

Australian/New Zealand Standard™

The storage and handling of Class 4 dangerous goods



AS/NZS 5026:2012

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee CH-009, Safe Handling of Chemicals. It was approved on behalf of the Council of Standards Australia on 13 January 2012 and on behalf of the Council of Standards New Zealand on 24 January 2012.

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Australian/New Zealand Standard™

The storage and handling of Class 4 dangerous goods

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PREFACE

This Standard was prepared by the Standards Australia/Standards New Zealand Committee CH-009, Safe Handling of Chemicals. Preparation of the Standard was commenced following a request from the chemicals industry that a series of Standards be prepared on the storage and handling of dangerous goods.

This Standard incorporates Amendment No. 1 (May 2013). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

This Standard deals with dangerous goods of Class 4, as classified in the UN *Recommendations on the Transport of Dangerous Goods—Model Regulations*, the ADG Code and the HSNO Act.

The purpose of this Standard is to promote safety wherever Class 4 dangerous goods are stored and handled, by providing requirements and recommendations that are based on industry best practices.

Australian and New Zealand references are separated by a slash (/).

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of appendices to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is for information and guidance only.

Statements expressed in mandatory terms in notes to tables are requirements of this Standard. Statements appearing as notes within the main text provide information only.

The series of publications covering the storage, handling and transport of dangerous goods presently comprises the following:

AS

1678	Emergency procedure guides—Transport (series)
1894	The storage and handling of non-flammable cryogenic and refrigerated liquids
1940	The storage and handling of flammable and combustible liquids
2187	Explosives—Storage, transport and use (series)
2507	The storage and handling of agricultural and veterinary chemicals
2508	Safe storage and handling information cards (series)
2714	The storage and handling of organic peroxides
2809	Road tank vehicles for dangerous goods (series)
3780	The storage and handling of corrosive substances
3846	The handling and transport of dangerous cargoes in port areas
3961	The storage and handling of liquefied natural gas
4289	Oxygen and acetylene gas reticulation systems
4326	The storage and handling of oxidizing agents
4332	The storage and handling of gases in cylinders
5034	Installation and use of inert gases for beverage dispensing
HB 76	Dangerous goods—Initial emergency response guide

AS/NZS

- 1596 The storage and handling of LP Gas
- 2022 Anhydrous ammonia—Storage and handling
- 2927 The storage and handling of liquefied chlorine gas

AS/NZS

- 3833 The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers
- 4081 The storage and handling of liquid and liquefied polyfunctional isocyanates
- 4452 The storage and handling of toxic substances
- 4681 The storage and handling of Class 9 (miscellaneous) dangerous goods and articles
- 60079.10.1 Explosive atmosphere—Part 10.1: Classification of areas—Explosive gas atmospheres

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**The storage and handling of Class 4 dangerous goods**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements and recommendations for the safe storage and handling of flammable solids, substances liable to spontaneous combustion, and substances that in contact with water emit flammable gases, i.e. dangerous goods that—

- (a) in Australia, are classified as Division 4.1, 4.2 or 4.3 in the Australian Dangerous Goods Code (ADG Code); and
- (b) in New Zealand, meet the 4.1, 4.2 or 4.3 classification criteria of the *Hazardous Substances and New Organisms Act*, 1996, referred to as ‘the HSNO Act’.

The Standard also applies to other dangerous goods that are assigned Division 4.1, 4.2 or 4.3 subsidiary risks by the ADG Code, except where more stringent requirements apply under another relevant Standard or regulation.

NOTES:

- 1 In Australia, this Standard is not intended to apply to consumer products and commercial cleaning products that are flammable liquid soaked solids or flammable liquid containing solids.
- 2 Dangerous goods are classified as such and listed in the *UN Recommendations on the Transport of Dangerous Goods—Model Regulations*. They are also listed in the ADG Code and HSNO Act.
- 3 Information on the hazards presented by Class 4 dangerous goods is provided in Appendix A.

1.2 APPLICATION**1.2.1 Where this Standard applies**

This Standard applies in locations that are generally industrial, commercial or rural in nature including research institutions. Its requirements apply in conjunction with, but do not take precedence over, any regulations that apply in any area.

NOTES:

- 1 An installation may come under the regulatory control of several authorities having differing areas of responsibility, and an agreement from one does not necessarily constitute an agreement from others.
- 2 The Building Code of Australia (BCA)/New Zealand Building Code (NZBC) applies to all matters relating to building works.

1.2.2 Where this Standard does not apply

This Standard does not apply to the following:

- (a) The transport of Class 4 dangerous goods, which is covered by other rules and Codes, e.g. the ADG Code/NZS 5433 or the IMDG Code.
- (b) The handling or transport of Class 4 dangerous goods in port areas which, in Australia, is covered by AS 3846.
- (c) The retail storage of Class 4 dangerous goods in retail packages, which in Australia is addressed in AS/NZS 3833.
- (d) The manufacture or processing of Class 4 dangerous goods.

1.2.3 Relationship with regulations

The requirements of this Standard apply in conjunction with, but do not take precedence over, any government regulations that apply in any area.

NOTES:

- 1 In Australia, some Class 4 dangerous goods may also be classified as workplace hazardous substances. As such they will also be subject to the legislative requirements relating to workplace hazardous substances. The requirements of the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) may also apply.
- 2 In Australia, *the National Standard for the Control of Major Hazard Facilities* (NOHSC:1014) may apply to the installation, depending on the size of the storage.
- 3 In New Zealand, all Class 4 substances (excluding items such as manufactured articles) are classified as hazardous substances under the HSNO Act. As such they are subject to the requirements of this Act. Whilst this Standard encompasses some of these requirements, it does not purport to specify all of them.
- 4 In New Zealand, Class 4 substances are subject to the legislative requirements of the *Land Transport Rule: Dangerous Goods 2005* during transport.
- 5 Regulatory authorities controlling various desensitized explosives may have their own regulations or may otherwise impose conditions which differ from this Standard. Recognition is given to the prerogative of such regulatory authorities to set such legal requirements and no further reference thereto is made in this Standard.

1.2.4 Minor storage (Australia only)

For minor storage of Class 4 dangerous goods (as defined in Clause 1.4.8), only Sections 1, 2, 3, 11 and 12 of this Standard apply.

1.2.5 Subsidiary risks

Where the Class 4 dangerous goods being kept have one or more subsidiary risks/hazard classifications, reference shall be made to the Australian or New Zealand legislation relevant to the Classes of those risks and the more stringent requirements shall apply.

NOTES:

- 1 Where there is no relevant Australian or New Zealand Standard for a particular Class of subsidiary risk, reference should be made to the relevant regulatory authority. The appropriate storage requirements may need to be determined by risk assessment, taking into consideration the specific properties of the substances being stored.
- 2 Under the HSNO Act, substances are assigned classifications according to their properties and all classifications are equally applicable.

1.2.6 Categories, divisions and descriptions of dangerous goods of Class 4

(Australia) For the purpose of this Standard, the categories, divisions and descriptions given in Table 1.1 apply.

(New Zealand) Under the HSNO Act a hazardous substance is assigned a hazard class, subclass and category; for the purpose of this Standard, the descriptions given in Table 1.1 apply.

A1

TABLE 1.1
CATEGORIES, DIVISIONS AND DESCRIPTIONS
OF CLASS 4 DANGEROUS GOODS

Category	Division and description of dangerous goods	
	ADG and NZS 5433 Classification	HSNO Act Classification
A	Division 4.1 (self-reactive and related substances; desensitized explosives)	4.1.2A, 4.1.2B, 4.1.2C, 4.1.2D, 4.1.2E, 4.1.2F, 4.1.2G
	Division 4.2 (pyrophoric substances)	4.2A
B	Division 4.1 PG I	Class 4.1.1A, 4.1.3A
	Division 4.2 PG I	Class 4.2A
	Division 4.3 PG I	Class 4.3A
C	Division 4.1 PG II	Class 4.1.1B, 4.1.3B
	Division 4.2 PG II	Class 4.2B
	Division 4.3 PG II	Class 4.3B
D	Division 4.1 PG III	Class 4.1.3C
	Division 4.2 PG III	Class 4.2C
	Division 4.3 PG III	Class 4.3C

1.3 REFERENCED DOCUMENTS

A list of documents referred to in this Standard is provided in Appendix B.

A1

1.4 DEFINITIONS

NOTE: Definitions relating to containers are aligned with those of the *Policy Proposal for Workplace Chemicals Model Regulations* as prepared by Safe Work Australia rather than the ADG code.

For the purpose of this Standard, the definitions below apply.

1.4.1 Access

A means by which a person or vehicle can approach or leave a specific location. The term includes walkways, platforms, stairways, ladders, roads and all provisions for safe entry and exit.

1.4.2 ADG Code

A1

The *Australian Code for Transport of Dangerous Goods by Road and Rail*, published by the National Transport Commission.

1.4.3 Boundary

The perimeter of the whole of the site under the same occupancy as the storage area.

1.4.4 Bulk

(Australia) Dangerous goods are in bulk if—

- (a) they are in a container or receptacle that has a capacity of more than 500 L; or
- (b) there is more than 500 kilograms of the goods in a container; or
- (c) the goods are not in a container and there is more than 500 kg of the goods in an undivided quantity.

(New Zealand) Hazardous substances in the form of—

- (i) a liquid, in a container in an undivided quantity exceeding 450 L or
- (ii) solids, in a container in an undivided quantity exceeding 400 kg.

1.4.5 Bund

An impervious embankment of earth, or a wall of brick, stone, concrete or other suitable material which may form part or the entire perimeter of the compound.

1.4.6 Capacity

The total internal volume of the container at a temperature of 15°C, expressed in litres (L).

1.4.7 Class (of dangerous goods)

(Australia) The number assigned to dangerous goods which exhibit a common single or most significant risk, determined from the criteria of the *UN Manual of Tests and Criteria* and listed in the ADG Code.

(New Zealand) The hazard classification assigned to a hazardous substance in accordance with the HSNO Act to represent the hazard property of the substance. Each substance may have multiple classifications.

1.4.8 Class 4 dangerous goods

Flammable solids; substances liable to spontaneous combustion; substances that, in contact with water, emit flammable gases.

Class 4 is divided into three divisions as follows:

- (a) Division 4.1 (see Clause 1.4.16);
- (b) Division 4.2 (see Clause 1.4.17); and
- (c) Division 4.3 (see Clause 1.4.18).

NOTE: The HSNO Act does not use the term 'division' as it is covered by the term 'subclass', however for simplicity in this Standard, the term 'Division' is used throughout the document.

1.4.9 Combustible materials

- A1 | Materials that can contribute to sustaining a fire, and are deemed combustible when tested in accordance with AS 1530.1 for Australia, or NZS/AS 1530.1 for New Zealand.

1.4.10 Compound

An area bounded by ground contours or by a bund, and intended to retain spillage or leakage.

NOTES:

- 1 This includes the floor of the compound.
- 2 A pit or tank may sometimes be used for the same purpose.

1.4.11 Confined space

A space of any volume as defined by AS/NZS 2865.

1.4.12 Container

Anything in or by which dangerous goods are wholly or partly encased, covered, enclosed, contained or packed, whether such a thing is empty or partially or completely full.

1.4.13 Corrosivity

The potential corrosive chemical action on other materials, in particular, containers, vessels, equipment and living tissue (including skin).

1.4.14 Dangerous goods

(Australia) Substances and articles that—

- (a) satisfy the UN tests and criteria for determining whether they are dangerous goods; or
- (b) are listed in the ADG Code or are determined to be dangerous goods by the regulatory authority.

(New Zealand) Substances and articles that have one or more hazard Classes assigned to them in accordance with the HSNO Act, including packaging and empty containers that have not been cleaned after containing hazardous substances.

In New Zealand, 'dangerous goods' is a term used by the *Land Transport Rule: Dangerous Goods 2005*, which applies during transport. For the storage and handling of substances, the HSNO Act applies, and the term 'hazardous substances' is used. For the purposes of this Standard the term dangerous good is synonymous with hazardous substance and both are used interchangeably throughout the document

NOTE: UN tests and criteria are specified in the *UN Manual of Tests and Criteria* and the Recommendations on the Transport of Dangerous Goods—Model Regulations.

1.4.15 Desensitized explosives

A substance is a desensitized explosive if—

- (a) in order to suppress its explosive properties, it has been formed into a homogeneous mixture by—
 - (i) in the case of a solid—wetting it with water or alcohol or diluting it with one or more other substances; and
 - (ii) in the case of a liquid—dissolving or suspending it in water with one or more other substances; and
- (b) it would, without that treatment, have been a Class 1 explosive; and
- (c) it is excluded from Class 1 by virtue of its package size or type.

1.4.16 Division 4.1—Flammable solids, self-reactive substances and solid desensitized explosives

This division comprises:

- (a) Solids that, under the conditions of transport, are readily combustible, or may cause or contribute to fire through friction.
- (b) Self-reactive substances that are liable to undergo a strongly exothermic reaction.
- (c) Solid desensitized explosives that may explode if not sufficiently diluted.

1.4.17 Division 4.2—Substances liable to spontaneous combustion

This division comprises:

- (a) Pyrophoric substances. These include solutions and mixtures (liquid or solid) that, even in small quantities, ignite within 5 minutes of coming in contact with air. These are the Division 4.2 substances most liable to spontaneous combustion.
- (b) Self-heating substances. These substances (other than pyrophoric substances) are liable to self-heating. They will ignite only when in large amounts (kg) and after long periods of time (hours or days).

1.4.18 Division 4.3—Substances that, on contact with water, emit flammable gases

‘Dangerous when wet’ substances which, in contact with water, can emit flammable gases that can form explosive mixtures with air. Such mixtures are easily ignited by all ordinary ignition sources, e.g. naked lights, sparking hand tools, or unprotected light bulbs. The resulting blast wave and flames may endanger people and the environment.

NOTE: Emitted gases may also be toxic.

1.4.19 Environmental impact, including ecotoxicity

The effect on the environment, in particular to aquatic life

1.4.20 Environmentally sensitive area

The term includes, but is not limited to—

- (a) a water catchment area;
- (b) a reservoir for drinking water;
- (c) a freshwater or marine environment; or
- (d) a national park or equivalent.

1.4.21 Explosiveness

The potential to explode when ignited, heated, or subjected to impact or shock (e.g. desensitized explosives).

1.4.22 Fire resistance level (FRL)/Fire resistance rating (FRR)

The grading period, in minutes, determined in accordance with AS 1530.4 for—

- (a) structural adequacy;
- (b) integrity; and
- (c) insulation;

and expressed in that order (e.g. 60/60/30).

NOTES:

- 1 In New Zealand the term ‘fire resistance rating (FRR)’ is used and has the same meaning as fire resistance level (FRL).
- 2 Where an FRL/FRR is required, reference should be made to the Building Code of Australia (BCA)/New Zealand Building Code (NZBC) for guidance.

1.4.23 Flammability

The potential to burn spontaneously or when ignited, or to produce flammable gas, vapour or dust either by decomposition or reaction

1.4.24 Freight container

An article of transport equipment that is—

- (a) of a permanent character and accordingly strong enough to be suitable for repeated use;
- (b) specially designed to facilitate the transport of goods, by one or other modes of transport, without intermediate reloading; and
- (c) fitted with devices permitting ready handling.

NOTE: The term ‘freight container’ does not include vehicles or packagings. However a freight container that is carried on a chassis is included.

1.4.25 Hazardous area

An area in which an explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of potential ignition sources.

NOTES:

- 1 Examples of the classification of 'hazardous areas' are given in the AS/NZS 60079 series of standards.
- 2 (New Zealand) The HSNO Act uses the term 'hazardous atmosphere zones' however for the purposes of this Standard the term 'hazardous area' and corresponding definition should be used.

1.4.26 Hazardous Substance (New Zealand)

See definition for Dangerous Goods 1.4.14.

NOTE: For the storage and handling of substances, the HSNO Act uses the term 'hazardous substances'. For the purposes of this Standard the term dangerous good is synonymous with hazardous substance and both are used interchangeably throughout the document.

1.4.27 Hot work

The use or operation of any of the following:

- (a) Welding or flame cutting equipment.
- (b) Grinders, electric drills, electric cables, cords, switches, lights, connectors or fittings or other electrical equipment not suitable for use in hazardous areas.
- (c) Hot tapping equipment.
- (d) Spark ignition engines or non-approved compression ignition engines.
- (e) Matches, naked lights, cigarette lighters, flames or sparks.
- (f) Hand tools that could create a spark.
- (g) Any other thing that is likely to produce a source of ignition or be an ignition source.

1.4.28 HSNO Act

The *Hazardous Substances and New Organisms Act 1996* together with the Regulations, Group Standards and Transfer Notices made under that act.

1.4.29 Ignition source

A source of energy sufficient to ignite a flammable atmosphere. Ignition sources can include naked flames, hot surfaces, exposed incandescent material, electrical welding arcs, mechanical or static sparks, hot particles, electrical discharge, and electrical or mechanical equipment not suitable for use in hazardous locations.

NOTE: A vehicle is not regarded as being an ignition source while it enters or leaves a hazardous zone outside a package storage area for the purposes of loading or unloading packages, providing that the hazardous zone is not enclosed, or forms part of the package store.

1.4.30 Incompatible

In relation to dangerous goods or other goods, those that are—

- (a) likely to interact with the dangerous goods so as to increase the hazard when mixed or otherwise brought into contact with the dangerous goods; or
- (b) listed in the ADG Code/Hazardous Substances (Classes 1 to 5 Controls) Regulations 2001 as being incompatible; or
- (c) declared by the regulatory authority to be incompatible.

A containment system (including a packaging, tank, bulk container or IBC) or equipment used for the transport or transfer of dangerous goods is incompatible with the goods if any component of the system or equipment that is intended or likely to come into contact with the substance during storage, handling, transfer or transport is—

- (i) likely to interact with the dangerous goods and increase risk because of the interaction; and
- (ii) not protected from contact under foreseeable circumstances by a protective coating or other effective means.

NOTES:

- 1 This definition should be read in conjunction with Clause 1.4.51.
- 2 Incompatible goods may be identified from the ADG Code/Hazardous Substances (Classes 1 to 5) Controls Regulations 2001 and from the relevant SDS.

1.4.31 Instability

The potential to undergo a spontaneous reaction (e.g. decomposition, polymerization), which could be violent.

1.4.32 Installation

All of those facilities on the site that are related to the storage and handling of the Class 4 dangerous goods.

1.4.33 Intermediate bulk container (IBC)

A rigid or flexible portable packaging for dangerous goods that—

- (a) has a capacity of not more than—
 - (i) 1500 L for solids of Packing Group I packed in a composite, fibreboard, flexible, wooden or rigid plastics container;
 - (ii) 3000 L for solids of Packing Group I packed in a metal container; and
 - (iii) 3000 L for solids or liquids of Packing Groups II and III;
- (b) is designed for mechanical handling;
- (c) is resistant to the stresses produced in handling and transport, as determined by tests; and
- (d) complies with the ADG Code/Part 6 of the *Hazards Substances (Tank Wagons and Transportable Containers) Regulations 2004*.

1.4.34 Material safety data sheet (MSDS)/Safety data sheet (SDS)

A document that provides information on the identification, health hazards, precautions for use and the safe handling of a specific chemical product, and complies with NOHSC:2011/Hazardous Substances (Identification) Regulations 2001 or HSNOCOP 8.

1.4.35 Minor storage (Australia only)

- A1 | The storage of Class 4 dangerous goods in accordance with the quantity criteria set out in Clause 3.2 of this Standard.

1.4.36 Non-combustible

- A1 | Material that does not support combustion or is deemed non-combustible when tested in accordance with AS 1530.1 for Australia, or NZS/AS 1530.1 for New Zealand.

1.4.37 On-site protected place

A building where people are employed within the property boundary of the installation, including warehouses, manufacturing or processing areas, amenities or other dangerous goods stores where quantities exceed minor storage.

The HSNO Act does not use the term 'on-site protected place' For the purposes of this Standard the term Area of High Intensity Land Use should be used.

1.4.38 Package

(Australia) The complete product of the packing of the goods, and consists of the goods and their packaging.

(New Zealand) A substance and the packaging in which it is contained.

1.4.39 Packaged dangerous goods

Dangerous goods that are—

- (a) in a container with a capacity of not more than 500 L; or
- (b) in a container that contains not more than 500 kg.

1.4.40 Packaging

(Australia) One or more receptacles, and any other components or materials necessary for the receptacles to perform their containment and other safety functions.

(New Zealand) Any receptacle, container or other material in which a substance may be encased, covered, enclosed, contained or packed, which performs part of the containment function; but does not include a freight container, a skip, a vehicle, a pallet or other article of transport equipment.

1.4.41 Packing group (PG)

One of three packing groups into which dangerous goods (of other than Classes 1,2,7 or Divisions 5.2 and 6.2) are designated in the ADG Code, in decreasing order of hazard, by the Roman numerals 'I' (high danger), 'II' (medium danger) and 'III' (low danger).

NOTE: The *UN Manual of Tests and Criteria* provides criteria for the assignment of Packing Groups. A list of those already assigned is given in the ADG Code/NZS 5433. Criteria for assignment of Packing Groups are also given in the ADG Code.

1.4.42 Pipework

An assembly of pipes, hoses, valves, fittings and associated appliances.

1.4.43 Port area

The land and sea area established by legislation

NOTE: Some port areas might overlap and legal requirements should take account of this possibility.

1.4.44 Practicable

Practical with regard to—

- (a) the severity of the hazard or risk in question;
- (b) the state of knowledge about that hazard or risk and any ways of removing or mitigating that hazard or risk;
- (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.

1.4.45 Premises

The area under the control of the occupier.

1.4.46 Primary risk (Australia only)

The most significant hazard posed by the substance and is the hazard by which the substance is classified.

NOTE: The HSNO Act does not make a distinction between primary risk and subsidiary risks as all classifications are equally applicable.

1.4.47 Protected place

A1

Any of the following:

- (a) A dwelling, place of worship, public building, school or college, hospital, aged persons' accommodation, child-care facility, hospital, theatre, or any building or open area in which people are accustomed to assemble, whether within or outside the property boundary of the installation.
- (b) A factory, workshop, office, store, warehouse, shop or building where people are employed.
- (c) A ship lying at permanent berthing facilities.
- (d) Any storage facility for dangerous goods.
- (e) An environmentally sensitive area, which includes but is not limited to—
 - (i) a water catchment area;
 - (ii) a reservoir for drinking water;
 - (iii) a fresh water or marine environment; or
 - (iv) a national park or equivalent.

NOTE: The HSNO Act does not use the term 'protected place' (it uses the term 'Area of High Intensity Land Use' (HILU)), however for the purposes of this Standard, the term 'protected place' and corresponding definition should be used.

1.4.48 Public place

A1

Any place other than private property, open to the public, which the public has a right to use and which includes a public road.

NOTES:

- 1 Commercial building car parking areas are not considered public places.
- 2 The HSNO Act does not use the term 'public place' (it uses the term Area of Low Intensity Land Use (LILU)) however for the purposes of this Standard the term 'public place' and corresponding definition should be used.

1.4.49 Pyrophoric substances

Substances that, even in small quantities, are liable to ignite within 5 min after coming into contact with air.

1.4.50 Quantity

In relation to dangerous goods the quantity is measured as follows:

- (a) *Solid dangerous goods*—the mass in kilograms of the goods in a container or storage or handling system;
- (b) *Liquid dangerous goods*—the net capacity in litres of the container or storage or handling system;
- (c) *Solid dangerous goods that are not in a container*—the undivided mass in kilograms.
- (d) *Dangerous goods that are articles or things*—the net capacity of that part of the articles or things that in itself comprises dangerous goods

1.4.51 React dangerously

The reaction of substances in a manner that directly creates a hazard due to the reaction—

- (a) being violent;
- (b) producing an explosion;
- (c) producing a potentially explosive combination of products;
- (d) producing potentially dangerous quantity of toxic vapour or gas; or
- (e) producing a fire or rapid evolution of heat.

A1 | NOTE: This definition should be read in conjunction with the definition for ‘incompatible’. (See Clause 1.4.30.)

1.4.52 Reactivity

The potential to react with other chemicals, water or fire extinguishing media.

1.4.53 Receptacle

A containment vessel for receiving or holding substances or articles, including any means of closing.

1.4.54 Regulatory authority

(Australia) The statutory authority responsible for the administration of control of the storage, transport and use of the Class 4 dangerous goods.

NOTE: More than one authority may be involved in relation to such matters (see Note 1 to Clause 1.2.1).

(New Zealand) The Environmental Protection Authority (EPA) administers the HSNO Act that places controls on the storage and use of hazardous substances of Class 1, 2, 3, 4, 5, 6, 8 or 9.

The NZ Transport Agency administers the *Land Transport Rule: Dangerous Goods 2005* which places controls on the transport of dangerous goods.

1.4.55 Restricted area

An area to which access is only available to persons authorized by the occupier.

A store for Class 4 dangerous goods is regarded as a restricted area.

1.4.56 Retail package

A package containing goods for individual sale, predominantly through retail shops.

NOTE: The term ‘retail package’ includes pre-packed articles and consumer commodities.

1.4.57 Risk management

The systematic application of management policies, procedures and practices to the following tasks:

- (a) Hazard identification (what can go wrong and why).
- (b) Risk analysis—comparing the anticipated risks of intervention with the risks of no intervention (how bad and how likely it is).
- (c) Risk assessment—a systematic process for the identification, analysis and evaluation of a substance, thing or event (a hazard) that could, under different circumstances, lead to an accidental loss or security breach (how acceptable it is).
- (d) Risk control (what can be done about it).

NOTE: AS/NZS ISO 31000 provides further information about risk management.

1.4.58 Screen wall

A structurally-sound wall that—

- (a) is impervious to liquid and vapour;
- (b) is constructed of materials that are substantially resistant to attack by the substances being kept; and
- (c) can act as a shield or deflection barrier.

1.4.59 Segregated

Isolated from each other within the store.

1.4.60 Segregation

The isolation of goods that are incompatible, or react dangerously, from each other within a storage area, by the use of physical barriers or distances within the same area.

1.4.61 Self-heating substances

Substances (other than pyrophoric substances) that, in contact with air and without an energy supply, are liable to self-heating. These substances will ignite only when in large amounts (kg) and after long periods of time (hours or days).

1.4.62 Self-reactive substances

Thermally unstable liquid or solid substances or mixtures liable to undergo strongly exothermic decomposition even without the participation of oxygen (air).

NOTE: This definition excludes substances and mixtures classified as explosives, organic peroxides, or oxidizing agents.

1.4.63 Separated

Isolated from the storage by a given minimum distance.

1.4.64 Separation

The isolation of dangerous goods storage areas from a protected place, a public place, premises boundaries, other dangerous goods storage areas, transport storage areas or transit storage areas.

1.4.65 Stationary tank

(New Zealand) A stationary container as defined in Schedule 8 of the Hazardous Substances Dangerous Goods transfer notice and schedule toxic substances.

1.4.66 Subsidiary risk (subrisk)

(Australia) A reference to any additional hazard that the dangerous goods might have, indicated by the Subsidiary Risk Number to which the dangerous goods are assigned. Dangerous goods have a Subsidiary Risk if they—

- (a) satisfy the criteria specified in the *UN Manual of Tests and Criteria* for their assignment to the Subsidiary Risk;
- (b) are assigned a Subsidiary Risk in the ADG Code; or
- (c) are assigned a Subsidiary Risk by the regulatory authority.

NOTE: (New Zealand) The HSNO Act does not make a distinction between primary risk and subsidiary risks, see Clause 1.2.5.

1.4.67 Supplier

An importer, manufacturer, wholesaler or distributor, but not a retail distribution centre or retail outlet.

1.4.68 Tank

(Australia) A receptacle in the form of a shell fitted with service equipment and structural equipment necessary to contain dangerous substances.

Tanks include fixed storage tanks, portable tanks, demountable tanks IBCs and cargo receptacles but do not include packagings.

The term 'tank' includes the following:

- (a) A static storage tank, intended to remain permanently in place once installed.
- (b) A demountable tank, which may be placed on a vehicle from time to time to enable its use as a temporary delivery tanker.
- (c) A cargo receptacles, which is fitted with frames to international freight container dimensions in accordance with AS 3711.6.
NOTE: This type of tank is also known as an 'ISO tank'.
- (d) A portable tank, including a shell fitted with service equipment and structural equipment necessary for the transport of dangerous substances.

A portable tank meeting this definition is capable of being loaded and discharged without the need to remove its structural equipment. It possesses stabilizing members external to the shell, and is capable of being lifted when full. It is designed primarily to be loaded in a transport vehicle or ship and is equipped with skids, mountings or accessories to facilitate mechanical handling.

- (e) IBCs as defined in Clause 1.4.33.

(New Zealand) A stationary tank or process container and its associated equipment, pipework and fittings, up to and including all transfer points as defined in Schedule 8 of the *Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004* (as amended).

NOTE: The HSNO Act uses the term 'stationary container', however for the purposes of this Standard, the term Tank is used throughout the document.

1.4.69 Toxicity

The immediate, delayed or long-term health effects on humans or animals, through inhalation, skin absorption or ingestion.

1.4.70 Transit storage

The storage of unopened containers of Class 4 dangerous goods, in accordance with the requirements of Section 4 of this Standard, held in transit for:

- (a) (Australia) Not less than 12 h and not more than five consecutive days, where such substances are intended for further transport to another location.
NOTE: For Class 4 dangerous goods that are desensitized explosives, check with the relevant state regulator for requirements on transit storage.
- (b) (New Zealand) More than—
 - (i) 18 hours, in the case of a substance that is not subject to tracking provisions of the *Hazardous Substances (Tracking) Regulations 2001*; or
 - (ii) 2 hours, in the case of a substance subject to the tracking provisions of those regulations; but
 in no case more than 3 days.

1.4.71 UN Number

(Australia) The four-digit substance identification serial number assigned to dangerous goods by the United Nations Committee of Experts on the Transport of Dangerous Goods and listed for each substance or article in the ADG Code/NZS 5433.

NOTE: The UN Number may be found on the packaging of dangerous goods.

(New Zealand) The identification number assigned to dangerous goods by the United Nations Committee of Experts on the Transport of Dangerous Goods and as published in the latest edition of—

- (a) NZS 5433; or
- (b) *United Nations Recommendations on the Transport of Dangerous Goods—Model Regulations*; or
- (c) *International Maritime Dangerous Goods Code*; or
- (d) *Technical Instructions for the Safe Transport of Dangerous Goods by Air of the International Civil Aviation Organization*; or
- (e) *Dangerous Goods Regulations of the International Air Transport Association*.

1.4.72 Work permit

A written document that specifies the conditions under which work in a restricted area may be carried out.

1.5 PACKAGING REQUIREMENTS

Packagings to be filled with Class 4 dangerous goods shall—

- (a) for use other than at the premises at which it is to be filled, meet the requirements of the ADG Code/HSNO Act; and
- (b) for use at the premises at which it is to be filled, be constructed—
 - (i) with sufficient strength and durability for its proposed service; and
 - (ii) such that all components of the packaging that could be in direct contact with the contents are compatible with the contents.

1.6 LABELLING

Packages containing Class 4 dangerous goods shall be labelled in accordance with the appropriate Australian state or territory, or New Zealand legislation.

NOTE: In Australia, legislation may require labelling to comply with some or all of NOHSC: 2012, the ADG Code and the SUSMP.

1.7 SECURITY OF STORAGE AREAS

All storage areas shall be appropriately secured from access by unauthorized persons. The storage area shall be considered a 'restricted area'.

SECTION 2 HAZARD IDENTIFICATION AND RISK ASSESSMENT

2.1 SCOPE

This Section specifies that a documented hazard identification and risk assessment be carried out to provide the basis for appropriate controls to be identified for implementation. It also includes a number of items which, as a minimum, shall be considered in such an assessment. The intention is not that a risk assessment be limited only to those items listed here.

2.2 GENERAL

Due to the diverse range of properties and reactivity of substances, it is not possible in this Standard to prescribe detailed requirements for every situation involving storage and handling of any substance within Class 4. Hence, for safe management of Class 4 substances, a hazard identification and risk assessment specific to the substance/s and activities should be undertaken. However, where a prescriptive requirement is provided in this Standard, it shall be implemented in addition to any requirements arising from a hazard identification and risk assessment.

The detail required in a risk assessment can be great or small. It varies with the scale and complexity of the operations on the site, the inherent hazards presented by the substances and equipment used and the proximity of risk receptors to the hazard.

The hazard identification and risk assessment process should be conducted by a group of people with detailed knowledge of the substances, equipment and processes involved, and representing a broad spectrum of those involved with the facility, including technical specialists, operations staff, designers, management, and personnel with financial control of the project. It may be necessary to bring in additional personnel to provide adequate technical and operational knowledge and experience. Reference should be made to records of previous incidents onsite and elsewhere within and outside the organization to identify potential incidents.

A thorough assessment can help to detect and correct any potentially hazardous situations, and is best carried out using systematic methods including safety studies and check lists.

The following Clauses outline the hazards that shall be considered when planning or reviewing a storage and handling facility for Class 4 dangerous goods.

2.3 FACTORS TO BE CONSIDERED

When conducting a hazard identification and risk assessment for a storage or handling facility for Class 4 dangerous goods, the following features shall be considered:

- (a) The nature and quantities of the dangerous goods to be kept on the site, including:
 - (i) Fire risk and the potential for the substance to generate flammable or toxic gas or fumes, either by decomposition or reaction with other materials (e.g. fire fighting water or foam).
 - (ii) Reactivity and stability of the material (e.g. some substances decompose over time to pressurize containers. Some substances require specific storage and handling conditions such as humidity levels to ensure stability of the material.)
 - (iii) Container/vessel capacity (e.g. Storage and use of the material in multiple smaller quantities with separation rather than fewer larger ones may reduce the magnitude of worst case spills/fires and other incidents.)

- (iv) Minimizing the quantity of material involved in higher risk activities (e.g. smaller reaction vessels), risk may be reduced by separating main storage areas from processing/packing/blending and other handling activities where possible.
- (b) The manner by which the goods are to be stored or handled, including the type of equipment to be used (e.g. flameproof fork lift trucks), such as:
 - (i) Classification of hazardous zones associated with the substance and activities undertaken – whether they are due to flammable vapour, gas or dust hazards.
 - (ii) Potential ignition sources in hazardous atmospheres (e.g. lighting, mobile telephones, forklifts, fans, electric motors).
 - (iii) Potential for generation of static electricity in storage and handling systems (hoppers, cyclones, conveyors, pumping, transfer and packing systems etc.)
 - (iv) Potential for friction which may lead to ignition in systems such as conveyors and other materials handling equipment (e.g. augers, bearings).
 - (v) Potential for mechanical impact to systems and equipment containing or conveying the Class 4 dangerous goods.
 - (vi) Where combustible dusts may be generated, the potential for dust accumulation on horizontal surfaces. This can lead to secondary dust explosions in fires.
 - (vii) The potential for explosion in structures, vessels and plant in which flammable atmospheres may occur. This may lead to a requirement for explosion venting systems.
 - (viii) Compatibility of surfaces in contact with the dangerous goods with the substances they are used with.
 - (ix) Potential for contamination of the dangerous goods during handling or processing activities.
- (c) The operator's technical, operational, organizational and emergency procedures and safeguards for the storage and handling facility including:
 - (i) Substance and process specific operating procedures.
 - (ii) Substance and process specific training requirements for personnel.
 - (iii) Maintenance requirements, schedules and procedures to ensure the ongoing serviceability, reliability and safety of the equipment and facilities associated with the dangerous goods.
 - (iv) Emergency response systems, procedures, personnel, materials and equipment.
 - (v) Any requirement for specialized fire extinguishing or spill neutralization/absorbent materials. This shall be determined in liaison with agencies which may be required to respond to any incident at the site.
 - (vi) Any requirement for specialized emergency response equipment, including personal protective equipment (PPE) for emergency responders. This shall be determined in liaison with agencies which may be required to respond to any incident at the site.
 - (vii) Requirements and methods to notify persons and agencies internal and external to the site (including neighbours) of an emergency involving dangerous goods.
 - (viii) Adequacy and reliability of communication systems, including alarms.
 - (ix) Processes for recovery, quarantine, repacking and disposal of contaminated or spilled product.
 - (x) Permit systems (e.g. hot work, isolations).

- (xi) Segregation of incompatible materials.
- (xii) The process for monitoring of the effectiveness of controls and review of the risk assessment to ensure currency and validity.
- (d) Access to the storage or handling facility, including that required for normal transport operations, emergency response vehicles, and any evacuation routes, including:
 - (i) Ease of access and egress for vehicles and personnel in normal operations and for emergency response.
 - (ii) Lighting to allow clear access and egress.
 - (iii) Access to the dangerous goods within the storage or handling facility for emergency response (e.g. access may be impeded on high pallet racking or due to dense stacking of stock).
- (e) Surrounding land uses, population densities and proximity to other hazardous installations including:
 - (i) Potential for offsite persons to be affected by an incident involving the dangerous goods.
NOTE: This may require consequence modelling, particularly for potential off site plumes.
 - (ii) Ability to evacuate or protect in place for persons who may be affected.
 - (iii) Potential for other facilities to become involved in an incident involving the Class 4 dangerous goods (e.g. fire spreading to other dangerous goods facilities, on site explosion impacting off site facilities).
 - (iv) Potential off site effects from an incident involving the class 4 dangerous goods (e.g. road/rail closures, power isolations, evacuations).
 - (v) Proximity of environmentally sensitive areas to the facility.
 - (vi) Proximity to protected places and boundaries.
- (f) The interaction of the abovementioned factors.

2.4 HAZARD IDENTIFICATION

2.4.1 Hazards presented by the dangerous goods

The following hazards shall be considered when identifying hazards associated with a storage and handling facility for Class 4 dangerous goods.

- (a) Flammability.
- (b) Explosiveness (e.g. desensitized explosives).
- (c) Instability. This could pressurize or rupture containers or processing equipment.
- (d) Reactivity.
- (e) Toxicity—This may be a property of the substance itself, or of decomposition and reaction products.
- (f) Environmental impact, including ecotoxicity.
- (g) Corrosivity.

Further information may be obtained from product labels, MSDS, technical experts and the supplier of the substances.

2.4.2 Hazards presented by storage and handling conditions

The manner in which the dangerous goods are stored or handled shall be considered, including the following:

- (a) Storage and handling arrangements, including—
 - (i) the quantity of dangerous goods in each component of the storage and handling system;
 - (ii) whether the system is indoors or outside;
 - (iii) segregation of goods having different hazards;
 - (iv) pressure and temperature in storage and handling systems; and
 - (v) height of storage and handling systems.
- (b) The nature of packaging and containment systems used, such as:
 - (i) Paper and plastics packaging can be highly combustible.
 - (ii) The mechanical strength of the containers/process equipment is also important, as damage could lead to leaks and spills.
 - (iii) Design of bulk storage tanks, silos, and process vessels.
- (c) The design and construction of the storage and handling facility, fittings (e.g. lighting, drainage, ventilation, electrical wiring and heating).
- (d) Potential for failure of safety features of the facility, such as:
 - (i) Fire detection, alarm and suppression systems, evacuation routes, fire compartmentation, smoke management systems, explosion venting systems, emergency showers and eyewash units.
 - (ii) Means of secondary containment and recovery of spills, leaks and fire fighting runoff.
- (e) Activities within the storage and handling facility, including maintenance, handling, traffic movements, introduction of ignition sources and other potential causes of incidents.
- (f) Where water reactive substances are stored or handled, identification of potential water sources (e.g. stormwater, taps, emergency shower/eyewash units, fire hose reels) and how water comes in contact with the dangerous goods.

2.4.3 Hazards related to the work and external environments

The following hazards shall be considered:

- (a) The layout of the facility (structures and access ways) and its materials of construction.
- (b) Proximity of the store to nearby industrial plants, hazardous installations, other dangerous goods stores, or traffic.
- (c) Natural events, e.g. floods.
- (d) Extreme climatic conditions, e.g. high or low temperature or humidity. These could affect the integrity of packagings or the stability of the substances being stored.
- (e) Security of the store.

2.4.4 Process and handling analysis techniques

For processing and handling operations, there are a number of techniques which may be used in the hazard and risk assessment process. It may be appropriate to use one or more of them depending on the scale, nature and location of the operation in question. Some of these techniques are:

- (a) Hazard and Operability Studies (HAZOP).
- (b) Failure Modes and Effects Analysis (FMEA).
- (c) Fault tree analysis.
- (d) Event tree analysis.
- (e) Bow tie method.
- (f) Layer of Protection Analysis (LOPA).

NOTE: AS/NZS ISO 31000 provides further information on risk management; AS IEC 61882 provides further information on HAZOP.

2.5 RISK ASSESSMENT

2.5.1 Introduction

A risk assessment is a systematic approach to the analysis of what can go wrong in a system. The normal conditions of operation are defined, and then the following questions are asked:

- (a) What events (e.g. accidents, incidents) can occur?
- (b) How frequently can they occur?
- (c) What are the consequences of each event?
- (d) What are the total risks (i.e. the probability and consequence of events) of the system?
- (e) What is the significance of the calculated risk levels?
- (f) Are the risks acceptable?

These questions form the basic components of a risk assessment, whether it be qualitative, quantitative or semi-quantitative.

For large or complex installations, a full quantitative risk assessment (QRA) may be required. A QRA may also be appropriate where risk receptors such as off site populations are close to a facility and have been identified as being exposed to risk, to ensure the risk is acceptable and within prescribed or agreed criteria.

In other cases it may not be necessary to use absolute frequencies and risks, but it may be acceptable to assign relative risk rankings in a semi quantitative manner. This approach may be suitable for storage facilities in sparsely populated areas.

In any case, the risk assessment process should identify all credible hazards and identify means of controlling them to minimize risk to a tolerable level.

2.5.2 Objectives of risk assessment

The primary objectives of risk assessment can be summarized as follows:

- (a) Determine the risks generated by activities within the facility.
- (b) Establish the basis for identifying risk controls to be implemented.
- (c) Identify possible hazardous material emergencies which should be addressed in the emergency plan.

- (d) Provide a reference point against which progress towards better control of risks can be measured.
- (e) Provide the basis for a system to control the risk.

2.5.3 Risk analysis/assessment

Risk analysis/assessment involves the following basic steps:

- (a) System evaluation, in which information on the facility and the environment in which it operates, is collated and assimilated.
- (b) Hazard identification, in which events within and external to the store (which could lead to an incident involving the dangerous goods) are identified.
- (c) Frequency estimation, in which the likelihood of an event is estimated. This is often based on historical data.
- (d) Consequence assessment, in which all possible consequences of each event are estimated. For complex sites, or those in close proximity to sensitive areas, this may include consequence modelling such as plume modelling to identify the area and population potentially impacted by an event.
- (e) Risk evaluation, in which the assessed risk is compared against known standards to determine whether or not it is acceptable.
- (f) Identification of potential risk controls, in which potential additional risk controls or modifications to existing risk controls are identified.
- (g) Selection of risk controls, in which one or more additions or modifications to the existing set of risk controls are selected for implementation. Selection of risk controls may be aided by reference to other Sections of this Standard or to other accepted standards.

The risk assessment conclusions should clearly distinguish between uncontrolled risk and residual risk. For example, a quantity of flammable material may present a severe risk of fire if no controls are in place. Current controls may reduce the risk to some extent, but residual risk may remain unacceptable. Additional controls may be needed to further reduce the risk. The aim should be to minimize risk as far as reasonably practicable.

2.5.4 Risk control

If the risks are assessed as being unacceptable, risk controls shall be introduced or modified to reduce the risks to an acceptable level. Responsibilities, resources and timeframes shall be determined to ensure implementation of identified controls.

Selection of risk controls should 'where possible' follow the hierarchy of controls, in descending order of preference as follows:

- (a) Elimination of the hazard.
- (b) Substitution of a lower hazard alternative.
- (c) Isolation of the hazard.
- (d) Use of engineering controls.
- (e) Use of administrative controls.
- (f) Use of personal protective equipment (PPE).

Where the introduction or modification of risk controls has implications for other aspects of systems of work (e.g. the Emergency Plan), those implications shall be followed through thoroughly.

2.6 RISK REVIEW

The risk assessment shall be reviewed and if necessary revised when the following circumstances occur:

- (a) New hazardous materials are introduced to the site, or the quantities of hazardous materials are substantially increased.
- (b) New processes or activities involving or impacting on hazardous materials are introduced to the site.
- (c) Significant changes to personnel are made.
- (d) Significant changes to the work environment are made.
- (e) An incident occurs onsite or elsewhere which indicates that the current risk assessment may not be adequate.
- (f) A set period of time has passed since the risk assessment was conducted or last reviewed, e.g. five years.

SECTION 3 MINOR STORAGE (AUSTRALIA ONLY)

3.1 SCOPE OF SECTION

This Section specifies the criteria for minor storage of Class 4 dangerous goods, and the requirements for such storage for application in Australia.

Storage of Class 4 dangerous goods in quantities not exceeding those listed in Table 3.1 and complying with the requirements of this Section, may be classified as minor storage and are exempted from the other sections of this Standard except as required by this Section.

The storage of minor quantities of Class 4 dangerous goods under conditions that do not comply with the requirements of this Section, or of quantities of Class 4 dangerous goods greater than those given in Table 3.1, shall comply with the requirements of other relevant Sections of this Standard.

Minor storage may exist as a part of a premises or complex in which no other Class 4 dangerous goods in processes or storage.

NOTES:

- 1 Workplace safety regulations and guidelines may apply even to quantities defined as minor storage.
- 2 For liquids with subsidiary risks, or in areas where decanting, package filling or processing occur, additional safety precautions (e.g. ventilation), may be required. Guidance may be found in relevant exposure standards, MSDS and product labels.

3.2 MINOR STORAGE QUANTITIES

3.2.1 General

The quantities of Class 4 dangerous goods allowable as minor storage are given in Table 3.1.

3.2.2 Quantities of packing Group I

Class 4 dangerous goods of PG I, in containers larger than 2.5 L, shall not be kept in minor storage unless they are essential for daily operations and handled only by trained personnel.

3.2.3 Multiple minor storages

Where there is more than one minor storage on the same premises, such storages shall be separated by a distance of at least—

- (a) 20 m, if they are indoors; or
- (b) 15 m, if they are outdoors.

This distance shall be measured from the outermost package or tank in the minor storage (see Figure 3.1).

If two or more buildings are separated by at least 5 m of open space (i.e. an area without a roof and accessible for firefighting at all times), or by a concrete or double-brick wall capable of preventing the spread of a fire, a separate indoor minor storage quantity may be applied to each building.

3.2.4 Separation between minor storage and other stores

A minor storage shall be separated from any other store of Class 4 dangerous goods that is larger than minor storage by—

- (a) the distance to an on-site protected place (as given in Table 4.1); or
- (b) at least 5 m,

whichever is the greater.

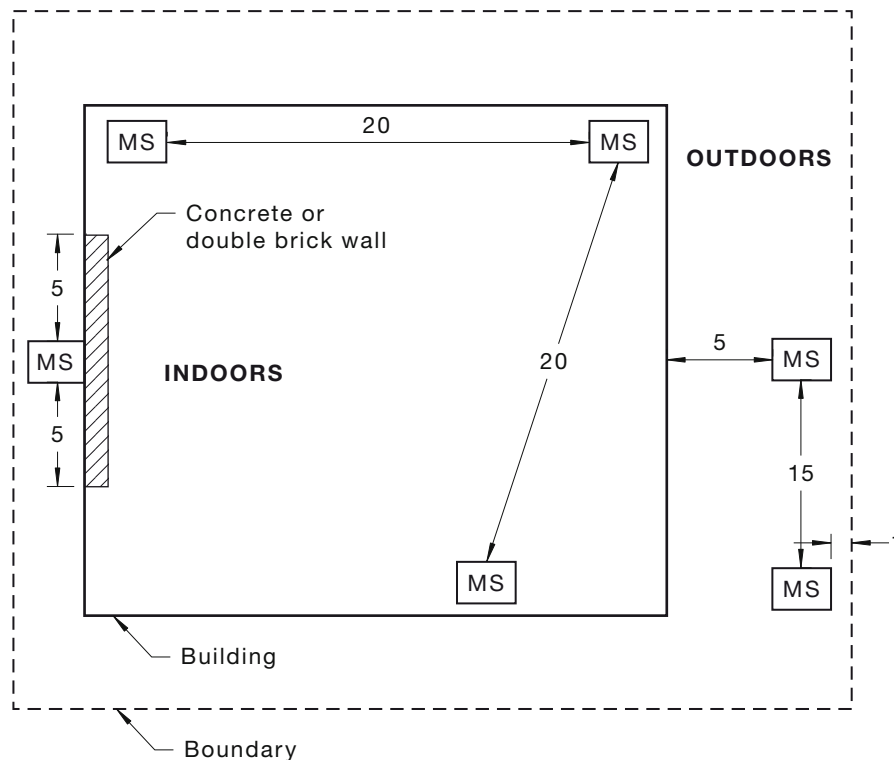
This clause (Clause 3.2.4) does not apply to storage cabinets (see Clause 4.7).

TABLE 3.1
MAXIMUM MINOR STORAGE QUANTITIES IN ANY 100 m² FLOOR AREA

Type of premises	Maximum quantity per 100 m ² floor area kg or L			
	Category A	Category B	Category C	Category D
1 Residential	0	0	1	5
2 Commercial building, hospital or educational establishment	0.5	2.5	5	10
3 Retail area	0	0	10	20
4 Laboratory, factory or workshop (except for those located within premises covered by 2 above)		5	10	20
5 Warehouse	5	10	20	40

NOTES:

- 1 Units of kilograms apply to solids and units of litres to liquids. The maximum quantities specified in terms of 'kg or L' are the sum of the number of kilograms (kg) of solids plus the number of litres (L) of liquids.
- 2 The total quantity of Class 4 dangerous goods of all categories should not exceed the maximum quantity specified for the least dangerous category being kept.
- 3 Categories of Class 4 dangerous goods are specified in Table 1.1.
- 4 Class 4 dangerous goods shall be in packages suitable for transport under the ADG Code and not more than 1 kg or L in capacity (Categories B and C) or 5 kg or L (Category D).
- 5 Security provisions for desensitized explosive substances may further restrict access and quantities permitted to be kept. Check with the relevant state regulator for additional requirements.



LEGEND:

MS = Designated minor storage areas

DIMENSIONS IN METRES

FIGURE 3.1 EXAMPLES OF LOCATIONS OF MINOR STORAGE

3.3 MINOR STORAGE REQUIREMENTS

The following requirements apply to the minor storage of Class 4 dangerous goods.

- (a) The store shall be an area or room of non-combustible construction.
- (b) Dangerous goods of Division 4.3 shall be kept away from—
 - (i) supplies of reticulated town water; and
 - (ii) storm water.
- (c) Adequate ventilation shall be provided for all storage and handling areas (see Clause 9.2.5).
- (d) Packages of Class 4 dangerous goods shall be kept at least 3 m from any foodstuffs, ignition sources, and other dangerous goods with which they are incompatible or may react dangerously.
- (e) Packages shall be kept cool, away from sources of heat.
- (f) Packages shall be kept securely closed when not in use.
- (g) Class 4 dangerous goods shall be used within their correct use-by date, or otherwise shall be disposed of in accordance with Section 12.
- (h) Where the dangerous goods are kept under water, they shall not be allowed to dry out.
- (i) Packages shall be kept in such a manner that avoids spillage.

- (j) Appropriate spillage-retention measures shall be provided at locations where packages are likely to be opened or their contents transferred.
- (k) The contents of a package shall not be transferred to any other container for storage unless the latter is suitable for the storage of the Class 4 dangerous goods and is clearly marked in accordance with Clause 1.6.

NOTE: Where the contents of the package have been transferred from another container, the resultant package, if it is to be used for transportation, is required by the relevant regulatory authority to comply with the ADG Code.

- (l) Static electricity shall be controlled in accordance with AS/NZS 1020.
- (m) Appropriate personal protective equipment, as specified in Clause 9.8.2, shall be worn by any person involved in product transfer operations.
- (n) Any spills or leaks shall be cleaned up immediately, and disposed of in accordance with Section 12.
- (o) Wastes shall be disposed of in accordance with Section 12.
- (p) Stores shall be placarded in accordance with regulatory requirements (see also Clause 10.4).
- (q) Suitable portable fire extinguishers of adequate capacity shall be provided in or near the store. They shall be installed in accordance with AS 2444.

Personnel shall be trained in the use of the fire extinguishers.

Where the nature of the Class 4 materials is such that the use of portable fire extinguishers is inappropriate, alternative fire fighting equipment shall be provided, along with training in its use.

NOTE: The manufacturer and relevant MSDS should be consulted for further advice.

SECTION 4 GENERAL REQUIREMENTS

4.1 SCOPE OF SECTION

This Section provides general requirements and recommendations that apply to the storage of Class 4 dangerous goods, in quantities greater than those classified as minor storage in Section 3. As Section 3 does not apply in New Zealand, see Table D1 of Appendix D for threshold quantities.

Additional requirements that are specific to particular types of installation are given in other sections of this Standard.

4.2 GENERAL DESIGN AND CONSTRUCTION AND OPERATIONAL REQUIREMENTS

4.2.1 Design safety and suitability

Any installation intended for the storage and handling of Class 4 dangerous goods shall be designed and constructed so that it is safe and suitable for the conditions of use. A risk assessment shall be undertaken as an element of the design process.

Factors that shall be considered include the following:

- (a) Working pressures and structural stresses.
- (b) Heat, corrosion, or attack by the substance being handled.
- (c) Site conditions such as topography, usage of adjoining areas, or the risk of natural disasters, e.g. flood, earthquake, lightning strikes.
- (d) Design of plant, equipment, piping and operating methods, so as to minimize fire and accident risks and the possibility of errors or misunderstanding by staff.
- (e) Specific design for emergencies (see Clause 3.2.2 and Section 11), particularly firefighting facilities.
- (f) The identification of the function of every valve, switch or control actuator, including any remote switches or actuators.
- (g) Safe access to and egress from all working locations.
- (h) Avoidance of ignition sources including static electricity.
- (i) Ventilation for vapour and dust dispersal, taking into account the possible effect of nearby structures, excavations, embankments, and the like.
- (j) Separation of potential hazards, including areas where activities cannot be controlled.
- (k) Points of vapour relief and explosion venting within buildings.
- (l) Spill control measures to avoid contamination of soil and water. Where dangerous goods can ignite on exposure to air, establish a method to contain any spillage so that air cannot come into contact with the spilt dangerous goods.
- (m) Incompatibility of materials.
- (n) Segregation of goods within the storage area.
- (o) The required separation distances to boundaries, buildings, and facilities both on and off site.
- (p) Packing and decanting areas.
- (q) Sufficient space to operate equipment such as forklifts, and to handle the day to day movement of goods.

- (r) Prevention of environmental contamination
- (s) Construction materials of walls, floors, ceilings, and handling equipment.
NOTE: Non-combustible, non-sparking materials should be used which are non-reactive with the materials stored.
- (t) Presence of store drainage system
- (u) Prevention of accumulation of dust within processing areas by all internal surfaces being readily accessible to facilitate cleaning. All walls should have a smooth finish and be sealed to prevent infiltration of dust

4.2.2 Operational requirements

Operations shall be conducted in accordance with the following:

- (a) Ensure high housekeeping standards. This is especially important for dangerous goods in powdered or granulated forms.
- (b) Ensure protection of dangerous goods from the weather, heat where they are sensitive to light, heat or temperature changes.
- (c) Ensure proper stock control measures are in place to avoid prolonged storage.
- (d) Ensure metallic powders are never stored in wet locations or where contamination with water is possible.
- (e) Ensure a routine inspection and testing regime is implemented where the stability of the dangerous goods relies on the presence of an inhibitor or stabilizer (e.g. desensitized explosives or wetted substances).
NOTE: Concentration of any inhibitor present should be checked often enough to ensure the concentration stays within the recommended levels set by the manufacturer.
- (f) Ensure a system is in place for containers containing wetted Class 4 dangerous goods, to be inverted gently as often as necessary to prevent the goods in the upper section of the container from drying out.

4.2.3 Emergency provisions

An installation shall be designed to facilitate the management of an emergency, taking into account—

- (a) the nature and quantity of the goods stored;
- (b) the layout of the storage area;
- (c) access through or around walls or other barriers;
- (d) the type of construction of any buildings; and
- (e) the type and means of operation of any fire protection system.

4.2.4 Hazardous areas

(Australia) A hazardous area shall not extend beyond a boundary.

(New Zealand) Each storage location shall be considered for the delineation of hazardous areas. A hazardous area must not extend beyond the boundary of the property at which the dangerous good is present unless the person in charge of any property beyond that boundary agrees that the hazardous area may be calculated to include the property of which the person is in charge. AS/NZS 60079.10 may be used to calculate the hazardous area delineation.

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4.2.5 Separation distances

4.2.5.1 General

Storages shall be separated from boundaries, ignition sources, protected places and accumulations of combustible materials by the minimum distances relevant to each type of storage as specified in the relevant Clauses of this Standard, with the additional requirements and qualifications as set out in this Clause (4.2.5).

Where alterations to the installation or adjoining site result in a breach of the required separation distances, the installation shall be assessed and brought into compliance or decommissioned.

4.2.5.2 Separation to any property boundary and protected places

The separation distance to any property boundary and protected places shall be at least that distance required by—

- (a) for Australia, Table 5.1; and
- (b) for New Zealand, Tables 5.2 and 5.3.

4.2.5.3 Adjacent occupancies storing Class 4 dangerous goods

Where two adjacent premises under separate occupancies are each used for the storage and handling of Class 4 dangerous goods and share a common boundary, the separation distances between tanks, package stores and other buildings may be measured as though both premises were under a single occupancy, provided that a formal agreement or covenant is used and providing for the alteration, redevelopment or change of ownership of either site is in place.

4.2.5.4 On-site storage of other dangerous goods

The on-site storage of other classes of dangerous goods may require differing separation distances, as specified in the relevant Australian or New Zealand Standards or by legislation, or both. Where no such distances are specified, the storage containing the other dangerous goods should be considered as an on-site protected place and the relevant distance specified in this Standard applied.

4.3 ELECTRICAL INSTALLATIONS AND EQUIPMENT

The following requirements shall apply to both electrical equipment and installations in areas designated as hazardous areas under AS/NZS 60079:

(a) Electrical installations

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All electrical installations shall be installed in compliance with the provisions of AS/NZS 3000 that relate to electrical equipment in hazardous areas. The equipment shall be of a type certified to comply with the relevant Australian or New Zealand Standard or that has been approved for use in such locations by the relevant authority.

(b) Portable and mobile electrical equipment

All electrical equipment to which AS/NZS 3000 does not apply shall be of a type certified to comply with the relevant Australian or New Zealand Standard or that has been approved for use in such locations by the relevant authority, except where Item (c) below applies.

(c) Electric forklift trucks

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In hazardous areas classified as Zone 2, electric forklift trucks and similar vehicles (e.g. stackers) not suitable for use in the Zone shall not be used, except where Appendix D is complied with in all respects.

NOTE: Requirements for electric forklift trucks for use in hazardous zones are specified in AS 1915.

4.4 INTERNAL COMBUSTION ENGINES

Internal combustion engines may be used in hazardous areas under the following conditions:

- (a) An engine designed and certified to AS 2359 may be used in the zones for which it is certified. In such cases, a hot work permit is not required.
- (b) A spark ignition engine not complying with Item (a) may be operated in a hazardous zone if a hot work permit (see Clauses 9.5.3 and 9.5.6) has first been issued.
- (c) A compression ignition engine may be operated in a Zone 2 hazardous area if—
 - (i) any incorporated or attached electrical equipment is suitable for use in a Zone 2 hazardous area;
 - (ii) the air intake is either extended to outside the hazardous zone, or is provided with a strangler valve or equivalent in the manifold, in which case the engine is attended when in use;
 - (iii) mechanical sparks cannot be produced in the engine compartment of the appliance during its operation; and
 - (iv) the exhaust has a spark arrester complying with AS 1019 or is extended to outside the hazardous zone.

Any compression ignition engine not complying with AS 2359 (see Item (a) above) shall not be operated in a Zone 0 or Zone 1 area unless a hot work permit has been issued.

Forklift trucks and similar vehicles that are not approved for use in Zone 2, or that do not comply with Items (a) to (c) above, shall not be used unless a hot work permit has been issued.

4.5 LIGHTING

Lighting shall be provided in accordance with the following requirements:

- (a) During the hours of operation, lighting shall be sufficient to provide safe working conditions that include, but are not limited to, clear visibility of all markings on packages, signs, instruments and other necessary items.
NOTE: A minimum value of 50 lx is recommended.
- (b) Sufficient lighting shall be available on any of the installation's internal roads when personnel at the premises might use them.
- (c) Refer to Clause 4.3 which applies to lighting installations in hazardous areas.

4.6 RESTRICTED USAGE

A storage that has a capacity greater than that given for minor storage shall only contain Class 4 dangerous goods, unless the other products being stored will not react dangerously or be incompatible with the Class 4 dangerous goods.

If the store contains dangerous goods having a primary risk of other than Class 4, any other relevant New Zealand or Australian Standards or legislation shall be consulted and the more stringent requirement shall apply.

NOTE: (Australia) For Class 4 dangerous goods that are desensitized explosives, check with the relevant state regulator for restricted usage requirements.

4.7 FIREWALLS AND VAPOUR BARRIERS

4.7.1 Conditions of use

Separation distances may be measured in a horizontal plane around the end of any intervening vapour barrier, provided that the barrier complies with the following:

- (a) For separation from protected places and on-site protected places, such a vapour barrier shall be a firewall.
- (b) (New Zealand) For separation from public places, such a vapour barrier shall be a firewall with a minimum fire resistance level of 120/120/120.
- (c) Building walls may be treated as being firewall or vapour barriers provided that they qualify as such.

A wall on an adjacent property shall not be used as a firewall unless an agreement similar to that described in Clause 4.2.5.3 is in place.

- A1 | Firewalls and vapour barriers may be used to achieve the separation distances in Tables 5.1, 5.2 and 5.3 to protected places, public places and boundaries.

4.7.2 Construction of firewalls

A firewall shall comply with the following requirements:

- (a) The fire resistance level shall be at least 240/240/240.
- (b) The firewall shall be impervious to vapour apart from around fire doors or other protected openings.
- (c) Any freestanding firewall shall be self-supporting and shall have adequate foundations.
- (d) The height of the firewall shall be sufficient to shield a protected place from heat radiation and flame impingement in the event that a potential storage fire becomes a reality, and vice versa.

NOTE: Where an FRL is required, reference should be made to the Building Code of Australia (BCA) or the New Zealand Building Code (NZBC) for building purposes.

4.7.3 Construction of vapour barriers

A vapour barrier shall comply with the following requirements:

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- (a) The material shall be impervious to vapour and deemed to be non-combustible when tested in accordance with AS 1530.1 for Australia and NZS/AS 1530.1 for New Zealand.
 - (b) The top of the vapour barrier shall be above the height of the hazardous area pertaining at that point as determined in the relevant part AS/NZS 60079.10.1.

4.8 EXPLOSION VENTING

Where Class 4 dangerous goods are stored in an enclosed storage area, and are capable of producing flammable gases, vapours or combustible dusts, appropriate explosion vents shall be provided in accordance with the following:

- (a) The explosion vent shall provide relief when the internal pressure exceeds 1 kPa gauge pressure.
- (b) An explosion vent may be a panel on a wall or free opening.
- (c) Explosion vents shall not be installed in a store that is enclosed within another building.
- (d) Each storage area within a building shall be separately vented.