DANGEROUS GOODS ACT 1985

CODE OF PRACTICE

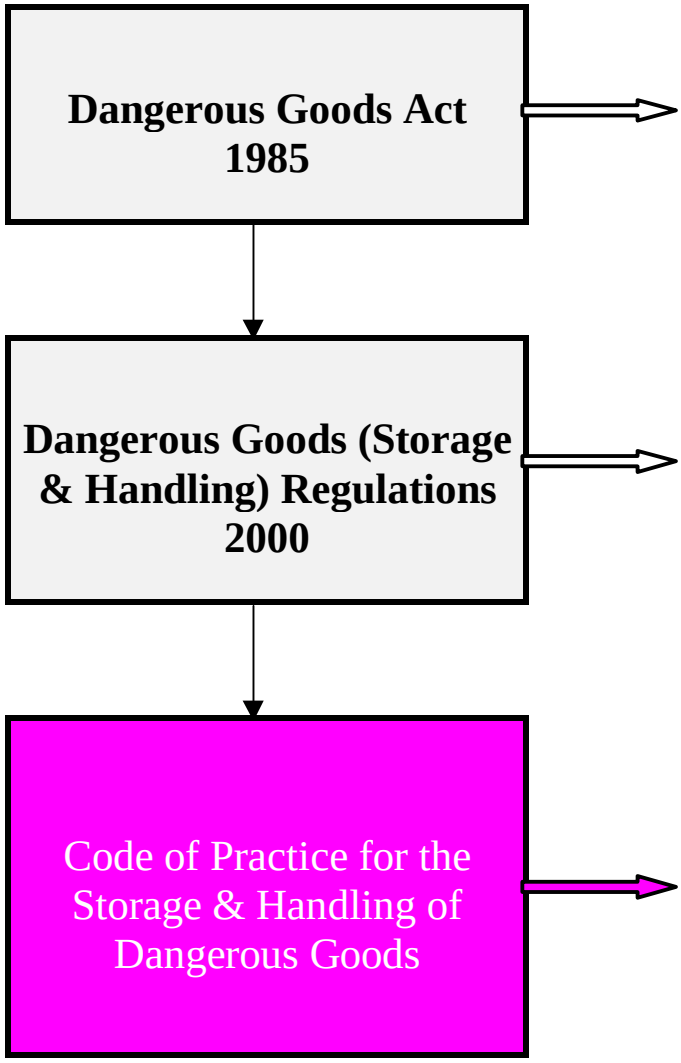
FOR THE

STORAGE AND HANDLING OF DANGEROUS GOODS

No. 27, 8 December 2000

This code of practice is approved under section 56 of the Dangerous Goods Act 1985

THE LEGISLATIVE FRAMEWORK



The Act sets out the general duties for the manufacture, storage, transport, transfer, sale and use of dangerous goods and the import of explosives into Victoria. The Act also enables regulations to be made about dangerous goods.

The Regulations set out specific duties for people who manufacture, import, supply, store or handle dangerous goods.

Section 45(1) of the Act states that failure to comply with regulations made under the Act is an offence.

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The Code provides practical guidance to manufacturers and suppliers of dangerous goods, and occupiers storing and handling those dangerous goods on how to comply with the Regulations.

Appendix 1 explains the Code's legal status

CONTENTS

PART 1 INTRODUCTION

1. What are dangerous goods?

Dangerous goods are substances that may be corrosive, flammable, explosive, spontaneously combustible, toxic, oxidising, or water-reactive. These goods can be deadly and can seriously damage property and the environment. Therefore, it's important that they are stored and handled safely.

You should read this Code if you manufacture, supply, store or handle dangerous goods. The Code will help you meet your duties under the *Dangerous Goods (Storage and Handling) Regulations 2000* to ensure that dangerous goods are stored and handled safely.

If you are a health and safety representative or an employee who works with dangerous goods, you may also find this Code useful.

2. Which dangerous goods are covered by this Code?

The following table (Figure 1) summarises the dangerous goods covered by the Regulations and therefore this Code.

Type of Goods	**Description**	**Reference for classification**
Dangerous Goods		ADG Code
Class 2	Gases	
2.1	Flammable gases	
2.2	Non-flammable, non-toxic gases	
2.3	Toxic gases	
Class 3	Flammable liquid	
Class 4	Flammable solids etc.	
4.1	Flammable solids; self-reactive and related substances; and desensitised explosives	
4.2	Substances liable to spontaneous combustion	
4.3	Substances that in contact with water emit flammable gases	
Class 5	Oxidising substances, organic peroxides	
5.1	Oxidising substances	
5.2	Organic peroxides	
Class 6.1	Toxic substances	
Class 8	Corrosive substances	
Class 9	Miscellaneous dangerous goods and articles	
Goods too dangerous to be transported	Goods listed in Appendix 5 of the ADG Code and goods determined to be so in accordance with reg 1.18(g) of the Road Transport Reform (DG) Regulations 1997.	ADG Code & order
C1 Combustible liquid	A liquid other than a flammable liquid that has a flashpoint between 61C $\leq$ 150°C, and a fire point less than its boiling point.	AS 1940 The storage and handling of flammable and combustible liquids

Figure 1: Types of goods covered by the Code of Practice

3. Which dangerous goods are not covered by this Code?

The Regulations and this Code do not apply to:

- dangerous goods which are explosives (including dangerous goods of Class 1); or
- dangerous goods of classes 6.2 and 7 as defined in the ADG Code;[1] or
- dangerous goods while they are used in the manufacture of explosives in accordance with Part 3 of the *Dangerous Goods (Explosives) Regulations 2000*; or
- dangerous goods which are batteries while they are in use; or
- dangerous goods in a fuel container which is fitted to a vehicle or boat; or
- dangerous goods in the form an appliance or equipment that forms part of a vehicle or boat and is necessary for its operation; or
- dangerous goods in the fuel container of a domestic or portable fuel burning appliance; or
- combustible liquids unless they are C1 combustible liquids; or
- dangerous goods in portable firefighting or medical equipment deployed for use at the premises; or
- asbestos designated by UN 2212 or UN 2509.

Dangerous goods at non-workplaces

Once any of the thresholds specified in regulation 106(1)(k) are exceeded, all the relevant provisions of the Regulations apply at the premises, and as a consequence, this Code applies.

The Regulations and Code do not cover the following dangerous goods if they are at premises that are not a workplace:

- compressed gas of Class 2.1, Class 2.2 or compressed oxygen each in aggregate quantities of less than 50 litres forming part of a welding set or used or intended to be used with a portable flame torch; or
- compressed oxygen or air used or intended to be used for medical purposes; or
- dangerous goods of Class 3 in an aggregate quantity of less than 250 litres; or
- pool chlorine in an aggregate quantity of not more than 100kg; or
- sodium hypochlorite designated by UN 1791 in an aggregate quantity of not more than 100 litres; or
- Class 9 dangerous goods in an aggregate quantity of not more that 100 kg; or
- dangerous goods of Packing Group I in an aggregate quantity of not more than 5 kg; or
- combustible liquids in an aggregate quantity of not more than 1,000 litres; or
- any other dangerous goods (not including dangerous goods of Class 2.3) in an aggregate quantity of not more than 100 kilograms.

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1 The ADG Code means the document known as the Australian Code for the Transport of Dangerous Goods by Road and Rail (Sixth edition or a later prescribed edition), as amended from time to time.

The **Dangerous Goods Act 1985** incorporates the ADG Code for definitional purposes and that Code is directly incorporated into the Commonwealth *Road Transport Reform (Dangerous Goods) Regulations 1997*. The latter Regulations have the force of Victorian law by virtue of the operation of the Victorian **Road Transport (Dangerous Goods) Act 1995**, which brings the Commonwealth **Road Transport (Dangerous Goods) Act** into state law. The effect of this legislative framework is to make the requirements contained in the ADG Code mandatory.

4. What is the difference between ‘dangerous goods’ and ‘hazardous substances’?

Don’t confuse dangerous goods with hazardous substances – they are classified according to different criteria. Dangerous goods are classified on the basis of *immediate physical or chemical effects*, such as fire, explosion, corrosion and poisoning, affecting property, the environment or people, while hazardous substances are classified only on the basis of*health effects* (whether they be immediate or long-term).

Dangerous goods and hazardous substances are covered by separate legislation, each focusing on controlling the different risks described above. Since many hazardous substances are also classified as dangerous goods, the requirements of both pieces of legislation will apply in these cases. Each piece of legislation complements the other, effectively ensuring the comprehensive control of all risks.

5. Relationship with other regulations

There are a number of regulations made under the **Dangerous Goods Act 1985, Road Transport (Dangerous Goods) Act 1995** and the **Occupational Health and Safety Act 1985** which have some relationship with the Storage and Handling Regulations. Appendix 2 provides a detailed summary of these relationships.

6. Competencies of people carrying out duties

You have a responsibility to ensure that people carrying out duties under the Regulations on your behalf have the appropriate competencies to enable them to perform tasks correctly. The competencies may be acquired through training, education or experience or through a combination of these.

PART 2 DUTIES OF MANUFACTURERS AND SUPPLIERS

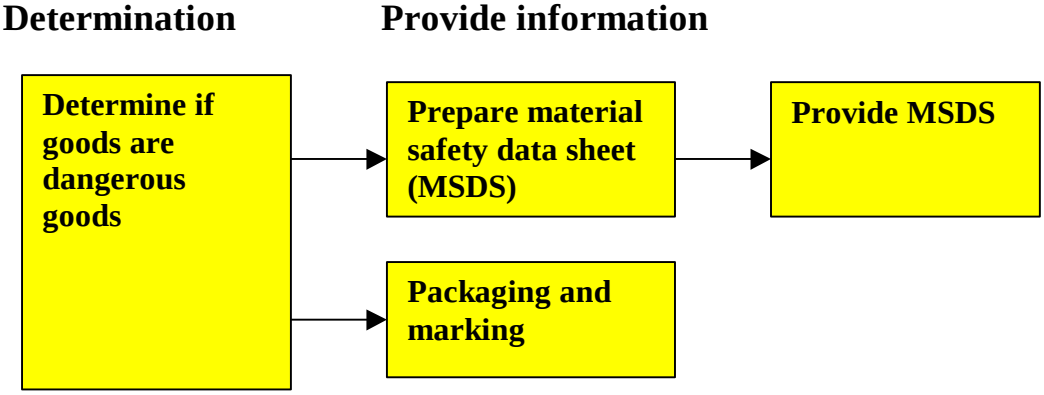
7. Introduction

This Part of the Code provides guidance for those who manufacture dangerous goods and supply them for use. When purchasers are making decisions about how to protect the health of employees using dangerous goods, they will rely on the information you provide, so it is vital that you comply with the Regulations.

If you manufacture dangerous goods or are the "first supplier"[2] of dangerous goods, the Regulations require you to determine whether the goods are dangerous goods. If you determine that the goods are dangerous goods, you must also prepare and provide purchasers with a material safety data sheet (MSDS) and ensure that the dangerous goods are assigned a class, subsidiary risk and packing group, and ensure compliance with Commonwealth legislation covering package marking (see Figure 2).

If you supply dangerous goods to premises for exchange or sale, you must provide purchasers with a copy of the MSDS and ensure that the condition of the dangerous goods and the packages and package marking complies with Commonwealth legislation.

Figure 2: Duties of manufacturers and first suppliers



8. Are the goods "dangerous goods"?

If you suspect (or reasonably ought to suspect) that goods you manufacture or supply as a first supplier are dangerous goods, you are required to determine if this is the case. This determination must be made before the goods are supplied for use.

Whether you "reasonably ought" to suspect that goods are dangerous goods is an objective test. That is, it does not depend on your personal knowledge but whether you, as a person in

[2] "First supplier", in relation to dangerous goods, means a person who –
(a) has not manufactured the dangerous goods; and
(b) is, or intends to be, the first person to supply the dangerous goods to another person.

Ordinarily, the "first supplier" will be the person who imports the dangerous goods into Victoria from overseas or another Australian jurisdiction (that is, another Australian state or territory).

the business of manufacturing or importing those goods, ought to suspect that the goods are dangerous goods.

The determination must be made having regard to one of the following:

- regulation 2.2 of the Commonwealth *Road Transport Reform (Dangerous Goods) Regulations 1997*;
- for C1 combustible liquids, Australian Standard AS 1940– *The Storage and Handling of Flammable and Combustible Liquids*;
- for goods that are too dangerous to be transported, an order-in-council made under section 9B of the Dangerous Goods Act titled "*Goods too dangerous to be transported – Declared dangerous goods*".

9. Classifying, packaging and package marking

Before the dangerous goods are supplied for use, you are required to ensure that the dangerous goods are:

- assigned the appropriate Class, Subsidiary Risk and Packing Group; and
- packed in accordance with the ADG Code, with particular emphasis on the need for packagings to be in sound condition and compatible with the goods.

The ADG Code requires dangerous goods containers (most packagings and all bulk containers) to be performance tested, approved and marked to indicate the types of dangerous goods for which they are approved. Approvals may be issued in any State under its respective laws adopting the ADG Code and are valid in all States.

10. Retailing dangerous goods

The requirement to package and mark dangerous goods does not apply to retailers of dangerous goods who supply the goods in a container provided by the purchaser. But if you are retailing dangerous goods, you are still required to ensure, as far as practicable[3], the container is suitable. To determine this, consider the following:

- Is this type of container usually used for goods of this kind? If not, is it strong enough and unlikely to be affected by the dangerous goods?
- Does the container have a tight-fitting lid that will prevent the goods leaking or being spilt?

If you are supplying Class 2 dangerous goods (gases), the container provided by the purchaser must comply with the provisions of the *Road Transport Reform (Dangerous Goods) Regulations 1997* concerning packages.

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[3] "Practicable" means practicable having regard to –
(a) the severity of the hazard or risk in question; and
(b) the state of knowledge about that hazard or risk and any ways of removing or mitigating that hazard or risk; and
(c) the availability and suitability of ways to remove or mitigate that hazard or risk; and
(d) the cost of removing or mitigating that hazard or risk.

If the dangerous goods to be supplied is a liquid fuel, containers that comply with AS 2906 *Fuel Containers – Portable – Plastics and Metal* should be used. Containers that are made to this standard will be indelibly marked (that is, embossed or moulded) with various safety information, including the type and quantity of the fuel that may be placed in the container.

Other metal containers may be filled with fuel provided that they are of substantial construction and have a closure, such as a screw top, that can't easily be dislodged.

A fuel tank designed to be detached from an engine or vehicle (for example, a boat) may also be used as a fuel container.

Refer to Part 4 for detailed guidance on retailer's duties.

11. Filling gas cylinders

Gas cylinders manufactured in Australia are marked in accordance with the provisions of AS 2030 to indicate that they have been physically tested. The test mark indicates that the cylinder has been tested to withstand its design pressure, and specifies the period for which the test is valid (commonly 10 years).

A gas cylinder manufactured overseas should be manufactured to a standard that is comparable to AS 2030. The cylinder should also be marked with a test mark and test date that provides the same level of information as that in AS 2030.

A cylinder with a current test mark can be filled, subject to other criteria. These include:

- Is the cylinder in good condition? Cylinders that are damaged or very corroded should not be filled.
- Is the cylinder compatible with the gas being filled? Cylinders are generally designed for specific types of gases and have fittings that are only suitable for those gases. They should only be filled with the gases for which they have been designed. Often the cylinder is distinctively marked to ensure that it is easy to identify as suitable for a particular gas. For example, oxygen cylinders and acetylene cylinders are painted different colours and are fitted with different valve assemblies. Are the valves and fittings in good working order, and any protective devices such as neck rings and shrouds in good condition?
- Are you using the right equipment?
- Cylinders should only be filled using equipment specifically designed for that purpose. Generally, the use of adaptors is discouraged unless it has been authorised by the original supplier of the gas or the manufacturer of the cylinder.

12. Preparing a Material Safety Data Sheet

12.1 What information do I have to include on a MSDS?

You are required to prepare an MSDS for all dangerous goods covered by the Regulations, other than C1 combustible liquids.

An MSDS is a document that describes the dangerous goods and provides vital information to help people use them safely.

MSDS must be written in English and include the following information:

- the date of preparation or, if the MSDS has been reviewed, the date it was last reviewed;
- the manufacturer's or first supplier's name and their Australian address and telephone number;
- telephone number for information in the event of an emergency;
- the product name of the dangerous goods, together with:
  - the proper shipping name, UN number, class, subsidiary risk and packing group;
  - its chemical and physical properties;
  - the names of the individual ingredients in the dangerous goods;
  - the proportion or proportion ranges of the ingredients identified with a chemical or generic name;
  - any relevant health hazard information, including first aid information;
  - information on the precautions for the safe use of the dangerous goods; and
- a statement that the goods are dangerous goods.

For dangerous goods that may be unstable except under controlled conditions of storage and/or chemical composition, the MSDS must provide details of those conditions and specify the recommended proportion and safe limits for each chemical making up the dangerous goods. For example, ethylene oxide gas depends on the addition of an inhibitor to ensure that it remains chemically stable and does not start to polymerise.

The MSDS should be clear and easily understood. Avoid technical jargon as much as possible and explain any technical terms that you have to used. Don't use vague phrases such as "may be dangerous" or "safe under most conditions of use".

There is no particular format required for an MSDS as long as you include the minimum information required under the Regulations. Formats based on the following are acceptable:

- the *National Code of Practice for the Preparation of Material Safety Data Sheets* (published by National Occupational Health and Safety Commission)[4];
- European Union and the International Labour Organisation formats, as described in the MSDS national code of practice;
- an MSDS that has been prepared under corresponding legislation in another Australian jurisdiction that has substantially the same data set requirements as these Regulations.

[4] At the time of publication, the *National Code of Practice for the Preparation of Material Safety Data Sheets* was being revised to apply to the production of MSDS as required under the *National Standard for the Storage and Handling of Dangerous Goods* (2000).

Note that the above formats may not cover all the items prescribed in the Regulations. If you base your MSDS on any of those formats, you must ensure that it includes all the prescribed items.

If you are using an MSDS prepared overseas, include the relevant Australian information, for example, supplier contact details and any relevant exposure standard.

12.2 **Reviewing and revising MSDS**

The MSDS should reflect the current state of knowledge about the dangerous goods. You are required to review an MSDS as often as necessary to ensure the information remains accurate and current. For example, the MSDS would need to be reviewed whenever there is a change in the formulation of a dangerous goods or when new information on the hazardous properties or the health effects of the dangerous goods or one of its ingredients becomes available.

In any event, you must ensure the MSDS is reviewed no later than five years after the last date of review. If a review reveals that the MSDS does not contain accurate or current information, it must be revised. After any review or revision, the MSDS must be reissued with the review date.

12.3 **Providing a current MSDS**

You must provide a copy of the current MSDS on or before the first occasion that dangerous goods are supplied for use. The MSDS must be provided to any person to whom the dangerous goods are supplied for use and, on request, to any occupier of any premises where those dangerous goods are stored and handled.

If you are a retailer, you don't have to provide an MSDS for:

- goods supplied in consumer packages;[5]
- fuel supplied to a vehicle; or
- Class 2 dangerous goods (gases) supplied in a container provided by the purchaser.

If you retail dangerous goods in consumer packages, you may choose to act by arrangement with your suppliers to distribute MSDS. This would be particularly useful for trade sale outlets.

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[5] A "consumer package" means a container of a net capacity that is readily available through retail outlets for household consumption or consumption by an occasional user. It is a package that a manufacturer or supplier has identified as suitable for use in all market sectors.

The inner packaging quantities cited in table 1.1 and 1.2 of the ADG Code would all fall within the commonly understood meaning of consumer package but do not restrict the application of the term.

Examples of consumer packages are:

- "pool chemicals' such as granulated chlorine (class 5.1) – widely available in packages having a net quantity of up to 10 kilograms;
- sodium hypochlorite solutions (class 8 PG II) – when marketed as a "pool chemical' the containers can have a capacity of up to 20 litres;
- ammonium nitrate fertilisers (class 9), which are widely available in a net quantity up to 25 kilograms.

There is no need to include an MSDS with every delivery. If the MSDS is reviewed, a copy must be provided when the dangerous goods are next supplied, and to any occupier on request. There is no requirement to send a copy of the revised MSDS to all previous purchasers of the dangerous goods.

12.4 **Provision of other information**

As a supplier, you must provide any other information that you have been provided regarding the safe use of the dangerous goods. Relevant information may include, but is not limited to, the following:

- summary reports produced under the Commonwealth **Industrial Chemicals (Notification and Assessment) Act 1989**; and
- where it is available, specific information relating to the conditions for safe use, compatibility and chemical stability under particular circumstances.

PART 3 DUTIES OF OCCUPIERS

13. Introduction

This Part is designed to assist occupiers[6] in meeting the requirements of the Regulations. If you are an occupier, you have duties to identify hazards and assess and control risks arising from the storage and handling of dangerous goods. You also have duties to consult with employees and health and safety representatives, and provide employees and other affected people on the premises with induction, information, training and supervision.

14. Consultation

You must consult with employees and their health and safety representative(s), and any other people you engage to carry out work at the premises who are likely to be affected by the dangerous goods, regarding:

- hazard identification, risk assessment, risk control;
- induction, information and training; and
- any proposed changes likely to affect their health or safety arising from the dangerous goods.

Consultation should take place as early as possible in planning the introduction of new or modified tasks or procedures associated with the storage and handling of dangerous goods to allow for changes arising from consultation to be incorporated. Consultative procedures should allow enough time for the health and safety representatives to discuss the issue with their designated work group employees and with you.

Techniques for organising consultation

Effective consultation depends on communication – that is, understanding the people being consulted and providing them with adequate information in a format appropriate to their needs, to enable them to have informed views. The process used for consultation should consider the needs of non-English speaking background health and safety representatives and employees. Guidance on techniques for consultation in multilingual workplaces is provided in the *Code of Practice for Provision of Occupational Health and Safety Information in Languages other than English.*

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[6] An occupier is defined in the **Dangerous Goods Act 1985**. An occupier, in relation to any premises (other than licensed premises that are a vehicle or boat), includes a person who—
(a) is the owner of the premises;
(b) exercises control at the premises under a mortgage, lease or franchise; or
(c) 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.

15. Material Safety Data Sheets

15.1 Obtaining an MSDS

The Regulations require you to obtain the current version of the MSDS from the manufacturer or first supplier on or before the first time the dangerous goods are supplied.

Generic MSDS are not acceptable.[7] You may use commercially available MSDS databases provided they contain the manufacturer's or first supplier's current MSDS. You need to ensure that the MSDS obtained from such a database is the authorised version prepared by the manufacturer or first supplier.

It is good practice to ask for a current copy of the MSDS before the dangerous goods are first supplied, as this will enable you to begin planning for its safe use. Manufacturers, first suppliers and suppliers have an obligation to provide you with a copy on request.

If an MSDS is not made available, you should ask the manufacturer, first supplier or supplier whether the goods have been determined to be dangerous goods according to the Regulations. If the supplier informs you that the goods are not dangerous goods, it is advisable to obtain written confirmation.

If you are not satisfied with the MSDS provided, raise your concerns with the manufacturer or first supplier. The same dangerous goods may also be available from a manufacturer or first supplier who does provide an adequate MSDS.

When is an MSDS not required?

If you are a retailer or retail warehouse operator, you are not required to obtain MSDS for dangerous goods stored and handled at the retail outlet in consumer packages that are intended for retail sale. An MSDS is also not required for any dangerous goods in transit on the premises.[8] However, for those dangerous goods for which an MSDS has not been obtained, you must have alternative relevant health and safety information readily accessible. This information will enable employees and emergency services authority personnel to deal with incidents such as spillages and damaged consumer packages.

Note that if the consumer package is opened or used at the retail outlet, an MSDS is required.

15.2 Providing access to MSDS

The MSDS must be readily accessible to all employees, other person on the premises and emergency services authority personnel.

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7 A generic MSDS is one that applies to a class of dangerous goods or a product but has not been prepared specifically for the manufacturer's product. Generic MSDS may be used as supplementary information or wherever the Regulations impose duties to have "other information" available.

8 "Dangerous goods in transit" means dangerous goods that –
(a) are supplied to premises in containers that are not opened at the premises;and
(b) are not used at the premises; and
(c) are kept at the premises for a period of not more than 5 consecutive days.

Copies of MSDS should be kept in a convenient location at the premises where the dangerous goods are stored and handled. Make sure that all relevant personnel on the premises know where to find the MSDS. You should also provide your employees with information or training on the purpose of MSDS and how to use them effectively. (See section 28 on information, instruction and training).

MSDS may be provided in a number of ways including:

- hard copy;
- microfiche; and
- computerised MSDS databases.

In each case, you should ensure that any storage or retrieval equipment is kept in good working order and all relevant people know how to access the information.

15.3 Ensuring that information in the MSDS is not altered

You must not alter information in an MSDS prepared by the manufacturer or first supplier. Additional information may be appended to the MSDS, but it must be marked clearly to indicate that it is not part of the original. Similarly, you may re-format or summarise the information contained in the MSDS, as long as it is appended to the original and clearly marked as a reformatted version.

16. Register of dangerous goods

You are required to keep a register for dangerous goods kept at the premises.

The register is simply a list of the product names of all dangerous goods stored and handled in the workplace accompanied, where required, by the current MSDS for each of these dangerous goods. If you are required to keep a register by the *Occupational Health and Safety (Hazardous Substances) Regulations 1999* you may combine that register with one required by the Storage and Handling Regulations.

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 register must be maintained to ensure it is current. Update the register when:

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

Since manufacturers or first suppliers are required to review, and where necessary, revise MSDS at least every 5 years, all MSDS in the register or otherwise accessible in the workplace should have issue dates within the last 5 years.

If the use of a dangerous good 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 to any employee at the premises and any other person who is likely to be affected by the dangerous goods on the premises. Keep it in a central location, or provide a copy of it to each work area.

Don't confuse a *register* with a *manifest*. A manifest provides information to the fire brigade in the event of an emergency while a register provides information to assist you in the management of dangerous goods in your workplace. However, some of the information will be duplicated in a register and manifest and you could combine them in one document.

17. Risk management

The Regulations require you to control risks associated with the storage and handling of dangerous goods at a premises. To do this effectively you must identify the hazards that contribute to the risks and assess the likelihood of those hazards causing injury or damage to property.

Hazard identification and risk assessment can be simple and straightforward or highly complex. For example, the storage of only one or two classes of dangerous goods at retail outlets where handling is limited to placing the goods on shelving for display is a relatively simple case and the hazard identification and risk assessments for the activity should be simple.

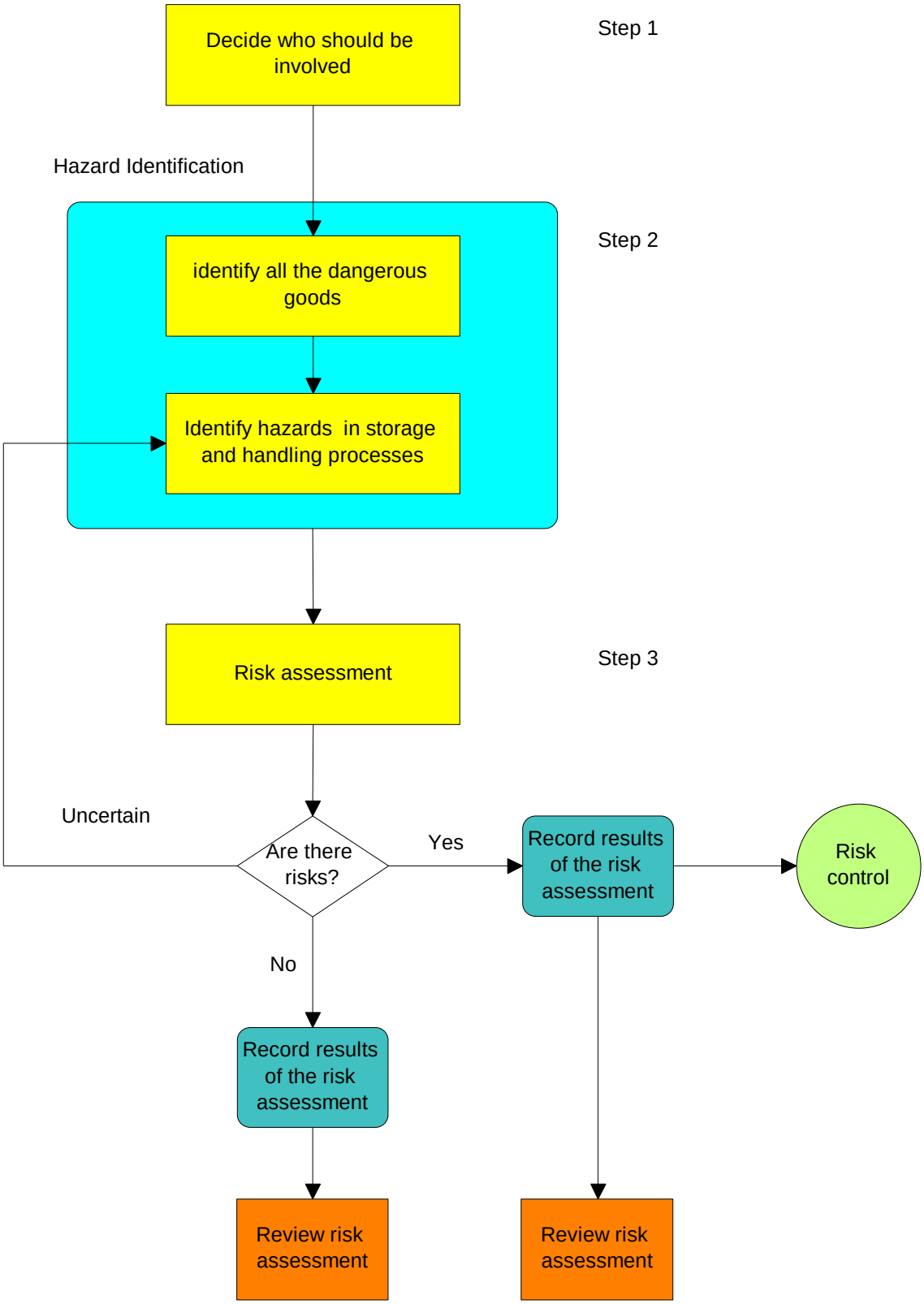
A major warehouse handling a large range of dangerous goods or a chemical manufacturing plant are likely to require detailed investigations of hazards and risks, involving people who have specialist knowledge of:

- the dangerous goods;
- the processing of those goods; and
- the work practices employed in connection with dangerous goods.

17.1 How do I carry out a hazard identification and risk assessment process?

The following step-by-step guide is intended to lead you through the hazard identification and risk assessment process. It can be used at any premises where dangerous goods are stored or handled. The flow diagram (Figure 3) provides a helpful summary of the process.

An Overview of the Hazard Identification and Risk Assessment Process



Consultation with employees and health and safety representatives should occur through out the hazard identification process

Figure 3: Flow diagram

Step 1 – Decide who should be involved

You have responsibility for carrying out the hazard identification and the risk assessment under Regulations 404 and 405.

You should ensure that any person carrying out the assessment is familiar with the requirements of the Regulations and has a practical understanding of the how the dangerous goods are stored and handled at the premises.[9]

A single person such as the works manager or works chemist may be suitably competent to perform simple assessments, while in more complex cases, several people representing a variety of skills will probably need to be involved in collecting and assessing the information. Consult your relevant employees and their health and safety representatives.

Step 2 – Hazard Identification

Identify all dangerous goods at the premises

Identify all dangerous goods stored and handled at the premises and any dangerous goods generated during any manufacturing process. All of these dangerous goods must be considered in the hazard identification and subsequent risk assessment process.

The following information should be assembled for each of the dangerous goods present:

- the name of the dangerous goods;
- the Class, Subsidiary Risk and Packing Group;
- if the dangerous goods are in packages, the sizes and numbers of packages of each size; and
- if the dangerous goods are in bulk, the identification numbers, capacity and average quantity of dangerous goods in each bulk container.

Obtain information about the dangerous goods

MSDS and markings on packages for all dangerous goods supplied to the workplace should be reviewed to obtain information on the chemical and physical properties, hazardous properties, precautions for use and safe handling requirements for the dangerous goods.

Sources of information

Sources of information include:

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[9] If you are considering contracting the services of external consultants, ensure that they have the expertise and experience to do the job competently. Guidance on the selection and effective use of dangerous goods and occupational health and safety consultants can be obtained from the Victorian WorkCover Authority publication *Selecting an Occupational Health and Safety Consultant – A Guide for Workplaces.* Professional associations, such as the Institution of Engineers Australia and the Royal Australian Chemical institute, may also be able to provide guidance on persons qualified to perform dangerous goods assessments.

- MSDS obtained from manufacturers and suppliers;
- package markings;
- class information (information about the Class of the dangerous goods indicates a key hazard of the dangerous goods but in itself is generally not sufficient because there are significant differences in the chemical and physical properties of individual products within the class);[10]
- package labels (information on the package itself will generally be insufficient to cover anything more than the most basic use of the product).[11]

Other helpful sources of information include:

- National Industrial Chemical Notification and Assessment Scheme (NICNAS) Summary Reports. NICNAS Summary Reports have been produced for every dangerous goods notified and assessed under the Commonwealth **Industrial Chemical (Notification and Assessment) Act 1989**;
- Sources listed in Appendix 1 of the *National Code of Practice for the Preparation of Material Safety Data Sheets*;
- the Victorian WorkCover Authority (WorkCover);
- NOHSC (formerly known as Worksafe Australia);
- trade unions and employer associations;
- industry associations; and
- occupational health and safety consultants.

Consider external sources of information on dangerous occurrences, such as:

- manufacturers or suppliers of the dangerous goods or equipment;
- fire services; and
- published literature.

You may wish to include a requirement in all supply contracts that your suppliers identify all known hazards associated with the containers and accessories used to store the dangerous goods, any spill containment used, plant and the fire protection system.

Review information about dangerous goods

To identify hazards effectively, you must look at how the dangerous goods are stored and handled. Therefore, when reviewing the information about dangerous goods, you should consider the following factors:

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[10] The ADG Code has information about the relative hazards of Classes, and Subsidiary Risks and the characteristics of Packing Groups.

[11] Package labels provide some information about the hazards associated with dangerous goods. Some products – for example, dangerous goods in consumer packages - may have sufficient information on the consumer package label to cover most likely situations of handling, such as the clean up and proper disposal of spills.

(a) The **inherent hazards** of the dangerous goods, for example:

- fire;
- explosion;
- toxic effects
  - inhalation;
  - ingestion (swallowing contaminated food or eating or smoking with contaminated hands);
  - absorption through the skin or eyes; or
  - corrosive action.

(b) The **form** (including concentration) in which the dangerous goods may be present, such as solid, liquid or gas; supplied as packaged dangerous goods or in bulk. For example, some goods may be virtually harmless in some forms (such as a block of metal) but may become very hazardous dangerous goods in another form (such as a fine dust that can be readily ignited or may be highly reactive).

(c) The **chemical and physical properties**. For example, gases or liquids with low boiling points or high vapour pressures can give rise to high airborne concentrations in most circumstances, whereas high boiling point liquids such as oils are only likely to create an explosive airborne concentration if they are heated or sprayed. Dangerous goods with a very low or high pH (ie. acids and caustics respectively) are corrosive to the skin and eyes and corrosive to metals. Some dangerous goods are chemically unstable or highly reactive (for example, many organic peroxides) and may self-react or react with other materials to cause a fire or explosion. This information may include:

- physical state – solid / liquid / gas;
  - if solid – what potential for dust cloud explosion?
  - if liquid – mobile / viscous / volatile / miscible?
  - if gas – lighter / heavier than air?
- flashpoint, firepoint and explosive limits;
- viscosity;
- density;
- particle size;
- vapour pressure;
- solubility and pH;
- reactivity;
- boiling and/or freezing point or range;
- electrical and/or heat conductivity; and
- the nature and concentration of combustion products.

(d) The **types of incidents**. For example, a Class 3 (flammable) dangerous goods may have a very low flashpoint of – 5°C (that is, they are highly volatile) and under most ambient conditions would able to ignite (within its explosive limits) when exposed to the atmosphere. A high flashpoint product with a flashpoint of 56°C cannot be ignited easily at ambient temperatures. The volatility of the dangerous goods will also affect the likely intensity of any fire. Other characteristics like the mobility of a liquid (ie whether it is thick like honey or thin like water) will determine how far a spill would spread and in turn affect the spread of a fire.

How factors can vary for different dangerous goods – petrol and caustic soda

Petrol and sodium hydroxide (caustic soda) are both dangerous goods, yet each has very different properties that make them dangerous.

Petrol is dangerous principally because it is flammable, so the identification of hazards and the assessment of risk should be based on the potential for fire and explosion. Petrol has other properties that may result in risk. It can act as a solvent and dissolve other hydrocarbons like greases, and can dissolve or weaken certain types of plastics. The assessment of risk should include whether there is potential to affect the operation of any plant or weaken plastic structures through contact with petrol.

In contrast, even brief exposures to high concentrations of sodium hydroxide may lead to immediate effects which include irritation or burning of the skin, eyes and respiratory tract. Sodium hydroxide is also corrosive to metals and may react with other substances, particularly dangerous goods that are acidic. Evaluation of risks for sodium hydroxide must therefore consider the potential for risk through a range of different pathways.

How are the dangerous goods stored and handled?

Once you have identified the dangerous goods on your premises and reviewed the available information you need to consider if the way the goods are stored and handled creates a hazard. You must identify any hazards arising from:

Manufacturing and transport processes

- Are there any hazardous chemical and physical effects that may arise during the manufacturing or transport process?
- Are procedures and operating parameters being adhered to?

An example of the need to determine and adhere to safe operating parameters is where a liquefied gas is being pumped. A reduction in pressure on the suction side of the pump may result in the gas partially vaporising before it enters the pump and causing a vapour lock within the pump. As a result, the pump stops pumping liquid and instead recirculates a pocket of vapour that may cause the pump to overheat and fail catastrophically unless safety controls have been specifically provided to detect such a condition and shut the pump down before a failure occurs.

Structures, plant and system of work

Hazard identification for structures, equipment, systems of work and activities used in the storage and handling of dangerous goods primarily involves the identification of all:

- physical components or characteristics which have the potential to cause harm;
- systems of work, including normal operating procedures and unusual operating conditions, which could give rise to harm or damage;
- the possibility of operator error; and
- activities which may pose a threat to the dangerous goods.

It is important to observe and consult with employees to find out how the job is actually done. People do not always work ‘by the book’, and may devise their own methods of work. Also, find out what happens during cleaning, maintenance and breakdowns, and during staff absences or shortages. Where you identify a difference between the way the system of work is set out and the way it is implemented you should examine the reasons for the difference.

Structures, plant, system of work and activities not used in the storage and handling of dangerous goods

Some activities, systems of work, structures and equipment that are not directly involved with the storage and handling of dangerous goods may constitute a hazard to the storage and handling of the dangerous goods. An example of an external fire hazard could be the development of a timber yard adjacent to the premises. Depending on the proximity of the timber yard and stacks of timber to where the dangerous goods are stored and handled, a fire at the timber yard could result in the dangerous goods becoming involved.

Consider the following hazard sources:

- Are there any dangerous goods stored near your premises?
- Do any of these activities on the premises occur?
  - operation of plant;
  - movement of vehicles;
  - deliveries of dangerous goods;
  - personnel movements in normal and emergency situations;
  - visitor access;
- Are there any fire hazards, including concentrations of combustible material (for example, a timber store or a store of C2 combustible liquids[12]) or uncontrolled vegetation on or off the premises?
- Are there any activities and installations on neighbouring premises that could create a hazard?
- What is the effect of a main road, railway line, airport, gas pipeline, water main, high voltage power lines and radio transmitters including mobile phone repeater towers?
- Could nearby facilities such as schools, hospitals, child and aged care facilities, theatres, shopping centres and residences be affected?

Chemical and physical reaction between dangerous goods and other substances and articles

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

Consider:

- Is there a hazard as a result of a physical reaction from incompatible substances coming into contact, for example, explosion or heat rapidly generated from acid mixing with water?
- Is there a hazard as a result of a chemical reaction from different substances coming into contact, for example, an oxidising agent such as pool chlorine mixing with a hydrocarbon such as oil or brake fluid?

A list of the chemical and physical properties to be considered when identifying hazards associated with the storage and handling of dangerous goods is at Appendix 5.

[12] A definition of C2 Combustible liquids is in AS 1940

Physical reaction

An example of a hazard arising from dilution is the mixing of acid and water. The addition of a small amount of a concentrated acid to a large quantity of water may result in some heat being generated through the dilution of the acid in the water but no hazard since the heat generated during dilution is quickly dissipated in the water. On the other hand, 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. The hazard is the potential for hot acid to be splashed around.

Chemical reaction

The combination of an oxidising agent (pool chlorine) and a hydrocarbon (oil, brake fluid) can result in a very intense fire that is difficult to extinguish. Not all chemical reactions will be hazardous – for example, the combination of a weak acid and a weak alkali will result in a neutralisation reaction that is relatively non-hazardous. However, 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.

Type and characteristics of incidents

Incident information contributes to the state of knowledge of the dangerous goods and their storage and handling. Consider:

- What types of incidents have occurred when storing or handling dangerous goods at your premises?
- What is known about how these incidents were caused?
- What information is available about the effectiveness of risk controls and about how risk controls can be improved?
- Have you taken into account incidents that have occurred at your premises and other facilities storing and handling similar types of dangerous goods?

Step 3 – Risk assessment

The final step in the risk management process is to assess the risks associated with the hazards. Risk assessment determines whether there is a risk of injury to people or damage to property from the storage and handling of dangerous goods at the premises. The purpose of the risk assessment is to:

- determine those risks that need to be controlled; and
- assist you to make decisions about the order in which risks should be controlled.

When carrying out a risk assessment, the Regulations require you to take account of the information and knowledge gained about the dangerous goods and the matters that affect safety in relation to the storage and handling of those goods.

Make sure that health and safety representatives are consulted at all stages of the risk assessment process.

There are a number of methods for carrying out a risk assessment. At premises where complex dangerous goods processes are involved, for example, chemical manufacturing processes, it may be more effective to use a more highly structured process such a Hazard and Operability Studies (HAZOP) or Hazard Analysis (HAZAN) to guide the hazard identification and risk assessment process. In some situations it may be necessary to

undertake quantitative risk analysis (QRA) to assist in the understanding of the extent of the risks involved. More information about risk assessment is available in AS/NZS 4360.

What are the consequences of an incident?

In assessing the consequences of an incident, consider the potential:

- injuries and illness to people and property damage at the premises;
- for 'knock on effects' involving other dangerous goods at the premises;
- for injuries and illness to people and property damage outside the premises.

Assessing consequence: escape of volatile flammable liquid

A flash fire hazard has been identified with an escape of a large amount of volatile flammable liquid into the spillage catchment area of a large bulk storage tank. Calculations show that a vapour cloud from the spill may travel over a hundred metres from the catchment area before the concentration is reduced below the point at which the vapour can be ignited (the lower flammable limit). The consequence of the ignition of the large vapour cloud is that anyone inside the flammable portion of the cloud will be severely injured and it is likely that any flammable material or construction will be ignited.

If the flammable portion of the vapour cloud could travel beyond the property boundary, the potential injury and property damage outside needs to be determined.

If there is a labour-intensive manufacturing business within the potential envelope of the flammable vapour from the spill, many people may be injured or even killed.

What is the likelihood that the hazard will result in an incident?

The next step is to estimate the likelihood that the hazard may cause an incident.

Look at historical records and review incident information from the premises and from similar types of industries. People who work at the premises are a very useful source of information. If the particular storage and handling operation is complex or is very high risk, a Quantified Risk Assessment (QRA) may be needed.

Estimating likelihood: example

An explosion hazard has been identified in relation to the welding of drums that once contained flammable and combustible liquid. The consequences of an explosion involving the tank are severe because it is likely to cause the death of the person doing the welding.

The person carrying out the risk assessment talks to management and supervisors to find out how often drums are welded. The health and safety representative and workers are also consulted about the hazard. The combined history of those involved shows that welding of drums has happened very infrequently and no one knows whether the drums contained flammable or combustible material.

The risk assessment concludes that the welding operation is likely to cause an incident. It has happened and is likely to happen again if steps are not taken.

17.2 Generic risk assessment

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 are permitted to make a single assessment of one representative situation and apply it to the other areas or premises. By performing generic assessments, you can minimise the duplication of assessments, thereby streamlining the risk assessment process. As with risk assessments generally, you must consult with employees and health and safety representatives and any other people you have engaged at the premises, when carrying out generic risk assessments.

You are responsible for ensuring that the generic assessment is valid for each of the premises or areas to which it is intended to apply. A generic assessment is valid if both the dangerous goods and their storage and handling are essentially similar. For example, a factory repackages Class 3 dangerous goods and has four separate packaging lines that are the same and are able to repackage the same range of products. The hazard identification and subsequent risk assessment needs only to be done on one of the packaging lines and applied to the other three. Similarly, if a generic assessment is undertaken by a trade association as a model to be used by a number of different occupiers with essentially identical premises – for example, service stations and retailers – the individual occupier is responsible for ensuring that the assessment is valid for his or her own workplace. An example of an Australian Standard that can be used in this generic way is AS 1596 –*Storage and handling of LP Gas.*

This Code refers to a range of Australian Standards and specific industry publications. In many instances the risk controls identified in those documents have been formulated following analysis of particular hazards and their risks. You may rely on the generic assessments when the control measures stated in the documents are implemented and directly applicable to the storage and handling situation to which they are applied. In those circumstances you should identify the hazards being controlled and refer to the Standard being relied on for the generic assessment.

If the situations are not similar and employees in different premises or areas of the same premises may be subjected to different risks, a generic risk assessment cannot be performed or may need to be supplemented to address those different risks.

17.3 Recording the outcomes of risk assessments

Outcomes of risk assessments must always be documented. Risk assessment records should include:

- name(s) of the assessor(s);
- date of the assessment;
- the premises/area/process;
- the dangerous goods for which the MSDS or equivalent information has been reviewed;
- the controls in place to prevent a risk;
- the nature of risk identified; and
- why decisions about the risk were made.

The record of the result of the assessment must be accessible to any person engaged to work at the premises who could be exposed to a risk, and their health and safety representatives.

An extensive record of the assessment is not required if you have identified that the storage and handling of the dangerous goods does not result in a risk that needs to be controlled.

A record of the risk assessment should be of assistance when undertaking any subsequent risk assessments that may be necessary because of changes to the dangerous goods used, systems of work, plant, structures or other circumstances that could result in change to the risk profile of the premises.

17.4 **Reviewing and revising risk assessments**

A risk assessment may no longer adequately assesses the risk associated with the storage and handling of particular dangerous goods. In this case, the risk assessment must be reviewed and, if necessary, revised. The assessment needs to be revised if:

- a new dangerous goods is introduced into the premises;
- the process or plant is modified;
- new information on the hazards of the dangerous goods becomes available;
- monitoring indicates inadequate risk control;
- incidents or near misses have occurred which may be due to inadequate control; or
- new or improved control measures become available or practicable.

Where it is known that circumstances will change, you may be able to prepare a risk assessment that takes the projected or known changes into account. In this way, you can ensure that the assessment will continue to deal with the risk adequately after the changes take place.

In any case, a risk assessment must be reviewed at intervals not exceeding five years. If the assessment remains correct (that is, it adequately assesses the risk), simply record the date of review.

18. Risk control

18.1 **What is risk control?**

Risk control is the process of determining and implementing appropriate measures to control the risks associated with the storage and handling of dangerous goods.

When planning and implementing risk control measures you must consult with your employees and any other people you engage to carry out work at your premises that are likely to be affected by the dangerous goods.

18.2 **What does ‘practicable’ mean?**

“Practicable” does not just mean the cost in dollar terms. To determine what is practicable, you, as a duty holder, must take into account:

(a) **severity of the hazard or risk in question**

How likely is it that the storage and handling of the dangerous goods will result in injury to people or the likelihood of damage occurring to property? How serious are the injuries and property damage likely to be and how many people could be affected?

(b) **state of knowledge about that hazard or risk and any ways of removing or mitigating that hazard or risk**

What is known about the hazards or risks associated with the storage and handling of the dangerous goods, and the ways to control the risk? What do manufacturers and suppliers of dangerous goods know about the hazards and risks? What do workplaces dealing with similar dangerous goods do to control the risk? What information can industry professionals and organisation, unions and government agencies provide?

(c) **availability and suitability of ways to remove or mitigate that hazard or risk**

Are the risk controls that you have identified readily available? Are they suitable for the premises and the employees involved?

(d) **cost of removing or mitigating that hazard or risk**

Are the costs of implementing the risk control commensurate with the benefits gained? Time and money invested in selecting and implementing risk controls should result in the elimination or significant reduction in risks from using dangerous goods.

18.3 The duty to control risk

You have a duty to ensure that any risk associated with the storage and handling of dangerous goods at your premises is controlled. The primary duty is to eliminate the risk. If this is not practicable, the risk must be reduced so far as is practicable.

The Regulations also place some specific duties on you to control risks associated with particular aspects of storage and handling of dangerous goods. Giving effect to these specific duties does not displace your general obligation to control risk. Figure 4 summarises the duties of occupiers to control risks.

The Australian Standards and other documents that are listed in Appendix 3 provide specific guidance on risk controls that can be applied to address specific hazards associated with the storage and handling of dangerous goods. The duty to control risks can be met for many identified risks by applying the risk controls that are specified in those documents. The use of the risk controls is subject to the conditions of storage and handling at the premises being the same or sufficiently similar that the specific and generic controls in the documents are applicable to those situations. In many instances the documents will provide specific risk controls that are able to address many of the risk control duties in the Regulations.

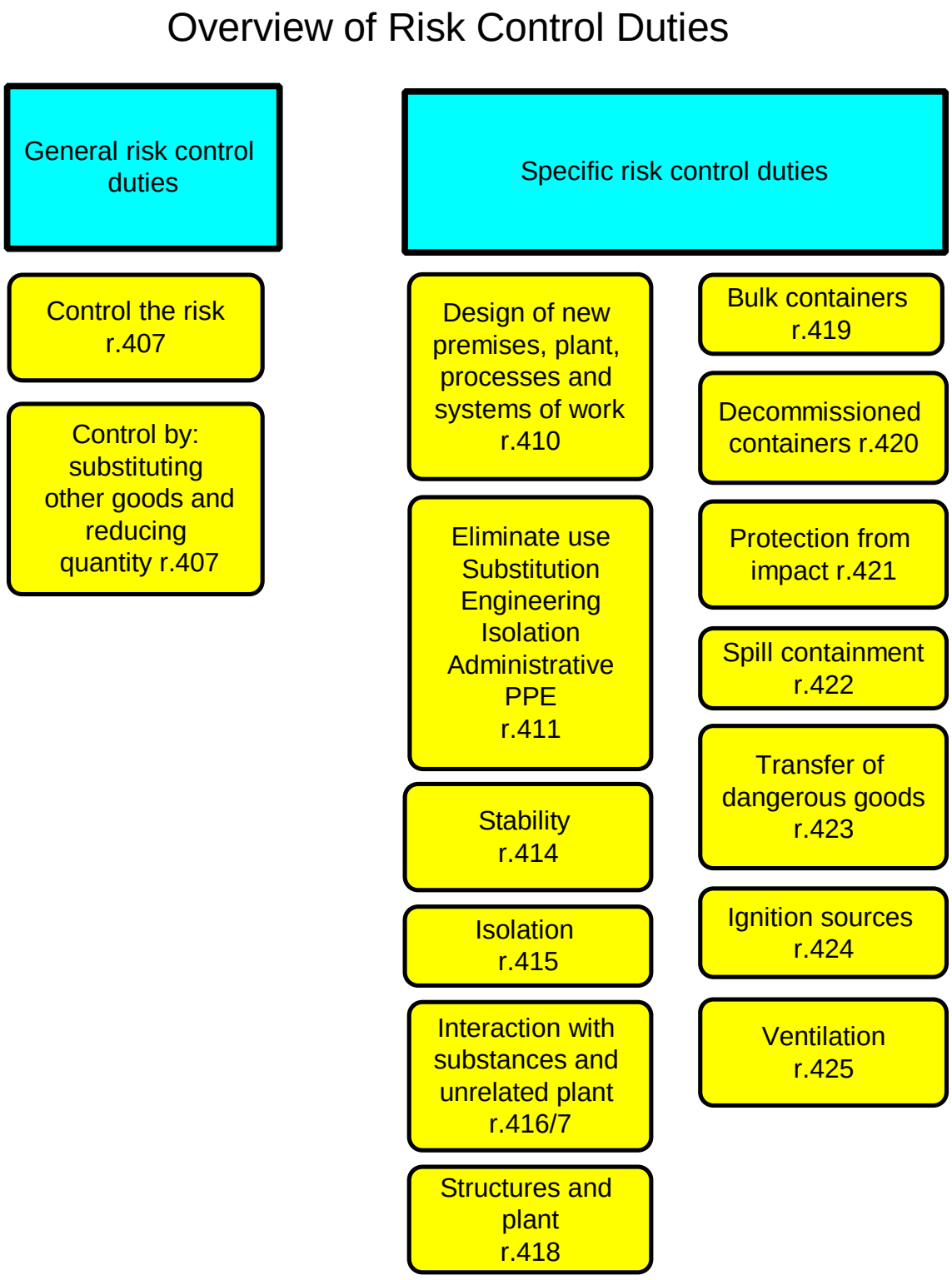

Figure 4: Summary of occupiers duties to control risks in regulations 407-425

18.4 **Designing out risk**

You must not use premises for the storage and handling of dangerous goods unless the premises, plant, processes, systems of work and activities have been designed to eliminate risks associated with storage and handling of dangerous goods, or, if this is not practicable, reduce the risk so far as is practicable.

Design of the premises

Good design is the most effective tool you have to reduce risk. It means:

- reduced establishment costs;
- avoiding high operational costs caused by poorly set-out premises; and
- avoiding complex systems of work to cope with the constraints of poorly set-out premises.

An effective design process means that problems can be anticipated and solved before they become real "bricks and mortar" problems.

Take account of any external factors in the layout of the premises, such as whether the location and type of fire protection system meets with operational requirements of the emergency services authority. If your premises has quantities of dangerous goods that exceed the fire protection threshold and you intend to establish a fire protection system, you must request the written advice of the emergency services authority in regard to the design of the fire protection system, and have regard to that advice.

Designing a process with low risk

You must design out risk associated with a chemical or physical process by adopting the most appropriate work method or system 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.

You must identify the hazards and assess risks associated with each of the work processes being considered. Select the process that eliminates the risk. If it is not practicable to do so, adopt the process that most effectively reduces the risk.

Once a process has been selected, you must identify, assess and control any hazards that may be associated with the use of dangerous goods in that process.

18.5 **Categorisation of risk control measures**

Regulations 407 and 410 combine to create, in effect, a three-step hierarchy. This is:

1. Elimination;
2. Control by substitution, engineering controls or isolation; and
3. Administrative controls or personal protective equipment

You must not rely solely on administrative controls or personal protective equipment unless it is not practicable to control the risk by measures higher in the hierarchy.

(a) Elimination

The most effective method of risk reduction is the elimination of risks at the source. This includes eliminating either the dangerous goods or the activity 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 the elimination of 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;
- hot melt or water-based instead of solvent-based adhesives; and
- producing chlorine in-situ by electrolysis rather than having to store or handle other dangerous goods which contain chlorine or one of its compounds.

Examples of eliminating an activity which gives rise to risk include:

- replacing a forklift (possible ignition and mechanical damage to the packages) to move flammable packaged 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 does not depend on the skill and care of an operator.
- replacing the manual filling of a large open vat mixing and reacting flammable and toxic dangerous goods (principal risks being fire, explosion, toxic release or spillage) with an enclosed continuous process utilising "in the pipe" mixing and reaction (principal risk spillage). In this case the activity of hand filling is eliminated but the process (chemical) is not altered.
- wet mixing of a friction-sensitive dangerous goods powder instead of a hazardous dry mixing process.

(b) Substitution

You must consider substituting the dangerous goods with other goods that have a lower risk associated with their storage and handling, and reducing the quantity of dangerous goods stored and handled. When considering whether to substitute dangerous goods with another substance, you should ensure that the replacement substance does not create a different type of risk. You also need to consider all the risks arising from the storage and handling of the replacement substance to determine whether substitution is practicable.

Examples of substitution include:

- degreasing with a detergent instead of a chlorinated or volatile solvent;
- a combustible liquid such as diesel instead of petrol and kerosene which are Class 3 flammable liquids;

- a dangerous goods with a higher Packing Group number, for example, substituting xylene (PGIII) for toluene (PGII);
- a less dangerous propellant in an aerosol, such as carbon dioxide Class 2.2 instead of un-odorised LPG of Class 2.1;
- dangerous goods without Subsidiary Risk; and
- using dangerous goods in a less dangerous form, such as a paste, pellets or a solution, instead of a powder.

(c) Reducing quantities stored and handled

You must consider reducing the quantity of dangerous goods stored and handled. The principle of reducing quantities of dangerous goods that are kept in storage is generally sound but there a number of circumstances where the 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. In some circumstances, the risk assessment process may result in a risk control that determines a minimum quantity of dangerous goods that must be maintained at the premises. For example, it may be necessary to ensure that stock levels of a dangerous goods used as a stabiliser do not fall below a critical level.

Ways to reduce quantity levels include:

- careful attention to inventory levels through effective stock control, such as the use of just-in-time ordering and supply arrangements;
- prompt disposal 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; and
- using just-in-time in manufacturing areas (ie. only handling those dangerous goods that are necessary for a production shift rather than stock piling the supply for several shifts in the manufacturing area).

Care is necessary, however, to achieve the optimum inventory level. The optimum level that may have been determined through cost control may not be the same as the optimum level that should be achieved to reduce risk. For example the additional vehicle movements and the increased handling associated with more frequent deliveries can create further risk.

(d) Engineering controls

Engineering controls are controls which use engineering measures to change the physical characteristics of structures, plant, equipment and processes to reduce the risk associated with the storage and handling of dangerous goods. They achieve this in a number of ways, by:

- minimising the generation of dangerous goods;
- containing or suppressing dangerous goods, including their vapours and dusts;
- eliminating, confining or controlling hazardous processes, plant or equipment that may pose a risk to the dangerous goods;

- protecting dangerous goods and installations from external hazards and/or environmental factors such as rain or sunshine; or
- limiting the area of contamination in the event of spills or leaks.

Engineering controls that should be considered include:

- totally or partially enclosing the dangerous goods or external hazard;
- providing adequate spill control to deal with the largest foreseeable spill (refer to section 19.6);
- specifying and installing appropriately rated electrical circuitry, fittings and equipment to minimise ignition hazard (refer to section 19.8);
- providing adequate ventilation, including local exhaust ventilation, to eliminate flammable or harmful atmospheres (refer to section 19.9);
- sparging or blanketing exposed liquid surfaces by an inert atmosphere to reduce evaporation and prevent explosive atmosphere formation;
- automating processes to eliminate human exposure and error;
- fitting sensors and controls for liquid levels, pressure and/or temperature, to minimise loss and formation of hazardous atmospheres, and eliminate overflow and uncontrolled reactions;
- fitting safety critical control devices, alarms and critical condition shut-down devices;
- installing lighting which provides ample illumination for the tasks to be performed (refer to section 19.10);
- installing fire detection systems and fire control systems (refer to section 23); and
- incorporating suitable protective devices to protect installations from external hazards, such as crash barriers to protect from moving vehicles.

Appendix 7 provides further guidance on engineering controls for storage and handling sites.

(e) Isolation

Regulation 415 requires that you ensure the risk to people, property and other dangerous goods at or beyond the boundaries of your premises is controlled by isolation.

Isolation is the separation of dangerous goods from people and other property, including other dangerous goods. Physical separation is the principal method by which such risks are controlled. Separation fulfils a dual purpose: protecting the other occupancies from the dangerous goods; and protecting the dangerous goods from the other occupancies. Many Australian Standards refer to “protected works” and define the expression it terms of different types of occupancies, buildings or structures. All the various definitions for “protected works” fall within the scope of property and do not limit it.

Distance, the use of effective barriers (such as fire rated walls or vapour barriers) or a combination of both may achieve separation. The types of barriers used will be dependent on the nature of the risks to be isolated.

Examples of isolation include:

- distancing the dangerous goods from people and other property;
- enclosing a hazardous activity, such as decanting in a fume cupboard where emissions can

be controlled by the use of scrubbers; and
- installing a vapour barrier with an appropriate fire resistance level (FRL)[13] to provide additional isolation.

Determining separation distances

Factors to consider include:

- the types of hazards exhibited by the dangerous goods and the risks they pose to the other occupancy;
- the quantity of dangerous goods stored and handled in the work area;
- the type of installation and processes applied to the dangerous goods in the work area and their associated hazards and risks;
- all other activities in the work area, which may increase the risk; and
- any control measures in place that will reduce the risk.

Minimum separation distances

For most classes of dangerous goods, minimum separation distances are specified in the class specific Australian Standards listed in Appendix 3.

For example, AS 1940 includes a number of separate tables for bulk storages and package stores of flammable and combustible liquids from boundaries, on-site facilities and specific facilities such as schools, hospita ships and other workplaces. Distances vary depending on quantities, Packing Group (or C1 classification), whether packages are opened or closed and, in one instance, tank diameter.

It should be noted, however, that AS 1940 has direct application only to storage and usage situations. It does not apply to plant in which flammable or combustible liquids are processed, even though these often give rise to increased risk. Similar limitations apply to most other Standards listed.

To determine if barriers – used in lieu of, or in conjunction with distances to achieve separation – are effective with the particular dangerous goods, consider:

- the types of hazards exhibited by the dangerous goods and the risks they pose to the barrier;
- the extent of vapour barrier required and its effectiveness in varied climatic conditions;
- appropriate levels of fire resistance (FRL) to be provided, depending on the potential heat load from internal or external incidents; and
- structural strength necessary to withstand weather and any overpressure resulting from internal or external incidents.

Most class specific Australian Standards listed in Appendix 3 provide for separation distances to be measured around suitable barriers. They are referred to as vapour barriers, screen walls and fire walls.[14]

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[13] Fire resistance level (FRL) gives a measure of the protection offered by a wall or structure when exposed to fire, in terms of structural adequacy, integrity and insulation. The FRL rating system is defined in AS 1530.4. Further information about screen walls and vapour barriers may be found in AS 1940 and the Building Code of Australia.

[14] Further advice on the use of screen walls can be found in Australian/New Zealand Standard AS/NZS 3833 *The Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Intermediate Bulk Containers*. Australian Standard AS 1940 *The Storage and Handling of Flammable and*

Segregation of dangerous goods within a storage area

When held in the same storage area, dangerous goods should be segregated from other dangerous goods or substances with which they are not compatible. Incompatible dangerous goods – for example, Class 5.1 oxidising agents and flammable materials – should be stored in separate buildings that are separated by sufficient distance so that an incident in one will not involve the other.

Useful guidelines for segregation of incompatible dangerous goods is provided in Australian/New Zealand Standard AS/NZS 3833 *The storage and handling of mixed classes of dangerous goods in packages and intermediate bulk containers*.

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.

(f) Administrative controls

Administrative controls are systems of work or safe work practices that help to reduce risks associated with the storage and handling of dangerous goods.

Examples of administrative controls include:

- safe work procedures that describe the correct methods for performing all activities associated with the storing and handling of dangerous goods, for example:
  - procedures for waste disposal and effective decontamination;
  - procedures to ensure that work involving inspection, maintenance, repair, testing and cleaning is carried out without risk;
- reducing the number of personnel in the dangerous goods work area (for example, the use of internal work permits to restrict non-essential access);
- rotation of employees (with the appropriate skills) to limit the period of exposure for individual employees;
- good housekeeping, including regular cleaning of work areas;
- prohibiting:
  - eating, drinking, smoking and the carriage of matches and lighters in potentially contaminated areas;
  - the use of heat in a hazardous zone.

(g) Personal protective equipment

Personal protective equipment (PPE) includes full-length overalls, aprons, abrasion or chemical-resistant gloves, dust masks, respirators or breathing apparatus, safety footwear or chemical-resistant boots, goggles or face shields, hard hats, hearing protection and fully encapsulated suits.

The use of PPE in conjunction with other control measures may provide additional risk control. However, PPE relies heavily on users following instructions and procedures correctly. As a result, you may need to provide a greater level of supervision than is required

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Combustible Liquids uses the term fire wall for this purpose.

for other risk controls.

PPE may be necessary:

- where it is not practicable to achieve adequate control by other means;
- to safeguard safety and health until such time as adequate control is achieved by other means, for example, where urgent action is required because of plant failure;
- during some infrequent maintenance operations where the short duration may make other control measures impracticable;
- in an otherwise safe working environment, where protection may be required from acute hazards in the event of sudden plant failure or other unexpected incident.

Selecting and maintaining PPE

MSDS will normally contain recommendations on the selection and use of personal protective equipment for the particular dangerous goods. This advice should be followed unless the risk assessment process determines that other PPE would be more appropriate.

When choosing the most appropriate PPE, ensure that:

- it provides the required level of protection from the risks associated with the particular task;
- it is suitable for the individual's size and build; and
- you consider the wearer's need for mobility, dexterity, clear vision and communication.

You should ensure that people wearing PPE have been trained to fit and use it properly. Make sure that the equipment is cleaned and maintained by appropriately trained staff in accordance with relevant technical standards.[15]

18.6 Maintaining and reviewing risk controls

Once control measures are in place, you should check that they have been implemented correctly and monitor their effectiveness. Control measures should be regularly reviewed.

Maintenance of control measures should include:

- frequent inspections;
- visual checks to ensure that controls are being properly applied;
- testing and preventive maintenance of engineering controls and PPE.

[15] Further guidance on the selection, use and maintenance of personal protective equipment maybe found in the relevant referenced documents in Appendix 3.

19. Specific risk control duties

19.1 Stability of dangerous goods

Many dangerous goods are highly reactive, unstable or self-reactive except under controlled conditions. The Regulations require that those controlled conditions be maintained.

Information about the required levels of stabilisers and/or control temperatures should be provided by the supplier and included in the MSDS.

Where the stability of the dangerous goods is dependent on regular dosing with a stabiliser you should ensure that 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.

19.2 Controlling risk associated with plant used at the premises

Plant used in the storage and handling of dangerous goods must be manufactured, installed, commissioned, operated, maintained and repaired so as to control the risk associated with the storage and handling of dangerous goods.[16]

Plant used to store and handle dangerous goods includes storage tanks, pipework, process vessels, mixing vats, driers and filters.

To comply with this requirement, plant should be:

- manufactured to a high standard within the design specification, from quality, durable materials which will not be adversely affected by the planned storage and handling of the dangerous goods;
- installed only after all hazards associated with the installation have been identified, and the risks assessed and controlled;
- commissioned only after it has undergone thorough testing and agreed procedures developed to ensure it 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 and breakdown; and
- maintained, repaired and, when the need arises, decommissioned in a manner which does not introduce additional risks.

Maintenance or repair of plant may involve the use of 'hot work' processes that generate heat or introduces 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

[16] The guidance in this section complements the specific duties and guidance that applies to plant covered by the *Occupational Health and Safety (Plant) Regulations 1995* and the approved Code of Practice for Plant.

recommended. Some Australian Standards, such as AS 1940, provide detailed guidance on 'hot work' in areas where dangerous goods are stored and handled.

You must ensure that any pipework containing dangerous goods is marked so that the dangerous goods are clearly identifiable, so far as is practicable. Suitable systems for identification may be found in AS 1345*Rules for the Identification of Piping, Conduits and Ducts* and Australian Institute of Petroleum's CP5 *Code of Practice for Pipeline and Underground Tank Identification.*

Suitability of storage tanks

A storage tank constructed to AS 1692 *Tanks for flammable and combustible liquids* may be used to store other classes of dangerous goods liquids like corrosive liquids and toxic liquids subject to a number of factors including materials of construction and specific gravity. A tank designed and constructed for the storage of a Class 3 flammable liquid like petrol may be suitable for diesel (C1 combustible liquid) or hydrochloric ac (Class 8 dangerous goods). Any decision regarding the suitability of a tank must take into account the chemical and physical characteristics of the dangerous goods, as well as structural considerations.

Plant and processes that are not used to store or handle dangerous goods, but have the potential to interact with them, must not increase the risk associated with the storage and handling of dangerous goods. Identify any hazards arising from such plant and processes. If your risk assessment indicates there is a risk, control that risk using the methods outlined in this section or by isolating the dangerous goods from the plant and processes.

19.3 Bulk containers for dangerous goods

A container and its pipework used for bulk storage needs to be:

- structurally sound and be capable of withstanding the stresses from the product being stored;
- provided with stable foundations;
- resistant to corrosion over the service life of the container.

The bulk container must be inspected at sufficiently regular intervals to ensure that it remains structurally sound. The results of the inspection must be recorded and retained for as long as the container remains in service.

Specific design requirements for different types of bulk tanks and attachments including pipework are included in several of the referenced documents in Appendix 3.

Underground tanks

Underground tanks pose risks and threats to people, property and the environment from:

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

Dangerous goods can migrate through the water table 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, and a range of electronic measures. Effective prevention is achieved by frequent monitoring. Protecting underground tanks from corrosion often requires the assistance of specialists.

Guidance on underground tank installations for petroleum products can be found in Australian Institute of Petroleum CP4 *Code of Practice for Design, Installation and Operation of Underground Petroleum Storage Systems.* Care should be taken in applying this guidance to dangerous goods other than petroleum.

19.4 Cleaning of decommissioned containers

Any receptacle that has contained dangerous goods must be cleared of the dangerous goods before it is decommissioned or disposed of.[17] Once you have done so, any residual risk associated with the receptacle must be controlled.

Specific advice is contained in AS 1940, other Australian Standards and industry codes such as the Australian Institute for Petroleum's CP 22 *The Removal and Disposal of Underground Petroleum Storage Tanks.*

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

- control of risks arising from any mechanical cutting, oxy-cutting, grinding or any other activities involving heat or friction;
- how any was waste generated will be stored or disposed of; and
- safe entry into a receptacle which is a confined space.[18]

Used packagings that have not been made free from dangerous goods should retain labels and markings that properly identify the residual hazard. When they are free of dangerous goods, the labels or markings should be removed.

19.5 Protection from impact

You must ensure that dangerous goods and any structure and plant associated with their storage and handling, are protected against damage from impact with vehicles, mobile plant ships or boats. Mechanical handling equipment used for moving containers of dangerous goods including forklifts or overhead lifting grabs can cause damage to containers either directly through mishandling or indirectly by moving the containers into other objects – like projecting pipework, railings or structures.

The most effective ways to protect containers, their pipework and attachments from this impact is to locate the containers away from trafficable areas or prevent vehicle access. Where

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[17] Where plant is being disposed of the disposal may be subject to the requirements of the Environment Protection Authority (EPA). The requirements of this regulation and the guidance in this Code are intended to operate in addition to any requirements of the EPA.

[18] For further guidance, refer to the *Code of Practice for Confined Spaces.*

vehicles must be able to come close to containers, the use of physical barriers like railings, bollards or stanchions should be considered.

19.6 **Spill containment**

You must provide spill containment that will eliminate the risk or reduce risk so far as practicable from any spill or leak of solid or liquid dangerous goods. This is required for every area where dangerous goods are stored and handled. All spillages or leaks of dangerous should be contained within the premises.

Factors that will determine the extent of spill containment include:

- the nature of the dangerous goods;
  - if liquid, whether it is mobile or viscous;
  - if solid, whether it will melt in a fire;
- the quantity of the dangerous goods;
- the size of the largest container or largest spill;
- the consequences of the spill; and
- whether or not it is necessary to provide for the management of firewater or other extinguishing materials from an incident.

Spill containment for liquids may be achieved by:

- providing drains to a purpose built on-site catchment (for example, an interceptor or remote impounding basin);
- grading the surface so that all spills are contained by the contours; or
- bunding the area to form a compound;[19]
- double walled containers;
- enclosing a tank with a partial or full height bund.

In some circumstances, it may not be necessary to provide any specific spill containment – for example, if the dangerous goods are high melting point solids or highly viscous liquids (such as some paints, resins and adhesives) in packages that are small in relation to the size of the storage area.

Designing spill containment

You should ensure that:

- the spill containment system is impervious and can hold the dangerous goods until the spill is cleaned up;
- the risks associated with the operation of the containment system are part of the design consideration;
- the materials used in construction or for absorption are:
  - compatible with the dangerous goods and other materials in the vicinity; and

[19] A compound is an area bounded by natural ground contours or by a bund, being sufficiently impervious to retain any spills or leaks of substances kept within the area pending the recovery of those spilled or leaked substances.

- appropriate to avoid contamination of ground water or soil;
- 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 or to assist in clean-up;
- contaminated firewater can be removed during an incident if needed; and
- means are available for removing any rainwater that may accumulate in the area.

If the design and location of your spill containment system may affect emergency services operating procedures you should consult with the emergency services authority.[20] For example, the location of a remote impounding basin may limit the deployment of fire fighting equipment.

A number of documents referenced in Appendix 3 provide specific guidance on spill containment.

19.7 **Transfer of dangerous goods**

Transfer of dangerous goods refers to the movement of the dangerous goods:

- from place to place within premises; and
- into or from a container.

It generally poses far greater risk than static storage. The goods will often be unconfined at some stage of the transfer process such as when pouring or pumping from one container to another. Additional hazards include:

- increased vapour levels around the operation;
- generation of static electricity;
- overflow or spillage; and
- spillage away from spill containment installations, such as where the transfer is by pipeline.

The transfer system should take into account:

- hazards associated with the particular dangerous goods;
- required flow or transfer rates and quantities; and
- external hazards and adjacent activities.

If dangerous goods are transferred into a portable container for use at the premises, you must ensure the container is marked with the Class label, Subsidiary Risk label and the product name of the dangerous goods, or, if this is not possible, by some other means of clearly identifying the dangerous goods. This is not required if the transferred dangerous goods are consumed immediately and the container is cleaned free of dangerous goods.

[20] The Regulations define “emergency services authority” as the Metropolitan Fire and Emergency Services Board or the Country Fire Authority.

The ADG Code and several of the documents referenced in Appendix 3 provide specific requirements for certain dangerous goods transfers.

19.8 Controlling ignition sources in hazardous areas

You must ensure that ignition sources are not present, so far as is practicable, in any hazardous area where dangerous goods are stored or handled.

What are 'hazardous areas'?

Flammable or combustible gases, vapours, dusts and mists may be generated or evolve within a dangerous goods storage and handling environment. These can form explosive mixtures with air in certain proportions. This risk is particularly relevant with dangerous goods of Class 2.1, 3 and 4 or dangerous goods with a Subsidiary Risk of 2.1, 3 or 4. However, other Classes of dangerous goods may also contribute to explosive atmospheres under some circumstances. The classification of ammonia does not indicate a flammable Subsidiary Risk because its explosive limits are within a very narrow range.

An area where an explosive atmosphere may occur is described as a 'hazardous area'. AS 2430 designates different levels of hazardous areas. That standard also describes the extent of the hazardous area for many specific situations.

The extent of the hazardous area needs to be determined for all areas where the following dangerous goods are stored or handled:

- Class 2.1, 3, 4 or 5 dangerous goods;
- dangerous goods with a Subsidiary Risk of 2.1, 3, 4 or 5; or
- goods which may generate combustible dusts.

The identification of hazardous areas should be undertaken by people having a thorough knowledge of the storage and handling areas at the premises and the activities that involve the dangerous goods.

Ignition sources

An ignition source is any source of energy sufficient to ignite a flammable atmosphere. Ignition sources include:

- naked flames, including those from blow torches, shrink wrapping equipment, stoves, gas or oil heaters, pilot lights, driers, cigarettes, lighters and matches;
- static electricity (see below);
- heat from appliances or from chemical or biological reaction vessels;
- friction from moving parts, such as fan blades rubbing nearby surfaces;
- sparks from grinding and welding;
- internal combustion engines and vehicles;
- electric equipment, such as power points, switches, lighting, appliances and battery-powered forklift trucks, which is not rated for the hazardous area; and
- radio transmitters and mobile phones.

Controlling ignitions sources – electrical equipment within hazardous areas

The ignition potential of electrical equipment located within a hazardous area can be controlled by providing wiring, switching and equipment protection that is suitable for use in the area. Guidance on electrical protection systems can be found in AS 1482 *Electrical equipment for explosive atmospheres – Protection by ventilation*, and a number of other documents listed in Appendix 3.

When you provide additional mechanical ventilation to reduce the extent of the hazardous zone, you should also control any risks that would arise if the ventilation failed. One such method would be the complete interlocked shutdown of all electrical systems within the room or building.

Restrictions on possession of potential ignition sources

You should have a procedure to ensure that people do not take any substance or article with the potential to be an ignition source within 3m of a hazardous area.

Where a naked flame or ignition source is required in an operation adjacent to a hazardous area, a formal 'hot work permit' system is recommended. Some Australian Standards, such as AS 1940, provide detailed guidance on 'hot work' in areas where dangerous goods are stored and handled.

Generation of static electricity

Static electricity may be generated by:

- movement (pouring, pumping, stirring and high velocity flow) of the dangerous goods or combustible liquids, particularly dry powders and liquids of low electrical conductivity;
- dry air streams;
- movements of personnel, especially when wearing, donning or removing clothing and footwear of low conductivity. (Some protective clothing – for example, those made of synthetic fibres like polyester – may not be static resistant and care should be taken during its selection);
- 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.

Avoidance of static

To guard against static electricity discharge:

- all tanks, pipework, transfer systems and process plant associated with the storage and handling system should be earthed, or otherwise protected, in accordance with AS 1020; and
- use anti-static additives in non-conductive liquids and the wearing of conductive clothing, especially footwear.

Controlling ignition sources outside hazardous areas

All other ignition sources on premises where dangerous goods are stored and handled should be identified and the sources eliminated or controls put in place where there is any likelihood that those ignition sources could result in an incident. An example of a situation where an ignition source outside the hazardous area should be eliminated is a gas fired furnace that is located in the likely path that flammable vapour that would follow in the event of a spill of flammable liquid. Flammable liquid vapours are heavier than air and tend to flow by gravity along natural channels and drains quite long distances before dispersing.

19.9 **Ventilation**

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

The purpose of ventilation is to produce and maintain a safe working atmosphere in the storage and handling area. Ventilation is achieved by the introduction or recirculation of air by natural, forced or mechanical means.

Safe atmosphere

A safe working atmosphere is one in which:

- there is a safe oxygen level for breathing;
- hazardous gases, vapours, mists, fumes and dusts are within relevant exposure standards;
- the concentration of flammable gases, vapours, mists, fumes and dusts is always below 5 per cent of the lower explosion limit; and
- the build-up of heat and extremes of temperature is avoided.

To ensure a safe atmosphere is maintained, atmospheric testing and monitoring may need to be carried out consistent with the hazards identified and the risk assessment.

Design considerations

A ventilation system for the storage and handling area should be exclusive to the particular building, room or space. Where this is not achievable, the system may be linked to another area provided that there will not be an increased risk arising from incompatible goods or any other relevant hazard.

Local exhaust ventilation removes airborne contaminants from the working environment before they reach the breathing zone of personnel in the area. It is usually more effective than an increase in general ventilation. General or dilution ventilation has limitations and should only be considered for contaminants of low toxicity. In addition, the quantity of contaminants generated should be relatively small, otherwise it would not be practicable to achieve the air volumes required for dilution.

Ventilation systems should be suitable for the types of dangerous goods on the premises. For instance, where there are dangerous goods with vapours heavier than air, fumes should be removed from the lowest point above any spill containment and fresh air introduced from above.

Fresh air should be drawn from a source uncontaminated by exhaust air or other pollutants and the exhaust discharged where it will not cause other risks, in compliance with environmental legislation concerning discharges to atmosphere.

Ventilation by recirculated air should be restricted to areas where temperature control is required.

Most of the Australian Standards covering individual and mixed class storage and handling and some of the other documents referenced in Appendix 3 provide detailed instructions on the provision of ventilation.

Purging

Purging is the method by which any contaminant is displaced from a confined space. The confined space may be purged, for example with an inert gas such as nitrogen, to clear flammable gases or vapours before work in the confined space.

After purging with inert gases the confined space should be adequately ventilated, and re-tested. The purging of a space should be undertaken in a manner that will not cause rupture or collapse of the enclosure due to pressure differentials, and the methods employed should ensure that any contaminant removed from the confined space is exhausted to a location where it presents no hazard.

Displacement of contaminated air may be temporary. For example, flammable gases absorbed into the walls of a steel tank may leach out and recreate the flammable atmosphere. Where flammable contaminants may build up in the confined space, you should consider whether it would be necessary to re-purge the space. Because purging may reduce oxygen levels or there may be residual contamination, safe entry procedures should be developed and enforced. These may require atmospheric sampling and monitoring or the use of breathing protection.

You should refer to the *Occupational Health and* Safety *(Confined Spaces) Regulations 1996* in respect of entry to confined spaces. Note that the Confined Spaces Regulations prohibit pure oxygen or gas mixtures with oxygen in concentration greater than 21 per cent by volume being used for purging or ventilating a confined space because of the risk of increased flammability.

19.10 **Additional risk control measures for your premises**

Introduction

To ensure that you are providing a working environment that is safe and without risks to health, you should consider these additional controls.

Lighting

You should ensure that:

- adequate natural or artificial lighting is provided to all areas where dangerous goods are stored or handled, and access ways;
- the only artificial lighting used in a room or space where dangerous goods are stored or

handled is electric lighting;
- electric lighting used in a hazardous area meets the provisions of AS 3000;
- internal lighting meets the relevant provisions of AS1680; and
- emergency exit lighting is provided, if necessary.

Access and egress

Access to the premises

Ensure access to 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; and
- doors and gates unlocked when they may be required as exit points; and
- outward-opening doors, where appropriate.[21]

Access should be readily available to the emergency services authority personnel.

Access to safety equipment

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

Provision of safety signs

You should provide safety signs that are readily recognisable, understandable and durable. AS 1319 *Safety signs for the occupational environment* provides examples of safety signs which may be applicable.

Many Australian Standards and industry codes of practice provide specific advice on safety signs that should be displayed in certain circumstances. For example AS/NZS 1596 *Storage and handling of LP Gas* contains specific advice on safety signs to be displayed at an automotive dispensing installation.

Safety signs should be:

- in formats (written or pictorial) that take into account the cultural diversity of the intended audience;
- visible against background structures; and
- easily interpreted in the conditions that may prevail, such as low light.

[21] The Building Code of Australia stipulates that required exit doors must open outwards, with an opening device that opens with a single action.

Types of Signs	Examples
Regulatory signs	**WARNING – RESTRICTED AREA AUTHORISED PERSONNEL ONLY** **SELF SERVE NOT PERMITTED**
Hazard warning signs	**FLAMMABLE GAS**
Precautionary signs	**HIGH PRESSURE OUTLET** **NO SMOKING – STOP ENGINE** **ATTACH EARTH CLIP BEFORE PUMPING**
Emergency information signs	**EMERGENCY STOP BUTTON**

Figure 5: Examples of common types of safety signs

20. Controlling risk at specialised facilities and operations

20.1 Transit storage

The term transit storage refers to short term storage 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 such as manufacturing.

Port areas are facilities where the transit storage of dangerous goods would comprise the major proportion of the storage and handling activities at the premises. AS 3846*The handling and transport of dangerous cargoes in port areas* provides advice for port areas.

Transit storage locations can present a particular risk as they interface between transport and storage activities and they may contain dangerous goods with widely varying hazards.

The quantities of dangerous goods in a transit storage location and the duration of that storage should be kept to a minimum commensurate with efficient operation but must not be kept at the premises for more than 5 consecutive days.

You should ensure that an incident occurring in a transit storage location is not likely to adversely affect the permanent storage or process areas or any other operations. Therefore, transit storage locations should be provided with controls appropriate to the type and quantity of goods stored, including:

- appropriate segregation of the dangerous goods in the area;
- equipment for containment and clean-up of spills and leakages and emergency response; and
- PPE for personnel in the area.

20.2 Transport storage areas

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

- locations inside a building (for example, at a transport depot) where packages or intermediate bulk containers are held awaiting loading;
- 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.

Types of premises that would make provision for transport storage areas would include ports, rail yards and road transport depots.

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 minimised to the quantity necessary to receive or dispatch dangerous goods in an efficient manner.

Control measures for transport storage areas

Ensure that:

- the length of time that dangerous goods are held does not exceed five consecutive working 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.

Placarding for transport storage areas

Transport storage areas often encounter regular variation in the types of dangerous goods held. It may be more convenient to use frames for slip-in/slip-out labels that are commonly used on vehicles for the transport of dangerous goods.

20.3 Cylinders for gases

Where Class 2 dangerous goods are stored and handled in cylinders, you should comply with the relevant parts of AS 4332 *The storage and handling of gases in cylinders.*

In addition to the provisions of AS 4332, you should ensure that:

- any cap provided for use with the cylinder is kept in place on the cylinder at all times when the cylinder is not connected for use; and
- unless the container is connected by permanent piping to a consuming device, the valve of the container is kept securely closed at all times.

Appendix 6 provides further guidance on storing and handling particular dangerous goods.

21. Preparing a manifest and plan of the premises

21.1 Manifest

You must ensure that a manifest is prepared when the quantity of dangerous goods exceeds the quantities listed in the "Manifest Quantity" column in Schedule 2 of the Regulations.

The principal purpose of the manifest is to provide the emergency services authority with information on the quantity, type and location of dangerous goods stored and handled on the premises, to enable them to respond 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 located near the Outer Warning Placard at the front of the premises, unless otherwise agreed with the emergency services authority. It should be housed in a holder of substantial weatherproof construction.

The manifest must include the following information:

(i) the name of the occupier of the premises;
(ii) the address of the premises;
(iii) the date when the manifest was prepared or last amended;
(iv) contact information for at least 2 people who may be contacted in the event of an incident;
(v) a summary list of the Classes and Packing Groups (if any) of the dangerous goods at the premises;
(vi) information about dangerous goods stored in bulk in other than IBCs;
(vii) information about packaged dangerous goods in IBCs;
(viii) information about dangerous goods in manufacture;
(ix) dangerous goods in transit; and
(x) a plan of the premises.

The manifest must be revised when there is a change in any of the above information.

Dangerous goods in transit

If the dangerous goods are in transit, and there are dangerous goods shipping documents that comply with the ADG Code available for the goods, the information required by items (v), (vi) and (vii) above may be provided in the form of a compilation of those shipping documents. However, MSDS should be used if they are available.

A sample manifest is provided at Appendix 8 of this Code of Practice.

21.2 Plan of the premises

The purpose of the plan of the premises is to identify the places, buildings and structures on the site where dangerous goods are stored and handled. It should be easy for emergency services authority personnel to read.

The plan of the premises should be on a scale that adequately illustrates the details required by the Regulations. The following information is required:

- locations and identification number or code of:
  - bulk containers and bulk storages; and
  - storage areas for packaged dangerous goods and dangerous goods in IBCs; and
  - areas where dangerous goods are manufactured; and
  - areas where dangerous goods in transit may be located
- legend for the identification numbers and codes for the above areas; and
- main entrance and other entry points to the premises; and
- location of essential site services including fire services and isolation points for fuel and power; and
- location of the manifest for the premises; and
- location of all drains on the site; and
- nature of the occupancy on adjoining sites or premises.

In addition, the following information may be relevant:

- the location of all buildings, amenities, structures and internal roadways on the premises and their uses;
- areas of public access adjacent to the site and parking (if any);
- public street names adjacent to the premises and evacuation routes; and
- nature of fences (if any).

A sample plan is found at Figure 7.

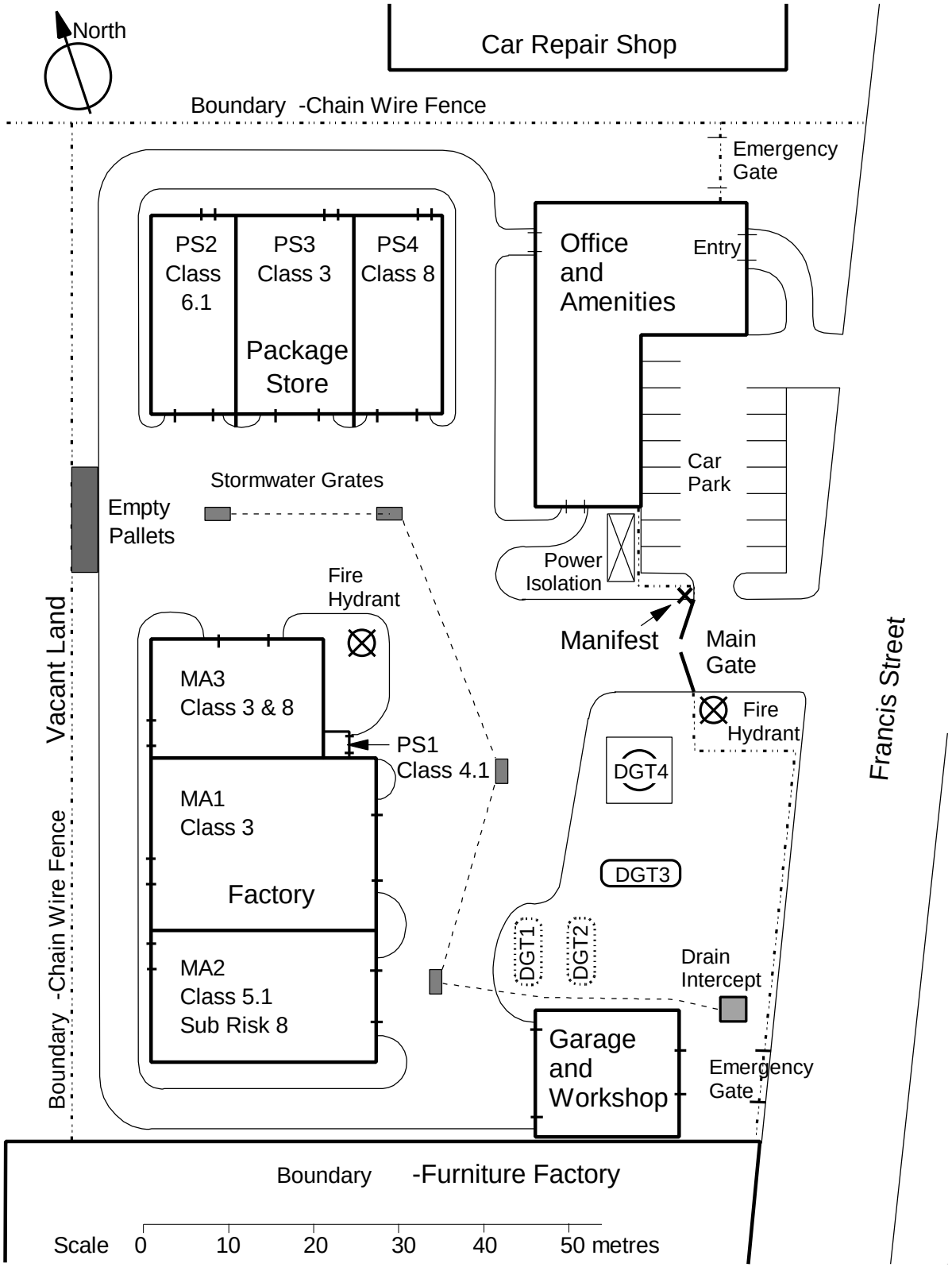

Figure 7: Sample plan of a premises

22. Placarding

Placards provide visual warning of the hazards associated with the dangerous goods at the premises. You must ensure that your premises are placarded if dangerous goods are stored in bulk or in a quantity that exceeds the quantity specified in the column headed "Placarding Quantity" in Schedule 2 of the Regulations, unless they:

- are in an IBC or bulk container intended for transport and marked in accordance with the ADG Code; or
- are C1 combustible liquids in a quantity not exceeding 10,000 litres; or
- are dangerous goods of Class 2.1 or 3 or C1 combustible liquids and are stored in an underground tank at a retail outlet where the goods are used to refuel vehicles.

Placards that were provided to comply with the *Dangerous Goods (Storage and Handling) Regulations 1989* may continue to be used until such time as they have become illegible or need to be replaced. Replacement placards must comply fully with the new Regulations.

Placards must be kept legible and unobstructed.

Types of placards

(a) Placards for bulk dangerous goods

Placards for bulk storage of dangerous goods are essentially the same as the full size Emergency Information Panel required by the ADG Code for bulk transport, with the emergency contact details removed.

The placard must be located on or adjacent to the bulk storage, unless otherwise agreed in writing by the emergency services authority.

Figure 8: Sample of a placard for bulk dangerous goods

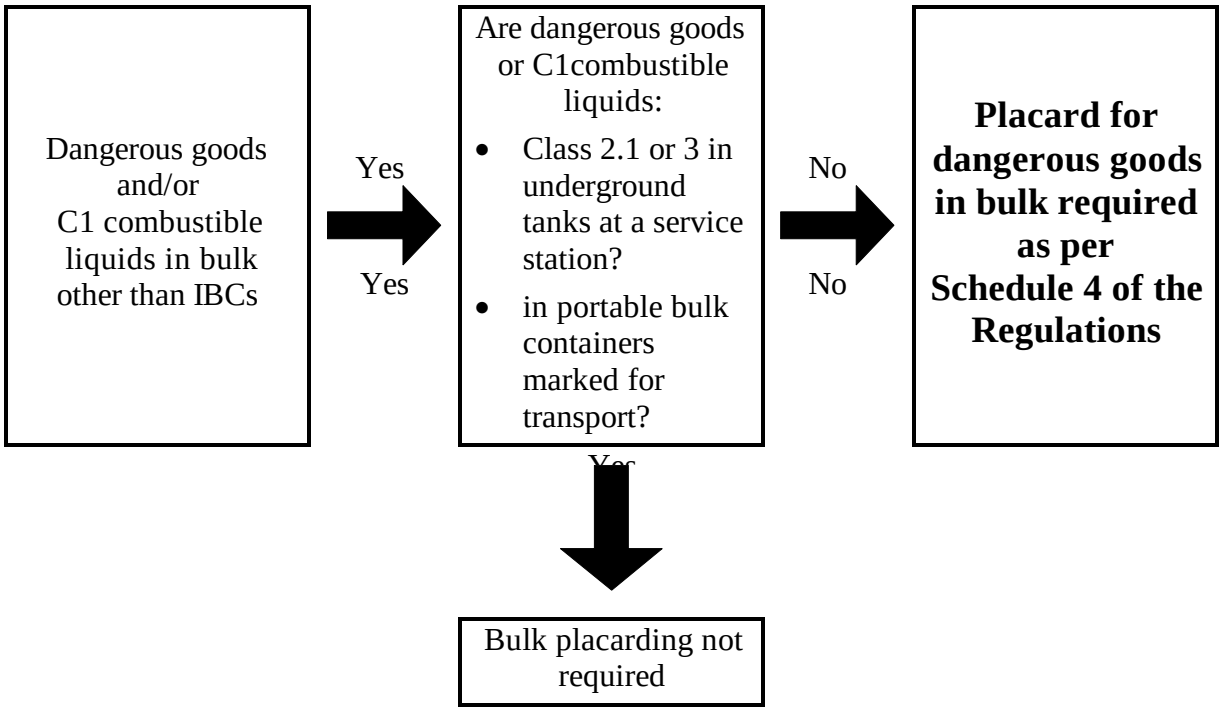

Figure 9: Flow diagram – placarding requirements for dangerous goods in bulk

(b) Placards for packaged dangerous goods

Storage and handling areas for packaged dangerous goods must be placarded if the quantity in the area exceeds the quantity specified in the column headed "Placarding Quantity" in Schedule 2.

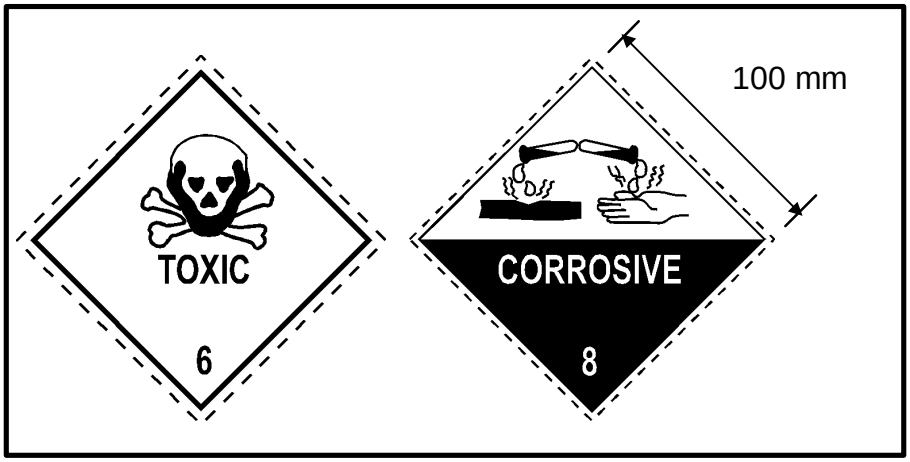

Figure 10: Sample of a placard for a dangerous goods stored in packages

The class and/or mixed class labels required by the Regulations should be grouped together. The class labels need not, however be placed in the one horizontal line on a shared sign as illustrated in Schedule 4 of the Regulations, provided they are clearly visible against a contrasting background. Vertical or diagonal grouping is equally acceptable.

For those storage and handling areas where there is regular variation in the types of dangerous goods (for example, in transit storage locations and transport storage areas), it may be more convenient to use frames for slip-in/slip-out labels that are commonly used on vehicles for the transport of dangerous goods.

(c) Outer warning placards

A 'HAZCHEM' Outer Warning Placard is required if the quantity of dangerous goods stored or handled at the premises exceeds the "Placarding Quantity" in Schedule 2.

Outer Warning Placards must be displayed at all road and rail entrances to the premises. For schools and farms, placards must be displayed at the main road entrance.

If the premises consist of a building set back from the street such that placarding at the street entrance would be neither effective nor practical, Outer Warning Placards should be displayed at each entrance to the building that may be used by the emergency services. However, you must have the written agreement of the emergency services authority to do so.

Figure 11: Form and dimensions of an Outer Warning Placard

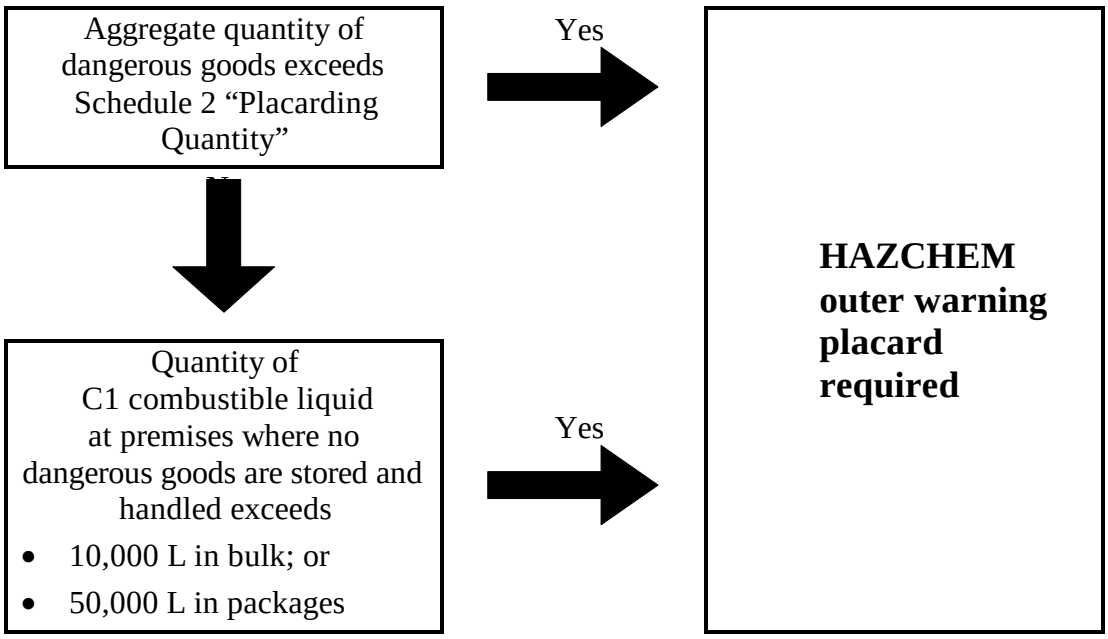

Figure 12: Flow diagram – requirement for outer placarding

23. Fire Protection

You must ensure that the premises are provided with fire protection and fire fighting equipment that:

- is designed and constructed for the types and quantities of dangerous goods and the conditions under which they are stored and handled; and
- uses fighting media that are compatible with the dangerous goods and effective in the control of incidents involving the types and quantities of dangerous goods.

23.1 Fire protection systems

While the Building Code of Australia specifies minimum requirements for fire protection, additional fire protection will usually be required for premises where dangerous goods are stored and handled.

The design and construction of the fire protection for each area in which dangerous goods are stored and handled and for the premises as a whole, should take account of the relevant Australian Standards and industry codes of practice listed in Appendix 3.

Premises exceeding the "fire protection threshold"

If a quantity of dangerous goods held at your premises exceeds that specified in the column headed "Fire Protection Quantity" in Schedule 2, and you intend to establish a fire protection system, you must request the written advice of the emergency services authority in relation to the design of the system. You must have regard to that written advice when establishing the system.

You are also required to request the written advice of the emergency services authority in relation to the design of the system, and have regard to that written advice if you intend to make modifications to:

- the buildings or structures on the premises; or
- the 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; or
- the fire protection system.

Designing the fire protection system

Fire protection system design should take account of:

- the chemical and physical properties of the dangerous goods;
- the total fire load of the area being protected;
- particular hazards of the dangerous goods and the quantities being stored and handled;
- the location, design, type of construction and total floor area of the building or storage and handling area;
- the type of operations in the building or storage and handling area, 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;
- the impact of hazards external to the storage and handling area, including beyond the boundaries of the premises;
- the personnel available to operate the system and their capability;
- the need to protect external facilities;
- all relevant environmental considerations; and
- the need for the fire protection system to remain in operational condition itself in the event of a fire.

Compatibility of the fire protection system with dangerous goods

Fire fighting media (such as water, foam or dry agent) must be compatible with the dangerous goods. For example, sprinklers and water based extinguishers should not be used with dangerous goods of Class 4.3 – Dangerous When Wet.

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 supply 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.[22]

The adequacy of the water supply should be checked with the emergency services authority. Specific guidance is provided in AS 1940 and AS 2419.

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 emergency services authority pumping equipment.

Fire alarm systems

Fire alarm systems should be designed in accordance with AS 1670 and AS 1603.5, and 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;

[22] If other than town water is used as a fire water supply, the cleanliness and the corrosive properties of the water need to be taken into account. A dirty or corrosive water supply may block or damage pumping equipment, distribution pipework, nozzles and sprinkler heads.

- 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 system is also installed, such as a visual system; and
- the system remains operable when the main power supply fails.

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

23.2 Fire fighting equipment

All fire protection and detection equipment should comply with the appropriate Australian Standards listed in Appendix 3.

Compatibility with equipment used by the emergency services authority

Fire fighting equipment at the premises must be capable of being used, without adaptation or modification, with the equipment used by the emergency service authority. Ensure that:

- the pressure rating of fire mains and associated equipment is consistent with the pressures that may be imposed by the connection of the emergency services authority's equipment;
- fire fighting foam or any special fire protection medium, if used, is compatible with the fire fighting media used by the emergency services authority.

The design and selection of coupling and the selection of fire fighting media should be carried out in consultation with the emergency services authority.

Location of firefighting equipment

Firefighting equipment should be located so that:

- all dangerous goods and other items being protected can be directly reached by the firefighting medium, with particular attention to high rack storage;
- it is readily accessible in the event of an incident, preferably adjacent to exit doors or on exit routes; and
- it is in a conspicuous position.

Identification of firefighting equipment

All firefighting equipment should be suitably labelled in accordance with the relevant Australian Standards.

Where necessary to assist with the identification of firefighting equipment, additional signs complying with AS 1319 *Safety signs for the occupational environment* should be installed.

Requirements for specific equipment

(a) Fire hose reels

Fire hose reels should comply with AS 1221 and be installed to AS2441, the requirements of the relevant emergency services authority and the Building Code of Australia.

Hose reel systems should be located:

- as required by the relevant emergency services authority;
- on every storey of a building used to store and handle dangerous goods where the total floor area exceeds 300 m^2;
- 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.

Hose reels should be provided with:

- a minimum hose length of 36 m;
- conspicuous signage; and
- protection by a cabinet or other suitable means, if the hose reel is installed in an environment where it may be damaged.

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

Hydrant hose systems may be substituted for fire hose reels.

(b) Fire hydrants

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

Guidance for the selection, installation and location of fire hydrants for use on premises where dangerous goods are stored and handled can be found in AS 2419. For premises storing or handling flammable and combustible liquids, detailed guidance is included in AS 1940. Further advice may be obtained from the relevant emergency services authority.

Hydrants should be equipped with hose, branch and nozzle except where it is not appropriate and prudent to do so, for example, where they are susceptible to theft or there are no personnel properly trained to operate them.

External hydrants should be:

- positioned convenient to but a safe distance from exit doors;
- easily visible, with appropriate identification signs; and
- capable of providing the appropriate coverage.

(c) 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 installation, with minimum exposure of firefighters.

Monitors should normally be installed in consultation with the emergency services authority.

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

- the design water flow capacity. An allowance of 50% over any calculated capacity should be provided to take account of adverse wind conditions;
- the type of nozzle that should be provided – fixed or variable pattern and whether it can supply foam as well as water;
- the location of the monitor relative to the installation being protected;
- the anticipated heat flux at the monitor location. In situations where the heat flux is likely to exceed 2 kW/m^2 the provision of radiant heat protection for personnel operating the monitor should be considered.

Monitors should be installed in accordance with the manufacturer's specifications and would normally be located 15-30 metres from the facility to be protected. If monitors are required to be closer to the facility, or where the expected heat flux may exceed the need for radiant heat, protection for personnel at the premises should be taken into account. This would normally necessitate remote control. 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.

(d) Automatic sprinkler systems

Where fire sprinkler systems are required, they should normally be installed in accordance with AS 2118.

Where foam systems are required, advice may be obtained from potential suppliers and the relevant emergency services authority. If necessary, refer to the codes such issued by the National Fire Protection Association (USA) and other specific guidance.

(e) Portable fire extinguishers

You should select fire extinguishers that are suitable for the fire risk involved, in compliance with the appropriate Australian Standard as listed in Appendix 3.

Fire extinguishers should be located, identified and protected so they are:

- clearly visible, unobstructed and readily available to the relevant risk; and
- not adversely affected by hazardous or climatic conditions.

AS 2444 provides guidance on the location and identification of portable fire extinguishers.

Where powder-type and foam extinguishers are likely to be used together in an emergency,

they should be compatible.

Portable fire extinguishers for special risks

- Foam extinguishers should be suitable for the particular dangerous goods. For example, alcohol-compatible foam should be used for alcohols and other polar (water miscible) solvents.
- Carbon dioxide extinguishers may protect electrical equipment and will minimise clean up and limit damage to the equipment, but have a poor 'knock down' short discharge range, and may be ineffective where there is significant air movement. Dry powder or vaporising liquid may be more effective.
- Carbon dioxide and acidic extinguishers such as those based on ammonium phosphate should not be used where there are cyanides present.
- Carbon dioxide should not be used on fires involving magnesium or titanium metals.

Responding to failure of the fire protection system

You must ensure that in the event that any of the components of the fire protection or fire fighting equipment are rendered inoperative:

- action is taken to return the fire protection and fire fighting equipment to full operation;
- the implications of the equipment becoming unserviceable or inoperative are assessed; and
- alternative measures are taken to control, to the same level of effectiveness, those risks that were controlled when the equipment was functioning fully.

Fire protection systems and equipment should be inspected and tested at regular intervals to ensure that it is fully operational at all times. Refer to AS 1851 for guidance on testing and inspection.

If any of the components of the fire protection system or equipment fail, you must:

- assess the implications of the failure;
- correct the faults and bring the system back to full operation; and
- control risks through alternative measures.

In the simple case of a fire extinguisher, this may involve having the extinguisher serviced or replaced. For more complex fixed fire protection systems, making the system fully operational may take time.

Alternative control measures may include:

- ceasing all or part of the operations in the areas affected by the failure if the risk is high;
- providing temporary fire protection systems or equipment until repairs are completed;
- notifying the emergency services authority to obtain advice.

Maintenance of fire protection equipment

All fire protection equipment should be maintained in accordance with the various parts of AS 1851 *Maintenance of fire protection equipment.*

24. Emergency preparedness

If you have dangerous goods at your premises in quantities exceeding the "Manifest Quantity" column in Schedule 2 of the Regulations, you must develop a written emergency plan.

24.1 Emergency plans

Purpose and scope

The purpose of the emergency plan is to minimise the effects of any emergency that occurs at premises where larger quantities of dangerous goods are stored and handled.[23]

The emergency plan should be capable of dealing with the worst-case credible scenario. However, detailed planning should concentrate on the more likely events. The emergency plan should also be sufficiently flexible to ensure that an emergency response can be varied according to the severity and type of dangerous occurrence or near miss.

Content

The emergency plan should include the following matters:

Site and Hazard Detail	1	Name, location, address and nature of operations
	2	Detailed map of the facility and surrounding area
	3	Inventory of Schedule 2 materials
	4	Maximum/minimum number of persons expected at the facility
	5	Infrastructure likely to be affected by an incident
	6	Emergency planning assumptions
	7	Description of measures to control the consequence of each hazard and major incident
Command Structure and Personnel	8	Details of emergency contact personnel
	9	Allocation of personnel for implementing the plan
	10	Arrangements for "mutual aid" between adjacent facilities
Notifications	11	Procedures for providing early warning of an incident
	12	Details of on-site and off-site warning systems
	13	Contact details for the emergency services
	14	Details of on-site communications systems
Resources	15	Details of emergency resources on-site
	16	Arrangement for obtaining additional external resources
Procedures	17	Procedures for safe evacuation and muster of personnel
	18	Details of control points and procedures for essential services
	19	Procedures for containment of any incident
	20	Procedures for decontamination following an incident

[23] "Emergency" means an event that exposes a person or property in the vicinity of the event to an immediate risk through —
(a) an explosion, fire, harmful reaction or the evolution of flammable, corrosive or toxic vapours involving dangerous goods; or
(b) the escape, spillage or leakage of any dangerous goods.

Development and consultation

In developing the emergency plan, you must request the written advice of the emergency services authority and have regard to that written advice.

If an emergency may impact beyond the perimeter of your premises, you should also consult with people in control of adjacent premises and the local counter-disaster organisation. Note: if you are required to develop an emergency plan, you will also be required to notify WorkCover in writing that the premises contains quantities of dangerous goods that exceed the "Manifest Quantity".

You may also be required to consult with other authorities responsible for the environment and planning as well as local government, to ensure consistency with legislation and emergency planning, for example, State Emergency Disaster Plans ('DISPLANS').

Implementing, communicating and maintaining the plan

The contents of emergency plans must be communicated to all people who may be exposed to a risk as a result of an emergency, including:

- employees;
- contractors and sub-contractors; and
- people in control of adjacent premises.

The emergency plan should be tested when first devised, after each modification and at regular intervals. Simulated emergencies and other exercises should systematically attempt to involve all people likely to be involved in a dangerous occurrence or near miss. These exercises should include practical drills.

Emergency plans must be updated whenever:

- there is a change of circumstances on or off the premises;
- updated information becomes available;
- a deficiency in the plan is identified.

Accessibility

The emergency plan should be in a readily accessible and understandable form. This could be either a hard copy or in a computer format.

The location of the emergency plan should be well known to supervisors and employees 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.

24.2 Emergency procedures

Emergency procedures should cover all foreseeable emergencies such as fire, spillage of dangerous goods, vapour release and uncontrolled reaction as well as external risks to dangerous goods.

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 the requirements of the premises, but should contain as a minimum:

- the means of raising the alarm;
- contact details of the emergency services authority and/or EPA; and
- actions to be taken by employees in an emergency.

A sample emergency procedures pocket card can be found at Appendix 9.

24.3 **Emergency equipment**

Equipment required to contain and clean up escapes, spills or leaks of dangerous goods must be kept on the premises and be accessible at all times. The equipment will vary with the types and quantities of dangerous goods. Examples include:

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

You should establish a procedure for the regular maintenance of emergency equipment to ensure that the equipment is in serviceable condition.

25. Responding to an emergency

You must respond to any emergency by ensuring that immediate action is taken to assess and control any risk associated with the emergency.

Only people who are essential to the tasks of assessing and controlling the risk associated with the emergency are permitted to remain in the vicinity of the emergency. Your emergency procedures should specify those essential personnel.

Investigating incidents

You must investigate all incidents.[24] These include dangerous occurrences – commonly referred to as "near misses" – which could have exposed people or property to a risk.

The investigation of incidents should be an integral part of the system for managing safety at the premises. The aim should be to ensure that incidents are prevented in the future.

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[24] "Incident" means –
(a) an emergency; or
(b) an unintended event that, but for the intervention of a risk control measure or human intervention, is likely to have resulted in an emergency.

The investigation must determine the cause or likely cause of the incident that has occurred at the premises. Further, the risk assessment must be reviewed having regard to the results of the investigation, and risk control measures revised accordingly.

The system for investigating incidents should:

- be prepared in consultation with employees and any health and safety representatives;
- be documented so that it is readily understood by people who may be affected; and
- inform supervisors, employees, health and safety representatives and other relevant people of the results of the investigation.

Recording incident investigations

You must make a record of the incident investigation and keep it for at least five years. The record must be readily available to WorkCover.

The following should be considered in recording a dangerous occurrence:

- Were the on-site or off-site emergency plans activated?
- Did the leak or spill have the potential to cause fire, explosion or release of toxic or corrosive materials?
- Did the leak or spill have the potential to cause any of the following effects:
  - acute or chronic human health effects?
  - environmental harm?
  - damage to property?
- Would the leak or spill affect the quantity or quality of effluent discharged into sewers?
- Did the leak or spill need to be reported to the Environment Protection Authority under a site-leak or spill-reporting plan?

26. Security of the premises

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

Examples of security measures, depending on the size and hazards of the particular premises, are:

- fencing or enclosure of areas where the dangerous goods are kept;
- locks on doors, windows and other openings to buildings, rooms, compartments or containers in which dangerous goods are kept;
- supervision of areas where the dangerous goods are kept; and
- security checks on all vehicles entering or leaving the premises.

A system to control access of all people to the premises should include:

- the means to identify the extent of access for each person;
- the means to account for all people on site at any given time, for example, by the use of a logbook; and
- security measures for visitors.

When developing security systems and procedures, you should consider:

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

People engaged to work at the premises should be trained to ensure that they understand the security measures and security signs provided.

27. Visitors to your premises

The activities of visitors may lead to increased risk for themselves and other people on the premises. You must guard against this by providing appropriate information, instruction and supervision.

Ensure that visitors are properly informed about:

- the hazards to which they may be exposed while on the premises;
- appropriate safety measures to be applied while on the premises; and
- what actions to take if any emergency occurs while they are on premises.

The need for a formal system of providing safety information, 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 to be provided.

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

You must also provide appropriate supervision. Consider keeping visitors under constant supervision or at least under observation.

28. Induction, information, training and supervision

You must provide appropriate induction, information, training and supervision to all people involved with the storage and handing of dangerous goods.

Induction, information and training provide employees with the skills and knowledge they need to perform their jobs safely. It should help them to understand:

- the hazards and risks associated with the storage and handling of dangerous goods;
- how to follow health and safety procedures;
- the reasons risk controls have been set in place and how to use them; and
- emergency plans.

28.1 Training

Who should be trained?

You must provide induction, information and training to any person on the premises who is likely to be affected by the dangerous goods. This includes:

- your employees and their health and safety representatives, if any; and
- any contractors you have engaged to work on the premises.

Employees supervising other employees who use dangerous goods should also receive training.

When developing and providing training programmes, you should consider any special needs the employees being trained may have, such as specific skills, work experience, physical or intellectual disability, first language, literacy and age.

Consider using oral or visual training methods, or conducting training where appropriate in languages other than English. Refer to the *Code of Practice for Provision of Occupational Health and Safety Information in Languages other than English* for guidance on training in multilingual workplaces.

Outcomes of training

The required outcomes of training for employees and other personnel on the premises include the ability to demonstrate an understanding of:

- safe work practices relating to the storage and handling of dangerous goods that are being used in the workplace;
- how to locate an MSDS, and use the information;
- the nature of the hazards and risks associated with the duties being performed;
- measures used to control risk;
- proper use of PPE;
- emergency procedures; and
- first aid and incident reporting procedures to be followed in case of injury or illness.

Review of training

To ensure that training remains effective, you should regularly review the training provided to identify the need for further training. Further training should be provided when:

- new dangerous goods are introduced to the premises;
- there are changes to the layout of the workplace, work practices or control measures for the dangerous goods; and
- new information on the hazards of the dangerous goods is made available (for example, a revised MSDS).

You should evaluate information, instruction and training to ensure that the content is clearly understood by employees. Evaluation could take the form of on-the-job observation. Refresher training should be provided as required and induction training for all new employees (and other people engaged to carry out work at the premises) should take place.

Limitations of training

Although training plays an important part in ensuring effective risk control, it is not a risk control measure in itself. People who are likely to be affected by the dangerous goods at the premises should be aware of the nature of the risk and the role that specific control measures play in risk prevention. However, you should not rely on safe worker behaviour alone. High levels of training and instruction cannot substitute for effective and proper measures to control the risk.

28.2 **Provision of information**

Who should receive information?

You must provide appropriate information to all people who may be involved with or affected by the storage and handling of dangerous goods, including:

- supervisors and employees;
- visitors;
- contractors, including transport drivers; and
- personnel of the emergency services authority.

Appropriate information would include MSDS, labels, safety signs and emergency procedure guides.

PART 4 RETAILER'S DUTIES

29. Introduction

This Part of the Code provides guidance to occupiers who are retailers. It applies only to dangerous goods in consumer packages that are:

- on display at retail outlets and are for sale to the general public; or
- kept in transit storage in areas of the retail outlet after they are unloaded from transport vehicles and before they are displayed for sale.

It does not apply to dangerous goods in bulk containers that are stored and handled at retail outlets.

What is a consumer package?

A "consumer package" means a container of a net capacity that is readily available through retail outlets for household consumption or consumption by an occasional user. It is a package that a manufacturer or supplier has identified as suitable for use in all market sectors.

The inner packaging quantities cited in table 1.1 and 1.2 of the ADG Code would all fall within the commonly understood meaning of consumer package but do not restrict the application of the term.

Examples of consumer packages are:

- "pool chemicals" such as granulated chlorine (class 5.1) – widely available in packages having a net quantity of up to 10 kilograms;
- sodium hypochlorite solutions (class 8 PG II) – when marketed as a "pool chemical' the containers can have a capacity of up to 20 litres;
- ammonium nitrate fertilisers (class 9), which are widely available in a net quantity up to 25 kilograms.

30. Relationship with other Parts of this Code

If this Part of the Code applies to your premises, you may choose to follow the guidance in this Part without the need to refer to Part 3 of this Code (except where noted).

31. MSDS

You are not required to obtain an MSDS for dangerous goods in consumer packages that are intended for retail sale unless the consumer packages are opened on the premises. However, you may choose to act by arrangement with your suppliers to distribute MSDS. This would be particularly appropriate for trade sale outlets.

For those dangerous goods for which an MSDS has not been obtained, you must have alternative relevant health and safety information readily accessible. This information may be in the form of generic MSDS, health and safety information provided by the manufacturer or supplier, and publications produced by industry organisations. It should enable employees and

emergency services authority personnel to deal with incidents such as spillages and damaged consumer packages.

32. Risk management for retail situations

32.1 Hazard identification

It is sufficient compliance with regulation 404 for you to prepare a list of all of the types of dangerous goods that are kept at the retail outlets. The list must include the name of each of the dangerous goods, the Class, Subsidiary Risk and Packing Group of each of the dangerous goods.

32.2 Risk assessment

It is sufficient compliance with regulation 405 for you to document the following broad types of risks associated with the storage and handling of dangerous goods at the premises:

- fire and explosion risks associated with the storage and handling of flammable liquefied gases (Class 2.1 or Subsidiary Risk 2.1), flammable liquids (Class 3 or Subsidiary Risk 3) and dangerous goods of Class 4.1, 4.2 and 4.3 or Subsidiary Risk 4.1, 4.2 or 4.3.
- fire risks that may result from the storage and handling of oxidising agents of Class 5.1 or Subsidiary Risk 5.1 or organic peroxides of Class 5.2.
- the toxic risks associated with dangerous goods of Class 6.1 or Subsidiary Risk 6.1.
- the corrosive risks associated with dangerous goods of Class 8 or Subsidiary Risk 8.

32.3 Risk control for goods on display

To control risk associated with dangerous goods in the display area:

- Ensure packages are marked in accordance with the ADG Code (unless the dangerous goods are placed in a container provided by the purchaser).

- Keep dangerous goods away from other retail goods, such as food or personal products, that could be contaminated in the event of leakage. This may be achieved by the use of an impervious barrier or by a separation distance sufficient to prevent contamination (a distance of 1.5 metres should be sufficient in most circumstances).

- Keep dangerous goods away from incompatible products. For example, swimming pools chlorine (calcium hypochlorite) should be kept away from any oils, flammable and combustible liquid. In addition isocyanurate pool chlorine and hypochlorite pool chemicals can react violently together and must be kept separate. Section 9.1.3 of the ADG Code provides advice on the compatibility of dangerous goods.

- Don’t store packages of liquid dangerous goods above solid dangerous goods in paper or absorbent packaging.

- Stow packages in a way that will prevent the packages from falling or being dislodged and being damaged.

- Do not open packages of dangerous goods on the premises. Exceptions to this would be for

tinting of paint for immediate sale and customer testing of the contents of the packages.

- If dangerous goods are dispensed into containers provided by the customer (for example, mineral turpentine, kerosene or LP Gas), you should ensure that all aspects of the filling operation comply with:
  - AS 1940 *The storage of flammable and combustible liquids* if the dangerous goods are flammable or combustible liquids;
  - AS 1596 *Storage and handling of LP Gas* if the dangerous goods are LP Gas. (Refer to section 11 of this Code for further guidance on filling gas cylinders.)

- Immediately clean up any spillage of dangerous goods in a safe manner.

- Ensure equipment and sufficient quantities of materials for absorbing, neutralising or decontaminating spills from the largest packages on the premises are kept at the premises. (Spill containment should not be needed unless the quantity of dangerous goods that may spill on any one occasion could create a risk in other parts of the premises or beyond the premises. Catchment for firefighting effluent is not required.)

- Keep ignition sources away from the areas where flammable or combustible dangerous goods are kept. Naked flames from direct fired heaters and any flames associated with maintenance work should be kept at least 5 metres from the goods.

- In addition to any fire protection measures provided for the premises as a retail outlet, additional fire extinguishers suitable for use with the dangerous goods may be required. You should seek advice from the emergency services authority.

32.4 **Risk control in storages areas**

If dangerous goods in consumer packages are kept in storage areas after being unloaded from transport vehicles and before being moved to the display area, refer to the guidance in section 20.1 ‘Transit Storage’.

33. Placarding of the premises

Your premises must be placarded if the quantity of all dangerous goods at the premises exceeds the “Placarding Quantity” in Schedule 2 to the Regulations. Refer to section 22 in Part 3.

For packaged dangerous goods in display areas, it is sufficient to place placards at the entry point into the building and area where the dangerous goods are being displayed.

34. Incidents and emergency management

You must establish a system for investigating every incident that occurs at the premises. Refer to section 25 ‘Responding to an emergency’ for further guidance.

35. Consultation, information and training

You have duties regarding consultation, information and training. Refer to sections 14 and 28 in Part 3.

36. Keeping larger quantities of dangerous goods

If the quantity of dangerous goods at the premises exceeds the "Manifest Quantity" in Schedule 2 of the Regulations, you must:

- prepare a manifest (refer to section 21.1);
- prepare a written emergency plan (refer to section 24.1); and
- notify WorkCover.

PART 5 MINOR STORAGES OF DANGEROUS GOODS

37. What are minor storages?

Minor storages are dangerous goods storages in quantities below the "Placarding Quantity" in Schedule 2 of the Regulations. A premises could have a number of such storages and this Part would be applicable to each storage

38. Relationship with other Parts of this Code

This Part of the Code only applies to minor storages of dangerous goods (other than dangerous goods on display for retail sale for which part 4 applies).

If this Part of the Code applies to your premises, you will be in compliance with the Regulations if you follow the guidance in this Part. You do not need to refer to Part 3 of the Code (except where noted).

39. Risk management for minor storages

39.1 Hazard identification

It is sufficient compliance with Regulation 404 in relation to each minor storage if you prepare a list of all the dangerous goods in each minor storage that includes:

- the name of each of the dangerous goods;
- the Class, Subsidiary Risk and Packing Group of each of the dangerous goods, and
- a summary of the hazards identified in the MSDS for each of the dangerous goods

The MSDS must be obtained for each of the dangerous goods at the premises. The MSDS provides the hazard information on the dangerous goods.

39.2 Risk assessment

It is sufficient compliance with Regulation 405 in relation to each minor storage for you to:

- review the MSDS for each of the dangerous goods kept in each minor storage; and
- document the following broad types of risk associated with the dangerous goods in the minor storage:
  - fire and explosion risks associated with the storage and handling of flammable gases (Class 2.1 or Subsidiary Risk 2.1), flammable liquids (Class 3 or Subsidiary Risk 3), dangerous goods of Class 4.1, 4.2 and 4.3 or Subsidiary Risk 4.1, 4.2 and 4.3, and combustible liquids;
  - fire risks that may result from the storage and handling of oxidising agents of Class 5.1 or Subsidiary Risk 5.1 or organic peroxides of Class 5.2;
  - the toxic risks associated with dangerous goods of Class 6.1 or Subsidiary Risk 6.1; and
  - the corrosive risks associated with dangerous goods of Class 8 or Subsidiary Risk 8.

39.3 **Risk control**

To control risk associated with minor storage of dangerous goods, implement the following measures:

Minimise quantities kept

- Consider substituting the dangerous goods with other goods that have a lower risk associated with their storage and handling. Examples of substitution are the use of:
  - degreasing with a detergent instead of a chlorinated or volatile solvent;
  - a combustible liquid such as diesel instead of petrol and kerosene which are Class 3 flammable liquids; and
  - a dangerous good with a higher Packing Group number. An example is substituting xylene (PGIII) for toluene (PGII).

- Ensure the quantity of dangerous goods kept at any one time is kept to a minimum consistent with the operation of the premises.

Follow MSDS instructions

- Where the label or MSDS for a dangerous goods specifies measures and/or equipment to be used for the storage and handling of the dangerous goods then you should adopt those measures or use that equipment.

Storage and handling of packages

- Keep packages securely closed when not in use. They should be stored on surfaces that are resistant to attack by their contents if spilt, and will not react dangerously with spilt dangerous goods.

- Stow packages in a way that minimises the risk of them falling or being dislodged.

- Store packages so that leakage cannot adversely affect other dangerous goods in the storage area. Liquid dangerous goods in packages should not be stored above solid dangerous goods in paper or absorbent packaging. Glass containers of liquids should be stored at lower levels.

- Where dangerous goods require special storage conditions to ensure their stability (ie to eliminate the risk of hazardous reaction), make regular checks to ensure that these special conditions are maintained. Examples of special storage conditions are the need for stabilisers or refrigeration.

- Where aerosols are stored together in outer packaging, enclose the storage area in a strong mesh enclosure to reduce the risk from projectiles in the event of a fire involving the aerosols.

Transfer of dangerous goods

Where dangerous goods need to be transferred (by pumping, decanting, dispensing and filling) into or from a container or moved from place to place in a minor storage area, ensure

that:

- spill containment is provided that can hold at least the quantity of the largest container;

- the container being filled and any transfer equipment is earthed, if there is a likelihood of static electricity being generated and risk from ignition of flammable vapours during the transfer;

- the transfer is done in a manner reduces the generation of any vapours and avoids splashing or spillage of the dangerous goods;

- the place where the transfer is carried out is:
  - set aside for that purpose;
  - not within the storage area but adjacent to it;
  - free of ignition sources;
  - free of obstructions with sufficient room to enable the transfer to be carried out and to hold containers and associated equipment;

- any decontamination materials or clean-up equipment is kept close by;

- where dangerous goods are to be transferred into containers at the premises, the container is suitable and can'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;

The container receiving the transferred dangerous goods as part of a work process does not require marking.

Segregation

- Segregate any dangerous goods that are incompatible to prevent them mixing. This may be achieved by the use of an impervious barrier or by a separation distance sufficient to prevent contamination (a distance of 1.5 metres should be sufficient in most circumstances).

- Section 9.1.3 of the ADG Code provides advice on the compatibility of dangerous goods.[25]

Separation

You must provide separation of the dangerous goods from people or property at or beyond the boundaries of the premises. For guidance on separation of dangerous goods, refer to section 18.5(e) on isolation.

Avoid sources of heat and ignition

- Keep ignition sources away from flammable or combustible dangerous goods (dangerous

[25] Examples of dangerous goods which are incompatible and which should be segregated are:
- Class 5.1 oxidising agents from Class 2.1 flammable gases, Class 3 flammable liquids, C1 combustible liquids from Class 4.1 flammable solids (fire and explosion hazard);
- concentrated acids from alkalis (reaction hazard);
- cyanides from acids (generation of toxic gas hazard); and
- calcium hypochlorite from isocyanurate pool chlorine products (reaction and fire hazard).

goods class or subsidiary risk of 2.1, 3, 4.1, 4.2, 4.3 or combustible liquids). Naked flames from direct fired heaters and any flames associated with maintenance work should be kept at least 5 metres from the goods.

- Store dangerous goods away from sources of heat (for example, heating appliances).

- Where dangerous goods being stored or handled can generate flammable or explosive atmospheres, use electrical equipment that is intrinsically safe or flameproof.

Spill control and clean-up

- Prevent any potential flow of dangerous goods to other parts of the premises that could create a risk or reach any watercourse or the property boundary. Possible means are bunding, provision of channels and utilising the slope of the land. Where spill containment is required, it should have a sufficient capacity to contain the dangerous goods spillage.

- Keep equipment and materials for clean up at the premises to cope with spills from the largest packages kept at the premises.

- Immediately clean up any spills and leaks. Contaminated, spilt or leaked goods should not be returned to their original packaging except for the purposes of disposal or where it is known that this will not increase the risk.

- Safely dispose of waste generated after the clean up of a spill or leak.

Decommissioning

- Ensure that any container or piece of equipment that has been used to store or handle dangerous goods, and which is no longer required for that purpose, is cleaned free of dangerous goods or otherwise made safe.

Ventilation

- Provide the areas in which dangerous goods are stored and handled with adequate natural or mechanical ventilation sufficient to prevent the generation of a flammable or harmful atmosphere. The level and type of ventilation will depend on the nature of the goods and whether they are being stored or used. Ventilation is not required where the documented assessment of the risks indicates that the likelihood of the release of flammable or harmful dangerous goods into the atmosphere in the storage area is negligible.

- If you intend to rely on natural ventilation and need to install vents to achieve the necessary airflow to maintain a safe atmosphere in the room being ventilated you should consider the following:

  – The need to provide vents at floor level and near the ceiling. Most dangerous goods gases and vapours are heavier than air and will vent through the floor level vents. The high level vents allowing fresh air to circulate into the room.

  – The need to ventilate directly to the outside and not into another room.

  – The need to provide a minimum amount of vent area and the spacing of vents to ensure

effective airflow. A useful guide is to allow at least 1 square meter of vent area for each 50 square meters of floor area. The actual amount of vent area and the number of vents that should be provided will be dependent on the size of the room to be vented and whether there are restrictions to the free circulation of the air within the room.

Lighting

- Provide sufficient lighting of areas where dangerous goods are stored and handled to allow normal work to be undertaken safely.

Security

- Secure storage areas for dangerous goods against unauthorised entry.

Personal protective equipment

- Ensure PPE, appropriate to the goods being handled, is worn when people are handling dangerous goods.

- Periodically check and maintain any PPE provided. Refer to Section 18.5 for additional guidance.

Access and egress

- Don't store dangerous goods where they could hinder escape from the building or area in the event of a fire, spill or leak.

Fire prevention

- Keep areas in which dangerous goods are stored or handled clear of combustible matter and refuse. In the case of storage or work outdoors, the surrounding area should be cleared of combustible vegetation for a distance of at least 3 metres.

40. Fire protection

A supply of water should be available, at a nearby location for emergency use.

In addition to building fire protection, provide portable fire extinguishers appropriate to the type and quantity of dangerous goods being stored and handled at or near to the place where the dangerous goods are stored or handled.

Maintain all fire protection equipment in an operable condition.

41. Emergency procedures

Establish procedures for responding to all emergencies, taking account of:

- the nature and quantity of dangerous goods;
- the types and likelihood of emergencies;
- the fire protection and other emergency equipment provided;

- the physical features of the site;
- access to the premises; and
- the number of people on the premises and adjoining premises.

Ensure that all relevant emergency contact telephone numbers are displayed in a prominent location at the premises.

42. Consultation, information and training

You have duties regarding consultation, information and training. Refer to section 14 and section 28 for further guidance.

Appendix 1 What is a code of practice?

The Dangerous Goods Act 1985 (the Act) empowers the Minister to approve codes of practice.

What are they?

An approved code of practice gives practical guidance on how to comply with a general duty under the Act or a specific duty under the Regulations. Compliance with the provisions in an approved code of practice, where relevant, may constitute compliance with the provisions of the Act or Regulations to which the code is giving practical guidance.

Generally, an approved code of practice contains various courses of action which are designed to achieve health and safety standards required by the Act and Regulations. Codes usually contain a number of options for meeting standards.

Who do they apply to?

Codes of practice may be written to provide practical guidance for any person placed under obligation by the Act or its Regulations, for example, occupiers, manufacturers and employees.

Each approved code of practice will state the people for whom the guidance is intended.

What is their legal status?

The provisions in a code are not mandatory. That is, a person may choose to comply with the relevant provision of the Regulations in some other way, provided that the method used also fulfils the requirements of the Regulations. A person or company cannot be prosecuted simply for failing to comply with an approved code of practice.

However, in legal proceedings, failure to observe a relevant approved code of practice can be used as evidence that a person or company has contravened or failed to comply with the provisions of the Act or Regulations. If a person has not adopted the method described in the code, it is up to that person to show that the legal requirement has been met by an alternative method. Therefore, an approved code of practice should be followed, unless there is an alternative course of action that would also fulfil the requirements of the Act or Regulations.

A WorkCover inspector may cite an approved code of practice as a means of remedying alleged non-compliance when issuing an Improvement Notice or a Prohibition Notice. Similarly, a health and safety representative may cite an approved code of practice in a Provisional Improvement Notice when providing directions as to how to remedy an alleged non-compliance.

Appendix 2 Relationship of the Code to other Regulations

The are a number of regulations made under the **Occupational Health and Safety Act 1985**, **Dangerous Goods Act 1985, Road Transport (Dangerous Goods) Act 1995** and Commonwealth road transport legislation which have some relationship with the Storage and Handling Regulations. These are:

- *Occupational Health and Safety (Hazardous Substances) Regulations 1999*
- *Occupational Health and Safety (Major Hazard Facilities) Regulations 2000*
- *Occupational Health and Safety (Plant) Regulations 1995*
- *Occupational Health and Safety (Incident Notification) Regulations 1997*
- *Dangerous Goods (Explosives) Regulations 2000*
- *Dangerous Goods (Rail) Regulations 1998*
- *Road Transport Reform (Dangerous Goods) Regulations 1997 (Commonwealth)*

General

The legislative frameworks are intended to operate in a complementary manner. All the above regulations have safety and prevention of risk as their core objectives. Duty holders should have regard to the impact of any other legislation that may be operative when determining compliance with the Storage and Handling Regulations.

Hazardous substances

Many of the substances covered by the *Occupational Health and Safety (Hazardous Substances) Regulations 1999* are also dangerous goods. The Hazardous Substances Regulations are concerned with the health effects to people resulting from exposure to substances. The Storage and Handling Regulations are concerned with the harm or injury to people and damage to property arising from:

- 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.

In some cases, compliance with the Hazardous Substances Regulations would contribute significantly to compliance with the Storage and Handling Regulations. Occupiers who are employers with duties under the Hazardous Substances Regulations should be able to adapt processes established for these regulations to achieve compliance with the Storage and Handling Regulations.

For instance, the Storage and Handling Regulations require the occupier at a workplace to maintain a register for dangerous goods. There is a similar requirement in Regulation 307 of the Hazardous Substances Regulations for an employer to maintain a register of hazardous substances at a workplace. Compliance with both provisions can be achieved by establishing a single register for both dangerous goods and hazardous substances and any material that is both a hazardous substance and a dangerous goods would only need to be entered once.

Another example would be a ventilation system proposed to control the risk of exposure from a hazardous substance, which is also a Class 3 (flammable) dangerous goods. Controlling the

hazardous substance risk brings the concentration of the substance below the lower explosive limit for the dangerous goods.

However, while the hazardous substances risk is reduced so far as is practicable, the dangerous goods risk has not been controlled so far as is practicable until the fire and explosion hazard that exists from the ventilation system – such as electrical ignition sources – has been dealt with as well. The techniques for controlling risks associated with explosion, harmful reactions and escapes of a substance are quite different from the techniques for controlling exposure.

Major hazard facilities

The provisions of the Storage and Handling Regulations apply to a major hazard facility in addition to the provisions set out in the *Occupational Health and Safety (Major Hazard Facilities) Regulations 2000.* If that facility is licensed under the Major Hazard Facilities Regulations, WorkCover may exempt the operator from any or all of the provisions of the Storage and Handling Regulations. This Code does not deal with the requirements for the issue of an exemption to an eligible facility.

In addition, the licensing regime created by Part 5 of the Regulations relates to major hazard facilities that are regulated under the Major Hazard Facilities Regulations.

Road and rail transport

The Storage and Handling Regulations do not address the transport of dangerous goods from place to place: rather, they regulate storage and handling of dangerous goods on site. Accordingly, compliance with the provisions of either the Commonwealth*Road Transport Reform (Dangerous Goods) Regulations 1997* or the *Dangerous Goods (Rail) Regulations 1998* does not conflict with any provision of the Storage and Handling Regulations.

Explosives

The *Dangerous Goods (Explosives) Regulations 2000* set out the duties relating to the manufacture, import, sale and use of dangerous goods that are explosives.

The Storage and Handling Regulations do not directly apply to explosives. The provisions of the Storage and Handling Regulations apply to dangerous goods that are stored and handled on the same premises as explosives, unless the dangerous goods are used in the manufacture of explosives in accordance with Part 3 of the *Dangerous Goods (Explosives) Regulations 2000.*

Plant

The *Occupational Health and Safety (Plant) Regulations 1995* set out the duties in relation to certain types of plant and the systems of work associated with that plant. If that plant is used with specified dangerous goods, the requirements of the both the Storage and Handling Regulations and the Plant Regulations must be met.

Not all plant is covered by the Plant Regulations. Examples are manually powered plant such as a hand pump for emptying fuel from a drum, and storage tanks for dangerous goods that

operate at atmospheric pressure. The Storage and Handling Regulations and the general duties of the **Occupational Health and Safety Act 1985** apply to all plant not covered by the Plant Regulations that is used in connection with dangerous goods.

Incident Notification

The *Occupational Health and Safety (Incident Notification) Regulations 1997* apply only at workplaces and define incidents that must be reported to WorkCover. These are incidents causing actual bodily harm and dangerous occurrences. The latter includes explosion or fire or the escape, spillage or leakage of any dangerous goods. The Regulations also specify the type of record that must be kept by the employer.

The **Dangerous Goods Act 1985** (section 32) places a duty on occupiers to, without delay, report to the nearest fire authority or to a police station *". . . any fire, explosion, spillage, leakage or escape involving dangerous goods . . ."* The Storage and Handling Regulations prescribe who needs to report, set criteria for reporting and place a number of duties on all occupiers. These duties include investigating incidents, record the findings of the investigations, and where necessary, take corrective action. The provisions of the Storage and Handling Regulations and the Incident Notification Regulations need to be satisfied.

Appendix 3 Publications incorporated in this Code

The following is a list of publications and technical standards incorporated in this Code to provide additional guidance on compliance with particular duties. The effect of incorporation is explained on page 83.[26]

Preparation of Material Safety Data Sheets

National Code of Practice for the Preparation of Material Safety Data Sheets National Occupational Health and Safety Commission [NOHSC:2011], Australian Government Publishing Service, Canberra, as amended from time to time.[27]

Standards applicable to all classes of dangerous goods

AS 2243	Safety in laboratories (all parts)
AS 2430	Classification of hazardous areas
AS/NZS 3833	The storage and handling of mixed classes of dangerous goods in packages and intermediate bulk containers
AS/NZS HB76	Dangerous goods – Initial emergency response guide

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

Class 1	**Explosives**
AS 2187	Explosives – Storage, transport and use
Class 2	**Gases**
AG 501	Australian Gas Association Industrial and Commercial Gas Fired Appliances Code of Practice AG 501
AG 504	Australian Gas Association Code of Practice for Natural Gas Vehicle Refuelling Stations AG 504
AG 601	Australian Gas Association Gas Installation Code of Practice AG 601
AS/NZS 1596	Storage and handling of LP Gas

[26] Where the publication of a new edition of a referenced document results in guidance that is different to that contained in an earlier edition it may not be necessary to update to the new edition. In such circumstances, a risk assessment should be carried out to determine whether the current control measures still meet the duty in the Regulations. Where it is practicable to implement a new or modified control measure that will lower risk below current levels, steps should be taken to implement the measure as the earliest opportunity.

[27] At the time of publication, the *National Code of Practice for the Preparation of Material Safety Data Sheets* was being revised to apply to the production of MSDS as required under the *National Standard for the Storage and Handling of Dangerous Goods* (2000).

AS 1894	The storage and handling of non-flammable cryogenic and refrigerated liquids
AS 2022	SAA Anhydrous Ammonia Code
AS 2030	The verification, filling, inspection, testing and maintenance of cylinders for storage and transport of compressed gases – Cylinders for compressed gases other than acetylene
AS 2809	Road tank vehicles for dangerous goods – Tankers for compressed liquefiable gases
AS 2337	Gas cylinder test stations
AS 2927	The storage and handling of liquefied chlorine gas
AS 3961	Liquefied natural gas – storage and handling
AS 4332	The storage and handling of gases in cylinders
AS 4289	Oxygen and acetylene gas reticulation systems
Class 3	**Flammable and combustible liquids**
AS 1692	Tanks for flammable and combustible liquids
AS 1940	The storage and handling of flammable and combustible liquids
AS/NZS 2106	Methods for the determination of the flashpoint of flammable liquids (closed cup)
Class 4	**Flammable solids; substances liable to spontaneous combustion; substances that in contact with water emit flammable gases**
None identified	
Class 5	**Oxidising agents and organic peroxides**
AS 2714	The storage and handling of hazardous chemical materials – Class 5.2 substances (organic peroxides)
AS 4326	The storage and handling of oxidising agents
Class 6	**Toxic substances**
AS/NZS 4452	The storage and handling of toxic substances
AS 4081	The storage, handling and transport of liquid and liquefied polyfunctional isocyanates

Class 8	**Corrosive substances**
AS 3780	The storage and handling of corrosive substances
Class 9	**Miscellaneous dangerous goods**

None identified

Standards and Codes applicable to an industry or particular 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 applicable to particular design requirements

AS 2809	Road tank vehicles for dangerous goods – Tankers for compressed liquefiable gases
AS 2865	Safe working in a confined space
AS/NZS 2982.1	Laboratory design and construction – General requirements
AS 3873	Pressure equipment – Operation and maintenance
'BCA'	Building Code of Australia

Fire Protection Standards

General

AS 1221	Fire hose reels
AS 1603.5	Automatic fire detection and alarm systems – Manual call points
AS 1670	Automatic fire alarm installations
AS 1851	Maintenance of fire protection equipment (all parts)
AS 2118	Automatic fire sprinkler installations
AS 2419	Fire hydrant installations
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	Specific requirements for water type extinguishers
AS/NZS 1841.3	Specific requirements for wet-chemical type extinguishers[28]
AS/NZS 1841.4	Specific requirements for foam type extinguishers
AS/NZS 1841.5	Specific requirements for powder type extinguishers
AS/NZS 1841.6	Specific requirements for carbon dioxide type
AS/NZS 1841.7	Specific requirements for vaporising – liquid type extinguishers
AS/NZS 1850	Portable fire extinguishers – Classification, rating and performance testing
AS 1851.1	Maintenance of fire protection equipment – Portable fire extinguishers and fire blankets
AS 4265	Wheeled fire extinguishers
AS 2444	Portable fire extinguishers and fire blankets – Selection and location

Standards and codes applicable to the design and specification for electrical equipment and wiring

AS/NZS 2381	Electrical equipment for explosive atmospheres – Selection, installation and maintenance
	Part 1: General requirements
	Part 2: Flameproof enclosure d
	Part 6: Increased safety e
	Part 7: Intrinsic safety i
	Part 8: Special protection s
	Part 9: Type of protection n – Non-sparking.
AS 1482	Electrical equipment for explosive atmospheres – Protection by ventilation

[28] Wet chemical extinguishers covered by AS 1841.3 are designed for fires involving cooking oils and fats, many of which are combustible liquids.

AS 1826	Electrical equipment for explosive atmospheres – Special protection – Type of protection s
AS 1939	Degrees of protection provided by enclosures for electrical equipment (IP Code)
AS 2380	Electrical equipment for explosive atmospheres – Explosion – protection techniques
	Part 1: General requirements
	Part 2: Flameproof enclosure d
	Part 4: Pressurised rooms or pressurised enclosures
	Part 6: Increased safety
	Part 7: Intrinsic safety I
	Part 9: Type of protection n – Non-sparking
AS/NZS 2381	Electrical equipment for explosive atmospheres – Selection, installation and maintenance
	Part 1: General requirements
	Part 2: Flameproof enclosure d
	Part 6: Increased safety e
	Part 7: Intrinsic safety i
	Part 8: Special protection s
	Part 9: Type of protection ‘n’-Non-sparking
AS 2431	Electrical equipment for explosive atmospheres – Encapsulated apparatus – Type of protection m
AS/NZS 3000	Australian/New Zealand wiring rules
AS/NZS 612412	Electrical apparatus for use in the presence of combustible dust.
	Part 1.1: Electrical apparatus protected by enclosures and surface temperature limitation-Specification for apparatus
	Part 1.2: Electrical apparatus protected by enclosures and surface temperature limitation-Selection, installation and maintenance.
	Part 3: Classification of areas where combustible dust are or may be present
IEC 60079	Electrical equipment for explosive gas atmospheres

What is the effect of incorporating documents in a code of practice?

Incorporation of a published technical standard in a code of practice has the effect of making that standard form part of the code. The standards listed in this Code provide guidance to manufacturers, first suppliers, suppliers of dangerous goods, and to occupiers on how to comply with their duties under the Dangerous Goods (Storage and Handling) Regulations 2000.

It is important to note that the standards themselves have not been written specifically as guidance on how to comply with the duties under the Regulations. As such, following the provisions of an incorporated standard may not constitute full compliance with the relevant duties. This is because the standard itself may not deal with all the matters relevant to hazard identification, risk assessment and risk control for the dangerous goods in question. Appropriate judgement needs to be exercised in such circumstances.

To the extent that provisions of an incorporated standard are relevant to a duty under the Regulations, following those provisions (as is the case with any code provision) is regarded as compliance with the relevant duty under the Regulations.

However, as with other code provisions, provisions of an incorporated standard are not mandatory – alternative measures may be used in order to comply with the duties under the Regulations.

It should be noted that many of the published technical standards listed in this Code contain provisions expressed in a mandatory manner, that is, they state that a person "shall" do some action. The mandatory provisions in the published technical standards are not mandatory for the purpose of the Code. Appropriate judgement needs to be exercised in such circumstances and the Regulations should be consulted to determine the regulatory requirements in Victoria.

Appendix 4 A system for ranking risks

The purpose of this appendix is to illustrate just one method that may be used to rank risks relative to each other. There are many other methods that are available that range in complexity from relatively simple qualitative methods to very sophisticated quantitative methods.

Ranking risks can be helpful when there are many risks that must be controlled and you must apply the test of practicability in deciding the order that you control those risks.

Quantifying severity of the risk – S

S	Extent of consequences	Examples
1	Minor	Minor loss of containment Dealt with by site personnel No harm to personnel No environmental damage
2	Medium	Loss of containment Minor fire No structural damage No harm to personnel No long term environmental damage
3	Major	Major loss of containment Fire Some structural damage Minor injuries or personnel affected by fumes Some environmental damage
4	Catastrophic	Total loss of containment Major fire Major structural damage Injuries/harm to personnel requiring hospitalisation >24 hours Death Impact largely confined to the premises
5	Catastrophic external	Significant impact beyond the boundaries of the premises

Likelihood of risk – L

L	Likelihood of occurrence	Indicative frequency
0	Totally eliminated	Zero
1	Rare	Once in a thousand years
2	Unlikely	Once in a hundred years
3	Likely	Once in ten years
4	Certain	Once a year
5	Imminent	More than once a year

Assessing relative level of risk (R = S x L)

R	Assessment of Risk	Priority for Action	
1-2	Low	4	Schedule for action after other risks
3-4	Medium	3	Further improvement required
5+	High	2	Immediate action required
10+	Totally unacceptable.	1	Shutdown unless additional controls instigated immediately

Limitations of the above system

Care should be taken when using the above system. You should note that it only provides a means of ranking of the risks to be controlled. It accounts for the likelihood of the hazard occurring and the severity (that is, the consequence). Although any risk associated with the storage and handling of dangerous goods must be controlled, this requirement is qualified by practicability.

To determine the order for the risks to be controlled, the feasibility of mitigating the risk, (that is, the availability and suitability of ways to do this) and the cost of mitigating the risk must be considered. It is conceivable that you will identify a risk that needs to be controlled for which the likelihood and severity are relatively low but can be controlled easily and at low cost. In such circumstances, it may be practicable to control that risk before other risks that have a greater likelihood or severity.

You should also note that the accuracy of the initial ranking of risk is affected by the judgement you make about the likelihood of an incident occurring and its severity. For example, determining if an incident will occur once in a thousand years or once in ten years can be made by a qualified risk assessor using actuarial tables or by relying on some other, less scientific process. The assessment you make about the likelihood will have a significant effect on the ranking of risks that are to be controlled.

Appendix 5 Chemical and physical properties of dangerous goods

Dangerous goods may exhibit a range of hazards far broader than those identified by their classification or subsidiary risks.

You will need to consider the chemical and physical properties of the dangerous goods when identifying hazards. This list identifies many of the properties of dangerous goods that are hazards under some circumstances. However, there may be other properties that present a hazard in the conditions that apply to the particular storage and handling activity.

Properties which may constitute a hazard

A. 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% solution

B. Flammability
Flashpoint (closed cup)
Flashpoint (open cup)
firepoint
Auto ignition temperature
Flammability range LEL
UEL
Evolves/produces hazardous combustion products
Explosion potential

C. Biological Hazards
Exposure limits/Toxicity
Irritant/sensitiser
Carcinogen (known / suspected)
Mutagen

D. Corrosivity
Skin
Metal
Other material

E. Reactivity
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

G. Environmental
Atmospheric pollutant
Ozone depleter
Marine pollutant
Ground water pollutant
Soil pollutant

Appendix 6 Guidance in relation to particular dangerous goods

A. Class 4 dangerous goods (Class 4.1, 4.2 and 4.3)

Class 4 dangerous goods are goods that have a very broad range of chemical and physical properties. Guidance on their storage and handling cannot readily be categorised in the same way as other classes of dangerous goods.

Where packaged dangerous goods of Class 4 are stored or handled in a room, the room should be ventilated and, if the goods can generate flammable gases or vapours or combustible dusts, explosion vents should be considered.

If the dangerous goods are sensitive to light, heat or temperature shifts, the packages should be protected from exposure to weather and from direct sunlight.

If the Class 4 dangerous goods are solids in powdered or granulated form, the floor surface of the room in which they are stored or handled should be incapable of producing a spark.

Where the stability of the dangerous goods is reliant on the dangerous goods being wetted with liquids such as stabilisers, the packages should be inverted gently as often as necessary to prevent the goods in the upper section of the packages from drying out. Proper stock control measures should also be put in place to avoid prolonged storage. Similarly, the concentration of any inhibitor present should be checked often enough to ensure that the concentration stays within the recommended levels set by the manufacturer of the dangerous goods.

Fire protection for a room in which dangerous goods of Class 4.3, or subsidiary risk 4.3 are stored or handled should be determined with the involvement of the emergency services authority. Because these dangerous goods emit flammable gases in contact with water, an alternative fire fighting medium must be considered.

The design and operation of the tanks for Class 4.2 and Class 4.3 dangerous goods should include measures to prevent moisture entering the tanks. The operability and accessibility of valves and fittings should be considered including the need to provide remote operation for primary shut off valves at the tank.

If the dangerous goods will ignite when exposed to the atmosphere (for example, phosphorus UN Number 1381 or 2447), establish a method to contain any spillage so that air cannot come into contact with the spilt dangerous goods. This will limit the effect of any fire, should it occur.

B. Un-odorised Liquefied Petroleum Gas

Un-odorised liquefied petroleum gas is particularly hazardous due to the absence of any discernible odour. Even a small, undetected leak may result in the accumulation of an explosive atmosphere.

The following guidance should be considered in addition to specific guidance prepared by the providers of the gas.

- The storage and handling of non-odorised liquefied petroleum gas should be kept to a minimum and restricted to those uses for which no less hazardous alternative is practicable, such as Aerosol propellant.

- The area where it is stored and handled should be well ventilated or in an open area or room designed for that purpose fitted with explosion ventilation; and

- Gas detection equipment should be installed where an explosive atmosphere may develop.

C. Potable (alcoholic beverages and ethanol solutions) flammable liquids

Alcoholic Beverages UN 3065 and Ethanol Solutions UN 1170 containing not more than 24 per cent ethanol by volume are not dangerous goods for the purposes of the Regulations, based on Special Provision 144 of the ADG Code.

Alcoholic Beverages containing more than 24 % but not more than 70% ethanol by volume are assigned to Packing Group III by Special Provision 145, even though their flashpoints may be lower than 23 °C.

AS 1940 provides useful guidelines for the storage and handling of potable flammable liquids, in particular, the design of storage tanks, flanges, pipework and valves.

However, some parts of that standard may be unduly restrictive when considering the physical and chemical properties of potable liquids. Due to their miscibility with water, sufficient dilution with water will render the potable liquids harmless. Therefore:

- for spillage control, dilution may be preferable to containment; and
- an adequate sprinkler deluge system will provide effective fire protection.

In considering whether dilution is a safe option, environmental concerns need to be considered.

Particular attention should be given to the need for adequate and appropriate ventilation in any storage and handling area for potable liquids from the point of view of flammability and occupational exposures (such as to avoid intoxication).

Appendix 7 Engineering controls for storage and handling sites

This Appendix identifies a number of engineering controls that should be considered when designing a significant storage and handling site, such as a dangerous goods store, processing plant or factory where dangerous goods are used.

The appendix is by no means comprehensive and there are many other engineering controls that may be relevant to the control of dangerous goods risks. The documents listed in appendix 3 contain more specific controls that are relevant to particular goods and circumstances.

ENGINEERING CONTROLS	DISCUSSION
LOCATION **Separation from property on adjoining premises (includes "protected works")**	The storage and handling system should be sufficiently isolated from other facilities as to protect the system and the dangerous goods from external hazards, and the other facilities from the dangerous goods. Appendix 3 documents assign widely varied distances, depending on Class, Packing Group and quantity of dangerous goods, and whether in closed or opened packages. Alternative solutions are to use: • distances from appropriate Class Standard, such as AS 1940 for Class 3 • distances from AS/NZS 3833 for mixed classes • distances from other codes of practice; or • other distances based on risk assessment. AS 1940 assigns distances from 0 to 50 m for flammable and combustible liquids, depending on Class, Packing Group and Quantity. Others such as AS 3780 (Class 8) also vary with Packing Group and have different distances for closed and opened packages, for liquids and solids in bulk and for larger bulk storages, ranging from 3 to 15 m. AS/NZS 3833 has a different approach for goods with a flammability hazard than others. Alternatives: • distances from appropriate Class Standard • distances from AS/NZS 3833 for mixed classes • distances from other codes of practice; or • other distances based on risk assessment.
LOCATION **Separation from other dangerous goods storage**	Each of the dangerous goods Australian Standards specifies minimum separation distances between dangerous goods storages. In some cases, the distances from protected works/places apply. These distances may be greater for storages on other premises. For most dangerous goods with a flammability hazard, these distances vary with quantity. Distances given in the various Standards are designed to provide safety with most possible combinations of goods of the classes concerned. Because for example some Class 8 react dangerously with some Class 5.1, distances given assume that all goods of these classes are incompatible, even though this can be demonstrated to be false with some combinations. Therefore, for many combinations lesser distances may be determined by risk assessment rather than by following minimum separation distances set out in Appendix 3 documents. For this to be effective, however, the assessment must be based on the specific hazards of the actual dangerous goods being stored and handled rather than on Class considerations only.

ENGINEERING CONTROLS	DISCUSSION
Separation from on-site facilities	Some Codes and Standards permit lesser distances between dangerous goods storage and other facilities on the same premises than apply to similar facilities on other premises. Others require full isolation distances. Given that the occupier will normally have control of the other on-site facilities and that emergency plans and procedures would be expected to include those facilities, a risk assessment may well determine that lesser distances are necessary provided other controls are put in place. Alternatives: • distances determined by risk assessment; • on-site facilities distances as determined from Appendix 3 documents; • protected works distances from Appendix 3 documents.
Separation from ignition sources	For dangerous goods with a flammability or explosion hazard, distances determined from AS 2430 should be regarded as minimum. Because of the potential impact of fires involving dangerous goods, ignition sources should be kept away, as far as practicable, from all dangerous goods installations, even those without a flammability or explosion hazard. Advice on safe ignition source distances is found in the individual class Standards and in AS/NZS 3833.
Separation from external hazards **Above flood levels**	Separation from external hazards needs to be determined on a case by case basis, depending on the nature of those hazards and the types of dangerous goods stored and handled. Consultation may need to take place with neighbours, utility providers, local government and the fire brigade. As most dangerous goods and combustible liquids are hazardous to the environment, areas where they are stored and handled should as far as practicable be above recorded flood levels. Where this is not practicable, the dangerous goods and combustible liquids should be in closed, impervious containers that are appropriately restrained. Consultation with local government
BUILDING CONSTRUCTION Approvals	As with all building developments, buildings for storage and handling of dangerous goods must comply with the Building Code of Australia together with planning and local government requirements.
BUILDING CONSTRUCTION Suitable for purpose	Buildings for the storage and handling of dangerous goods should: • be compatible with or protected from those goods; • as far as practicable be of non combustible construction; • be designed to contain and stop the spread of an incident; • if necessary, be designed with a frangible panel or roof or other explosion relief devices to allow any internal explosion to dissipate with minimal structural damage to the building or impact on surrounding facilities; • provide suitable protection from adjoining and surrounding installations by means of appropriately fire rated screen walls and doors.

ENGINEERING CONTROLS	DISCUSSION
STORAGE SYSTEM CONSTRUCTION **Suitable for purpose**	Construction of racking and shelving should be compatible with or protected from the dangerous goods. Racking and shelving should be located so as to provide ready access to all storage, both for normal operation and in emergencies.
PROVISION OF SAFE ATMOSPHERE **Local Exhaust Ventilation**	Mechanical extraction of atmospheric contaminants at the source is usually more effective in providing a safe working atmosphere than the provision of general ventilation. Extraction vents should be placed and have sufficient capacity under all atmospheric conditions so as to prevent the escape of contaminants into the work area. Discharge points should be located so as to prevent further contamination of this or any other work area. 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. The exhaust system should be resistant to attack by the vapours, mists and dusts being exhausted. Refer to AS 1482 *Electrical equipment for explosive atmospheres –Protection by ventilation* for further guidance.
Natural Ventilation	Most dangerous goods Standards and Codes provide some guidelines on the design of natural ventilation systems. Many dangerous goods vapours are heavier than air, so to prevent build up of hazardous concentrations, vents should normally be provided at a level immediately above any spill containment, on opposite sided of room or space to provide for air flow. High level ventilation may also be necessary for temperature control. Vents should be located away from any external potential ignition sources. Vents in screen wall negate any fire protection or vapour barrier effects.
SAFE ATMOSPHERE **Mechanical Ventilation**	Inlet and outlet vents should normally be located on opposite sides of the store at low levels to provide laminar airflow across the floor as far as practicable. Where both inlet and exhaust are mechanically assisted, capacities and rates should be adjusted to ensure that the pressure inside the store never exceeds that outside, and especially in any adjoining offices or other work areas to prevent air flow from the store.
Exhaust cleaning	Where any exhaust ventilation may carry atmospheric contamination that may cause environmental pollution or nuisance, it may be necessary to fit some mechanism to clean the exhaust prior to discharge to atmosphere. Suitable mechanisms may include various types of filtration for particulates, or absorbents, catalysts, scrubbers or burners for other contaminants.

ENGINEERING CONTROLS	DISCUSSION
SPILLAGE CONTROL	The most effective way to control spillage is prevention. However, absolute prevention cannot be guaranteed so reliance must be placed on careful design and selection of equipment coupled with sound operating procedures and training. Care should be taken to ensure the spillage control system selected does not itself introduce new risks. For example, high bund walls around a package store will usually necessitate long or steep ramps being provided for materials handling equipment (forklifts). Such ramps can cause load instability. Other methods of spill retention are generally preferred in package stores and other work areas accessed by loaded forklifts. Spillage control should provide sufficient capacity to hold the largest foreseeable spill under any possible conditions. All dangerous goods Standards and Codes give guidelines on spill capacity calculation.
SPILLAGE CONTROL **Bunding**	Bunding is the most frequently specified system for containing dangerous goods spillages from storage and handling systems. It has the convenience of being able to be retrofitted to existing buildings and outdoor installations. Bunding is the preferred method for above ground bulk storage installations. Bund walls may be constructed from a variety of materials including: • concrete kerbing, preferably reinforced and integrally constructed with the flooring. If separate, must be firmly anchored, adhered and sealed to withstand the inevitable traffic damage; • brick and concrete block walls are only acceptable where they are protected from damage by materials handling operations; and • steel angles or other sections firmly anchored to the floor and sealed, usually with a silicone based sealant. Temporary bund construction materials include: • raised earthen walls, preferably with an impervious membrane unless contingency plans are in place for the recovery or disposal of contaminated earth after a spill; and • bags of sand or other compatible absorbent material. For specially constructed bunded stores, gently sloping floors away from entries may avoid the need for ramps. However such slopes need to be minimised to avoid instability of materials handling equipment when placing loads in high rise racking. External bunds should be provided with additional capacity to deal with rainwater and run off and with a secure system for the removal of that water. External bunds should therefore be subjected to the full hazard identification, risk assessment and control process.

ENGINEERING CONTROLS	DISCUSSION
SPILLAGE CONTROL **Drains, tanks, sumps etc.**	Draining spilled material to an underground tank or sump or an external pit avoids the access problems associated with bunds. However the tank, pit or sump itself becomes a potential source of hazards, as does the network of drains. Generally each such containment system should be exclusively for the effluent from one store or work area unless all the dangerous goods and combustible liquids are compatible and effective provision is made to prevent flashback. Such containment systems should, if at all possible, be prevented from collecting rainwater. These systems are frequently out of sight so controls need to be in place to ensure they are fully available for use when required. They should therefore be subjected to the full hazard identification, risk assessment and control process.
ISOLATION OF INCOMPATIBLE GOODS **Screen Walls and Vapour Barriers**	Separation distances between incompatible goods may be measured around screen wall and vapour barriers provided they will give equivalent protection to the required separation distance. For dangerous goods having a flammability hazard, screen walls must have an appropriate fire resistance level (FRL). Useful guidelines on the use of screen walls is found in AS 1940 and AS/NZS 3833.

Appendix 8 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	30,000 L
DG T3	LP Gas	2.1	n/a	1075	n/a	a/g	3,000 L
DG T4	Hydrogen Peroxide	5.1	8	2014	II	a/g	18,000 L

u/g — underground
a/g — aboveground
n/a — not applicable

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	UN No.	PG	Average	Maximum
PS1	Sodium Picramate	4.1		1349	I	20 kg	50 kg

2.2 Other packaged dangerous goods

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

3. MANUFACTURING AREAS

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

Appendix 9 Sample emergency procedures pocket card

Outside

FIRE PROCEDURES

On hearing alarm:

- Make safe whatever you are doing
- Ensure all roadways and emergency accesses in your area are clear
- Move as quickly as possible to your designated assembly area
- Have your name checked off immediately on arrival
- Watch out for emergency vehicles
- Avoid moving through smoke and any signs of emergency activity
- Follow instructions from Area Wardens
- Take contractors and visitors with you

If you discover a fire:

1. Make sure alarm is raised
2. If possible, move materials in danger away from the fire to stop it spreading
3. Avoid breathing smoke or fumes
4. Fight the fire using extinguisher or hose reel if trained to do so
5. If not involved in fire fighting, keep away and go to assembly area

NO HEROICS!

[Company Details]

SITE EMERGENCY PROCEDURES

Emergencies include:

- FIRE
- COLLISION
- Any INJURY to people
- CHEMICAL SPILL or LEAK
- Any other incident threatening life, health, property or the environment

In any emergency:

1. Raise the alarm
2. Notify your Supervisor
3. Warn anyone in danger
4. Then give whatever assistance it is safe for you to give
5. If not involved with the Emergency, keep away from the scene.

NEVER PUT YOURSELF AT RISK

CHEMICAL EMERGENCY

If you discover a dangerous goods or chemical spill or leak:

- Keep away until positively identified
- Keep upwind
- Avoid all contact with material
- Avoid breathing gas, fumes, mist or dust
- Immediately notify Supervisor
- Warn nearby people
- Keep all ignitions sources away

Assess if it is a Dangerous Occurrence, based on type and quantity of leaking substance

Raise alarm if Dangerous Occurrence

Obtain information from:

- Manifest
- Shipping Documentation
- Labels and Placards
- EPG or HB76
- MSDS

Observe HAZCHEM precautions

Stop leakage if safe to do so

Prevent spillage from entering drains

HAZCHEM INTERPRETATION

NUMBER	
1	Water Jets
2	Water Fog
3	Foam
4	Dry Agent

FIRST LETTER			
P	V	Full Protective Clothing*	DILUTE
R		Full Protective Clothing*	
S	V	Breathing Apparatus	
S	V	Breathing Apparatus for Fire Only	
T		Breathing Apparatus	
T		Breathing Apparatus for Fire Only	
W	V	Full Protective Clothing*	CONTAIN
X		Full Protective Clothing*	
Y	V	Breathing Apparatus	
Y	V	Breathing Apparatus for Fire Only	
Z		Breathing Apparatus	
Z		Breathing Apparatus for Fire Only	

SECOND LETTER	
E	Consider Evacuation

Note V: Danger of violent reaction or explosion
* Full Protective Clothing includes Breathing Apparatus

Appendix 10 Glossary of terms

There a number of key terms used throughout this Code. Some of these terms are defined in the Regulations; others are defined in the **Dangerous Goods Act 1985** or **Occupational Health and Safety Act 1985**. They are reproduced here for convenience.

Act means the Dangerous Goods Act 1985.

ADG Code means the document known as the Australian Code for the Transport of Dangerous Goods by Road and Rail (Sixth edition or a later prescribed edition), as amended from time to time.

Administrative controls means controls that use systems of work to eliminate or reduce risk and that do not involve engineering controls or use of personal protective equipment.

AS 1940 means the Australian Standard entitled "The storage and handling of flammable and combustible liquids", published by the Standards Association of Australia, as amended from time to time.

AS 2106 means the Australian Standard entitled "Methods for the determination of the flash point of flammable liquids (closed cup)", published by the Standards Association of Australia, as amended from time to time.

AS 2430 means the Australian Standard entitled "Classification of Hazardous Areas", published by the Standards Association of Australia, as amended from time to time

AS2700S – 1996 (R13) means the Australian Standard entitled "Colour Standards for general purposes – Signal Red", published by Standards Australia, as amended from time to time.

AS2700S – 1996 (Y11) means the Australian Standard entitled "Colour Standards for general purposes – Canary", published by Standards Australia, as amended from time to time.

Boiling point has the meaning given to the term in AS 1940.

Bulk means –

(a) a quantity of dangerous goods in a container having a capacity greater than the maximum container size specified for packaged dangerous goods of that type; or

(b) solid dangerous goods in an undivided quantity exceeding 400 Kg, that are not in a container.

C1 combustible liquid means liquid dangerous goods that have –

(a) a flashpoint that is higher than 61°C, but no higher than 150°C; and

(b) a firepoint that is less than the boiling point.

Capacity means the internal volume of a container at a temperature of 15° C expressed in litres.

Class, in relation to dangerous goods, has the meaning as it has in regulation 2.3 of the Commonwealth Regulations.

Class label means a label of a type specified in the ADG Code for the Class of dangerous goods.

Combustible liquid means any liquid dangerous goods whose flashpoint is higher than 61°C.

Commonwealth Regulations means the Road Transport Reform (Dangerous Goods) Regulations 1997 of the Commonwealth, as amended from time to time.

Compatible in relation to 2 or more substances or items, means that they will not react together to cause a fire, explosion, harmful reaction or the evolution of flammable, toxic or corrosive vapours.

Container means 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.

Control temperature means 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, published by the United Nations, as amended from time to time.

Current MSDS means the most recent MSDS that complies with regulation 306 or 307 and, where applicable, has been reviewed and amended in accordance with regulation 308.

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

(a) Class 1 dangerous goods in that Code are not dangerous goods for the purposes of this Act; and

(b) the following substances and articles are also dangerous goods –

  (i) explosives; and

  (ii) combustible liquids having a flashpoint higher than 61°C; and

  (iii) any substance or article declared to be dangerous goods by an Order in Council made under section 9B.

Dangerous goods in transit means dangerous goods that –

(a) are supplied to premises in containers that are not opened at the premises; and

(b) are not used at the premises; and

(c) are kept at the premises for a period of not more than 5 consecutive days.

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

(a) an explosion, fire, harmful reaction or the evolution of flammable, corrosive or toxic vapours involving dangerous goods; or

(b) the escape, spillage or leakage of any dangerous goods.

Emergency services authority, in relation to any premises where dangerous goods are stored or handled, means –

(a) the Metropolitan Fire and Emergency Services Board; or

(b) the Country Fire Authority –

whichever is appropriate to the location of the premises

Employee means a person employed under a contract of employment or under a contract of training.

Employer has the same meaning as it has in the **Occupational Health & Safety Act 1985**.

Firepoint has the same meaning as it has in AS 1940.

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

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

First supplier, in relation to dangerous goods, means a person who –

(a) has not manufactured the dangerous goods in Victoria; and

(b) is, or intends to be, the first person to supply the dangerous goods to another person.

Flashpoint means the temperature at which a liquid first evolves vapour in a sufficient quantity to be ignited when tested in accordance with –

(a) AS 2106; or

(b) a technical standard that specifies a test that is equivalent to that specified in AS 2106.

Goods too dangerous to be transported means goods of that description that are declared to be dangerous goods by an Order in Council made under section 9B of the Act.

Handling includes –

(a) conveying the dangerous goods within premises, including within pipework; and

(b) manufacturing, processing, using, treating, dispensing, packing, supplying, transferring, rendering harmless, destroying and disposing of the dangerous goods.

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

(a) an explosion, fire, harmful reaction or the evolution of flammable, corrosive or toxic vapours involving dangerous goods; or

(b) the escape, spillage or leakage of any dangerous goods.

Hazardous area means a hazardous area within the meaning of AS 2430.

Hazardous substance has the same meaning as it has in the Occupational Health and Safety (Hazardous Substances) Regulations 1999.

Health and safety representative means a person who has been elected as a health and safety representative under section 30 of the Occupational Health and Safety Act 1985 and has not ceased to be a health and safety representative.

Ignition source means a source of energy sufficient to ignite a flammable atmosphere and includes –

(a) a naked flame, exposed incandescent material, an electrical welding arc, a mechanical or static spark;

(b) any electrical or mechanical equipment that is not specifically designed to be used in a hazardous area.

Incident means –

(a) an emergency; or

(b) an unintended event that, but for the intervention of a risk control measure or human intervention, is likely to have resulted in an emergency.

IBC (intermediate bulk container) means a rigid or flexible portable packaging for the transport of dangerous goods that –

(a) has a capacity of not more than:

(i) for solids of Packing Group I in a composite, fibreboard, flexible, wooden or rigid plastics or wooden container – 1,500 litres; or

(ii) for solids of Packing Group I in a metal container – 3,000 litres; or

(iii) for solids or liquids of Packing Groups II and III – 3,000 litres;

(b) is designed for mechanical handling; and

(c) is resistant to the stresses produced in usual handling and transport.

Manifest means an inventory of dangerous goods.

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

(a) making non-dangerous goods from dangerous goods;

(b) making non-dangerous goods from non-dangerous goods, where in the course of the process dangerous goods are made;

(c) the unmaking, altering, repairing or remaking of dangerous goods.

MSDS means a Material Safety Data Sheet.

Occupier, in relation to any premises (other than licensed premises that are a vehicle or boat), includes a person who –

(a) is the owner of the premises;

(b) exercises control at the premises under a mortgage, lease or franchise; or

(c) 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

and, in relation to licensed premises that are a vehicle or boat, includes a person who –

(a) is the owner of the vehicle or boat; or

(b) is in charge of the vehicle or boat.

Package means the complete product of the packing of dangerous goods for transport of the goods and consists of the goods and their packaging.

Packaged dangerous goods means –

(a) Class 2 dangerous goods that are in a container with a capacity of not more than 500 litres; or

(b) goods too dangerous to be transported or dangerous goods of a Class other than Class 2 that are in a container with –

(i) a capacity of not more than 450 litres; or

(ii) a net mass of not more than 400kg; or

(c) C1 combustible liquids in a container with a capacity of not more than 450 litres.

Packaging means the container in which dangerous goods are received or held for transport, including anything that enables the container to receive or hold the goods or to be closed.

Packing Group has the same meaning as it has in regulation 2.5 of the Commonwealth Regulations.

Pipework means –

(a) a pipe or an assembly of pipes; and

(b) associated pipe fittings, valves and pipe accessories –

used to convey dangerous goods.

Plant includes any machinery, equipment, appliance, implement and tool, any component thereof and anything fitted connected or appurtenant thereto.

Pool chlorine means calcium hypochlorite, dichloroisocyanuric acid and its salts or trichloroisocyanuric acid

Practicable means practicable having regard to –

(a) the severity of the hazard or risk in question; and

(b) the state of knowledge about that hazard or risk and any ways of removing or mitigating that hazard or risk; and

(c) the availability and suitability of ways to remove or mitigate that hazard or risk; and

(d) the cost of removing or mitigating that hazard or risk.

Premises has the meaning given to term in the Act, but does not include a vehicle or ship or a boat.

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

Proper Shipping Name has the same meaning as it has in the ADG Code.

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

Risk means the likelihood of injury to persons or damage to property being caused by a hazard.

Stabilisers means any substances (including any diluent, inhibitor, desensitiser, phlegmatiser, 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 it has in the Commonwealth Regulations.

Subsidiary Risk label, in relation to dangerous goods, means a label of a type specified in the ADG Code for the Subsidiary Risk of the dangerous goods.

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

Transfer means any process which involves –

(a) the filling, loading, pumping or pouring of dangerous goods into a container; or

(b) the discharging, unloading, pumping or pouring of dangerous goods from a container.

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

UN Number, or **UN** followed by a number, in relation to dangerous goods, means the identification serial number shown in Appendix 1 and in Column 1 of Appendix 2 of the ADG Code in relation to those goods.

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