it physically difficult for a person to enter or exit the space
- is, or is intended to be, at normal atmospheric pressure while any person is in the space, and
- contains, or is intended to contain, or is likely to contain
  - an atmosphere that has a harmful level of any contaminant
  - an atmosphere that does not have a safe oxygen level, or
  - any stored substance, except liquids, that could cause engulfment,
- but does not include a shaft, trench or tunnel that is a mine or is part of the workings of a mine.

**Consumer package** – a package that is intended for retail display and sale.

**Container** – anything in or by which dangerous goods are wholly or partly cased, covered, enclosed, contained or packed, whether such a thing is empty or partially or completely full, but does not include a vehicle.

# Appendix 10

## Glossary

**Control temperature** – the maximum temperature at which dangerous goods can be safely stored and handled as specified or determined by, or in accordance with, the Recommendations on the Transport of Dangerous Goods—Manual of Tests and Criteria, 5th Revised Edition, published by the United Nations in 2009, as amended from time to time and Part 2 of the ADG Code.

**Dangerous goods** – has the same meaning as it has in the ADG Code except that:

- Class 1 dangerous goods in the ADG Code are not dangerous goods for the purposes of the *Dangerous Goods Act 1985* and Dangerous Goods (Storage and Handling) Regulations 2012, and
- the following substances and articles are also dangerous goods:
  - explosives
  - combustible liquids having a flash point higher than 60°C
  - high consequence dangerous goods
  - any goods defined under the ADG Code or the Dangerous Goods (Transport by Road or Rail) Regulations 2008 to be goods too dangerous to be transported, and
  - any substance or article declared to be dangerous goods by an Order in Council made under Section 9B of the *Dangerous Goods Act 1985*.

**Dangerous goods in transit** – dangerous goods that are:

- supplied to premises in containers that are not opened at the premises
- not used at the premises, and
- kept at the premises for a period of not more than five consecutive days.

**Emergency** – an event that exposes a person or property in the vicinity of the event to an immediate risk through:

- an explosion, fire, harmful reaction or the evolution of flammable, corrosive or toxic vapours involving dangerous goods, or
- the escape, spillage or leakage of any dangerous goods.

**Emergency services authority** – whichever of the following is appropriate for the location of the premises:

- Metropolitan Fire and Emergency Services Board, or
- Country Fire Authority.

**Fire point** – has the same meaning as in *AS1940: 2004*. It means the temperature at which a liquid, when tested according to the method set out in *ISO 2592: 2000* first evolves vapour at a sufficient rate to sustain burning for at least five seconds after application of the specified test flame.

**Fire protection system** – the fire protection equipment and fire fighting equipment used to combat or mitigate any emergency occurring at the premises.

**Fire risk dangerous goods** – dangerous goods of Class 2.1, 3, 4.1, 4.2, 4.3, 5.1 or 5.2 and dangerous goods of Subsidiary Risk 2.1, 3, 4.1, 4.2, 4.3, 5.1 or 5.2.

**First supplier** – a person who:

- has not manufactured the dangerous goods in Victoria, and
- is, or intends to be, the first person to supply the goods in Victoria to another person.

**Flash point** – the temperature at which a liquid first evolves vapour in a sufficient quantity to be ignited when tested in accordance with:

- *AS/NZS 2106 Methods for the determination of the flashpoint of flammable liquids (closed cup) - series*, or
- a technical standard that specifies a test equivalent to that specified in *AS/NZS 2106*.

**GHS** – Globally Harmonized System of Classification and Labelling of Chemicals, third revised edition or fourth revised edition, published by the United Nations.

**Goods too dangerous to be transported** – means:

- goods set out or described in Appendix A to the ADG Code
- goods determined under regulation 30(2)(a) of the Dangerous Goods (Transport by Road or Rail) Regulations 2008 to be too dangerous to be transported, or
- goods (other than goods mentioned above) that are so sensitive or unstable that they cannot be safely transported even if the relevant requirements of the Dangerous Goods (Transport by Road or Rail) Regulations 2008 and the ADG Code are complied with.

**Handling** – includes:

- conveying the dangerous goods within premises, including within pipework, and
- manufacturing, processing, using, treating, dispensing, packing, supplying, transferring, rendering harmless, disposing of or destroying the dangerous goods.

# Appendix 10

## Glossary

**Hazard** – any thing, activity, occurrence or circumstance of any kind that has the potential to cause injury to persons or damage to property by:

- an explosion, fire, harmful reaction or the evolution of flammable, corrosive or toxic vapours involving dangerous goods, or
- the escape, spillage or leakage of any dangerous goods.

**Hazard class** – the nature of a physical, health or environmental hazard under the GHS.

**Hazardous area** – has the same meaning as in *AS/NZS 60079.10.1: 2009 Explosive atmospheres – classification of areas – explosive gas atmospheres*. This standard provides that a hazardous area is an area in which an explosive gas atmosphere, is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment.

**HSIS** – the Hazardous Substances Information System published by Safe Work Australia on its website and as amended from time to time.

**Health and safety representative (HSR)** – a current health and safety representative under Part 7 of the *Occupational Health and Safety Act 2004*.

**High consequence dangerous goods (HCDG)** – substances or articles that are declared to be high consequence dangerous goods under Section 9B of the *Dangerous Goods Act 1985*, excluding any substances or articles that are explosives.

**Intermediate bulk container (IBC)** – has the same meaning as in regulation 11 of the Dangerous Goods (Transport by Road or Rail) Regulations 2008.

Regulation 11 provides that:

(1) Subject to subregulation (2), IBC means a rigid or flexible portable packaging for the transport of dangerous goods that complies with the specifications in Chapter 6.5 of the ADG Code and that:

- has a capacity of not more than:
  - for solids of Packing Group I packed in a composite, fibreboard, flexible, wooden, or rigid plastics container – 1500L
  - for solids of Packing Group I packed in a metal container – 3000L
  - for solids or liquids of Packing Groups II and III – 3000L, and
  - for any other dangerous goods – 3000L, and
- is designed for mechanical handling.

(2) Rigid or flexible portable packaging that complies with the requirements of Chapter 6.1, 6.3 or 6.6 of the ADG Code cannot be an IBC.

**Ignition source** – a source of energy sufficient to ignite a flammable atmosphere including:

- a naked flame, exposed incandescent material, an electrical welding arc, or a mechanical or static spark, and
- any electrical or mechanical equipment that is not specifically designed to be used in a hazardous area.

**Incident** – an emergency, or an unintended event that, but for the intervention of a risk control measure or human intervention, is likely to result in an emergency.

**Inner packaging** – any packaging that is, or that is to be, contained or protected by the outer packaging.

**Isolation** – the physical separation of the dangerous goods from the person, property or thing by either distance or a physical barrier.

**Lower explosive limit (LEL)** – the concentration of flammable gas, vapour or mist (as a percentage of volume in air) below which an explosive atmosphere will not be formed.

**Manifest** – an inventory of dangerous goods.

**Manufacture** – includes any part or the whole of any process of:

- making non-dangerous goods from dangerous goods
- making non-dangerous goods from non-dangerous goods, where in the course of the process dangerous goods are made, and
- the unmaking, altering, repairing or remaking of dangerous goods.

**Occupier** – in relation to a premises, includes a person who:

- is the owner of the premises
- exercises control at the premises under a mortgage, lease or franchise, or
- is normally or occasionally in charge of, or exercising control or supervision at, the premises as a manager or employee or in any other capacity.

**Package** – the complete product of the packing of the goods for transport. It consists of the goods and their packaging.

**Packaged dangerous goods** – dangerous goods (including goods too dangerous to be transported or C1 combustible liquids) in a container with a net capacity of not more than 500L or a net mass of not more than 500kg.

# Appendix 10

## Glossary

**Packaging** – the container in which the goods are received or held for transport. It includes anything that enables the container, to receive or hold the goods, or to be closed.

**Packing Group** – has the same meaning as in regulation 42 of the Dangerous Goods (Transport by Road or Rail) Regulations 2008.

Regulation 42 provides that the packing group of particular dangerous goods is:

- if a determination under regulation 30(1)(d) that the goods are of a particular packing group is in effect – the packing group specified in the determination, or
- if no such determination is in effect – the packing group determined for the goods in accordance with the ADG Code.

**Pipework** –

- a pipe or an assembly of pipes, and
- associated pipe fittings, valves and pipe accessories

used to convey dangerous goods.

**Plant** – includes:

- any machinery, equipment, appliance, implement and tool
- any component of any of those things, and
- anything fitted, connected or related to any of those things.

**Pool chlorine** – Calcium hypochlorite, dichloroisocyanuric acid and its salts or trichloroisocyanuric acid.

**Premises** – includes:

- a building or part of a building
- a tent, stall or other structure, whether permanent or temporary
- land, whether or not accompanying a building, and
- any other place,

but does not include a vehicle or boat.

**Product name** – the brand name or trade name given to dangerous goods by the manufacturer or any supplier of the dangerous goods.

**Proper shipping name** – the name assigned to the dangerous goods by the Dangerous Goods List in Chapter 3.2 of the ADG Code.

**Reasonably practicable** – reasonably practicable, having regard to:

- the likelihood of the hazard or risk concerned eventuating

- the degree of harm that would result if the hazard or risk eventuated
- what the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk
- the availability and suitability of ways to eliminate or reduce the hazard or risk, and
- the cost of eliminating or reducing the hazard or risk.

**Receptacle** – a container, plant, pipework or any other thing that can contain dangerous goods.

**Stabiliser** – any substance (including any diluent, inhibitor, desensitiser, phlegmatizer, solvent, wetting agent or adulterant) added to, or present in, dangerous goods that overcomes the chemical instability inherent in the dangerous goods.

**Subsidiary risk** – has the same meaning as in regulation 41 of the Dangerous Goods (Transport by Road or Rail) Regulation 2008.

Regulation 41 provides that the subsidiary risk of particular dangerous goods for the purposes of these regulations is:

- if a determination under regulation 30(1)(c) that the goods have a particular subsidiary risk is in effect – the subsidiary risk specified in the determination, or
- if no such determination is in effect – the subsidiary risk determined for the goods in accordance with the ADG Code.

**Subsidiary risk label** – a label of a type specified in the ADG Code for the subsidiary risk of the dangerous goods.

**Tank** – a container, other than an IBC, used or designed to be used to transport, store or handle dangerous goods in the form of a gas or a liquid in bulk. It includes fittings, closures and any other equipment that forms part of the container.

**Transfer** – any process that involves:

- filling, loading, pumping or pouring of dangerous goods into a container, or
- discharging, unloading, pumping or pouring of dangerous goods from a container.

**Underground tank** – a permanent tank that is wholly or partially located beneath the ground.

**UN Number (UN No)** – has the same meaning as in the ADG Code.

Clause 2.0.2 of the ADG Code explains the meaning of this term.



**Upper explosive limit (UEL)** – the concentration of flammable gas, vapour or mist (as a percentage of volume in air) above which an explosive atmosphere will not be formed.

**Workplace** – any place, whether or not in a building or structure, where persons work, who are employed under a contract of employment or contract of training or who are self-employed.





## WorkSafe Victoria

### WorkSafe Agents

Agent contact details are all available at [worksafe.vic.gov.au/agents](http://worksafe.vic.gov.au/agents)

### Advisory Service

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For information about WorkSafe in your own language, call our Talking your Language service

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