

Australian Standard[®]

The storage and handling of oxidizing agents



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The following are represented on Committee CH-009:

- ACCORD Australasia
- Australasian Fire Authorities Council
- Australian Paint Manufacturers Federation
- AGSAFE
- Consumers' Federation of Australia
- Department of Environment and Climate Change, NSW
- Department of Consumer and Employment Protection, WA
- Department of Emergency Services, Qld
- Department of the Premier and Cabinet, SA
- Engineers Australia
- New Zealand Chemical Industry Council
- Plastics and Chemicals Industries Association
- TRANZ
- Victorian WorkCover Authority

Additional Interests:

- Australian Explosives Industry and Safety Group
 - Department of Mines and Energy, Qld
 - NSW Fire Brigades
 - Manufacturers and suppliers of dangerous goods of Division 5.1
-

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Australian Standard[®]

The storage and handling of oxidizing agents

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CH-009, Safe Handling of Chemicals, to supersede AS 4326—1995. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

This Standard deals with oxidizing agents that are classified as dangerous goods of Division 5.1, as classified in the UN *Recommendations on the Transport of Dangerous Goods—Model Regulations*.

Revision of this Standard was commenced following the committee's decision that the series of Standards relating to the storage and handling of dangerous goods needed to be reviewed and updated to reflect changes in regulatory requirements and control philosophies.

In June 2004, the Council of Australian Governments (COAG) introduced principles for the storage of ammonium nitrate which have been adopted by the states and territories. Because of some differences in the regulatory requirements between the states (e.g. in terms of security, separation distances), regulatory advice must be sought regarding the location, operation and security of a store for ammonium nitrate. Over time, as the explosive properties of ammonium nitrate are researched further, standardized separation distances will be developed. In the meantime, advice regarding the siting of new facilities can be found in various guidance notes prepared and published by State and Territory regulatory authorities.

The purpose of this Standard is to promote the safety of persons and property where oxidizing agents are stored and handled, by providing requirements and recommendations based on industry good practice.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of the Standard, i.e. its requirements are mandatory, whilst an 'informative' appendix provides information and guidance only.

Statements expressed in mandatory terms in notes and footnotes to tables are requirements of this Standard. Notes that appear in the main text of this Standard provide information only.

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

HB 76	Dangerous goods—Initial emergency response guide
AS	
1678	Emergency procedure guide—Transport (series)
1894	The storage and handling of non-flammable cryogenic and refrigerated liquids
1940	The storage and handling of flammable and combustible liquids
2507	The storage and handling of agricultural and veterinary chemicals
2508	Safe storage and handling information card (series)
2714	The storage and handling of hazardous chemical materials—Class 5.2 substances (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
- 4332 The storage and handling of gases in cylinders
- 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
- 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

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STANDARDS AUSTRALIA

Australian Standard

The storage and handling of oxidizing agents

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out requirements and recommendations for the safe storage and handling of oxidizing agents that meet the Division 5.1 classification criteria of the ADG Code.

This Standard also applies to other dangerous goods that are assigned a Division 5.1 Subsidiary Risk by the ADG Code, except where they are of Class 2, or where more stringent requirements apply under another relevant Australian Standard or applicable regulation.

This Standard provides safety requirements for storage areas, operating procedures, emergency planning and fire protection for stores in which oxidizing agents are kept. It provides technical guidance to assist in the storage and handling of oxidizing agents in accordance with the risk management requirements of NOHSC:1015 and regulations drawing on that document.

NOTES:

- 1 A discussion of the hazards presented by oxidizing agents is given in Appendix A.
- 2 Specific properties and hazards of ammonium nitrate are discussed in Appendix B.

1.2 APPLICATION

1.2.1 Where this Standard applies

This Standard applies in locations that are generally industrial, commercial or rural in nature. Its requirements apply in conjunction with, but do not take precedence over, any government 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 authority does not necessarily constitute an agreement from others.
- 2 Any regulatory requirements take precedence over the requirements of this Standard.
- 3 Cognizance of the relevant requirements of the *Building Code of Australia* (BCA) is necessary for all matters relating to building works.
- 4 The transfer of oxidizing agents between a ship and an onshore storage is controlled by the relevant port authority and is addressed in AS 3846.

1.2.2 Where this Standard does not apply

This Standard does not apply to the following:

- (a) Gases having a Division 5.1 Subsidiary Risk, e.g. oxygen, chlorine, nitrous oxide.
- (b) Forms and concentrations of ammonium nitrate that are not Division 5.1 dangerous goods.
- (c) The transport of oxidizing agents, which is dealt with in the ADG Code.
- (d) The manufacture of oxidizing agents.

- (e) Emulsions and slurries based on ammonium nitrate and fuels, with or without other oxidizing agents, cross-linkers, pH buffers or water.

NOTE: These mixtures are widely used in the explosives industry but do not meet the criteria for classification as Class 1 dangerous goods. An example of such a mixture is UN 3375.

- (f) Substances which exhibit oxidizing properties that are not sufficient for the substance to be classified as an oxidizing agent of Division 5.1.

1.3 REFERENCED DOCUMENTS

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

1.4 DEFINITIONS

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

1.4.1 Access

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

1.4.2 ADG Code

The Australian Dangerous Goods Code, published by the National Transport Commission.

1.4.3 ANFO

A mixture of ammonium nitrate and fuel oil.

1.4.4 Boundary

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

1.4.5 Break tank

A tank, of capacity not exceeding 1500 L, which is used to supply additions of a liquid to a process over a given period.

NOTE: A break tank may also be known as a batch tank, head tank, or day tank.

1.4.6 Bulk

Liquid or solid oxidizing agents that are not in packages.

NOTE: Reference should be made to the ADG Code.

1.4.7 Bulk container

A container (including any liner or coating) that—

- (a) has a capacity of 1.0 m³ or more; and
- (b) is intended for the transport of solid substances which are in direct contact with the containment system.

Examples of bulk containers are freight containers, offshore bulk containers, skips, bulk bins, swap bodies, trough-shaped containers, roller containers and load compartments of vehicles.

NOTE: Reference should be made to the ADG Code.

1.4.8 Bund

An embankment or wall that may form part or all of the perimeter of a compound.

1.4.9 Bunker

A partially enclosed storage space with at least two walls, for the keeping of bulk solids.

1.4.10 Combustible materials

Materials that can contribute to sustaining a fire.

1.4.11 Compatible

In relation to two or more substances or items, those that will not react together to cause a fire, explosion or harmful reaction, or evolve flammable, toxic or corrosive vapours.

1.4.12 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 a tank may sometimes be used to provide the function of a compound.

1.4.13 Container

Anything in or by which dangerous goods are wholly or partly cased, covered, enclosed, contained or packed, whether such a thing is empty or partially or completely full, but not including a vehicle or a freight container.

1.4.14 Critical infrastructure

Those physical facilities, supply chains, information technologies and communication networks which, if destroyed, degraded or rendered unavailable for an extended period, would significantly impact on the social or economic well-being of the nation, or affect Australia's ability to conduct national defence and ensure national security.

1.4.15 Fire resistance level (FRL)

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).

NOTE: Where an FRL is required, reference should be made to the *Building Code of Australia* (BCA) for guidance.

1.4.16 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.

NOTE: A classification system for hazardous areas is given in the AS/NZS 2430.3 series of Standards.

1.4.17 Incompatible

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

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

In relation to packaging or transfer equipment, a container or item of equipment that is constructed of a material likely to interact with the oxidizing agent so that it is weakened or damaged to the extent that risk increases.

NOTES:

- 1 This definition should be read in conjunction with Clause 1.4.33.
- 2 Goods with which oxidizing agents are incompatible may be identified from the ADG Code and relevant MSDSs.

1.4.18 Installation

All of those facilities on a site that are related to the storage or handling of oxidizing agents.

1.4.19 Intermediate bulk container (IBC)

A rigid or flexible portable packaging for the transport of dangerous goods that—

- (a) has a capacity of not more than—
 - (i) for solids or liquids of Packing Groups II and III, 3 m³ or 3000 L;
 - (ii) for solids of Packing Group I in a composite, fibreboard, plastics or wooden container, 1.5 m³; and
 - (iii) for solids of Packing Group I in a metal container, 3 m³.
- (b) is designed for mechanical handling;
- (c) is resistant to the stresses produced in the usual handling and transport, as determined by tests; and
- (d) complies with the UN *Recommendations on the Transport of Dangerous Goods—Model Regulations*.

1.4.20 Large packaging

Packaging consisting of an outer packaging that contains articles or inner packagings and—

- (a) is designed for mechanical handling; and
- (b) exceeds 400 kg net mass or 450 L capacity but has a volume of not more than 3 m³.

1.4.21 Magazine

A specially constructed store used exclusively for keeping explosives or pyrotechnics.

1.4.22 Material safety data sheet (MSDS)

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.

1.4.23 May

Indicates the existence of an option.

1.4.24 Minor storage

The storage of oxidizing agents, in various locations, in quantities conforming to the criteria specified in Clause 2.2 of this Standard.

1.4.25 Non-combustible

Material that does not support combustion or is deemed to be non-combustible when tested in accordance with AS 1530.1.

1.4.26 On-site protected place

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

1.4.27 Oxidizing agents

Substances that are listed as Division 5.1 oxidizing agents in the ADG Code or that meet the classification criteria specified in that Code for oxidizing agents.

NOTE: Such substances, although not necessarily combustible, may readily liberate oxygen or be the cause of oxidation processes and, as a result, may start a fire in other materials or stimulate the combustion of other materials, and therefore increase the violence of a fire.

1.4.28 Package

The complete product of the packaging operation, consisting of the packaging and its contents prepared for transport.

1.4.29 Packaging

One or more receptacles and any other components or materials necessary for the receptacles to perform their containment function and—

- (a) in relation to dangerous good of Class 2, a container having a capacity not exceeding 500 L; and
- (b) in relation to dangerous goods of any other Class, a container having a capacity not exceeding 450 L and having a net mass of 400 kg.

1.4.30 Packing Group (PG)

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

NOTE: The ADG Code provides criteria for the assignment of Packing Groups, and a list of those already assigned.

1.4.31 Pipework

An assembly of pipes, pumps, hoses, valves and fittings used in the handling of bulk goods.

1.4.32 Protected place

Any of the following:

- (a) A dwelling, place of worship, public building, school or college, hospital, child care facility, theatre, or any building or open area in which persons are accustomed to assemble, whether within or outside the property boundary of the installation.
- (b) A factory, workshop, office, store, warehouse, shop, building or yard where persons are employed, and which is outside the property boundary of the installation.
- (c) A ship lying at permanent berthing facilities.
- (d) Any storage facility for dangerous goods that is outside the property boundary of the installation, except for those defined as minor storage in other Standards or regulations.

1.4.33 React dangerously

In relation to the reaction of substances, to react in a manner that directly creates a risk due to the reaction—

- (a) being violent;
- (b) producing an explosion;

- (c) producing fire or rapid evolution of heat; or
- (d) producing toxic vapour or toxic gas.

NOTES:

- 1 Examples of substances that react dangerously are solid pool chlorine and petrol, calcium hypochlorite and hydrochloric acid, hydrogen peroxide and organic substances.
- 2 This definition should be read in conjunction with Clause 1.4.17.

1.4.34 Regulatory authority

The authority responsible for administration of control of the storage and handling of Division 5.1 substances.

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

1.4.35 Restricted area

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

1.4.36 Retail premises

Premises on which dangerous goods of Division 5.1 are kept for the purpose of sale to the general public.

1.4.37 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).

1.4.38 Screen wall

A structurally-sound wall that is impervious to liquid and vapour and is constructed of materials that are substantially resistant to attack by the substances being separated.

1.4.39 Secure

Secure from—

- (a) detectable theft;
- (b) unexplained loss;
- (c) sabotage; and
- (d) unauthorized access.

1.4.40 Secure store

A physically secure place where a product is kept under lock and key or under constant surveillance, and where there are procedures for controlling access and keys, and documenting the receipt and dispatch of measured quantities of the product.

1.4.41 Security fence

A chain wire fence complying with AS 1725 and being—

- (a) at least 2.45 m high;

- (b) galvanized or plastic coated, with both selvages twisted and barbed;
- (c) capped with three rows of security wire with 150 mm spacings; and
- (d) at least 3 m from the store.

1.4.42 Security plan

A plan to assess, address and effectively reduce all security risks relevant to the storage of a product.

1.4.43 Security sensitive ammonium nitrate

Ammonium nitrate, ammonium nitrate emulsions and ammonium nitrate containing greater than 45% ammonium nitrate, excluding solutions and ammonium nitrate products classified as Class 1 explosives.

NOTES:

- 1 This includes substances such as calcium ammonium nitrate that are not classified as dangerous goods, and dangerous goods having UN numbers 1942, 2067, 2071 and 3375 where applicable.
- 2 Some States include ammonium nitrate solutions having a concentration greater than 80% in their definition of 'security sensitive'. The relevant regulatory authority needs to be consulted.

1.4.44 Segregated

Isolated from each other within the store.

1.4.45 Segregation

The isolation of incompatible goods within a store.

1.4.46 Separated

Isolated from the storage by a given minimum distance.

1.4.47 Separation

The isolation of a storage from protected places, on-site protected places, boundaries and other dangerous goods stores.

1.4.48 Shall

Indicates that a statement is mandatory.

1.4.49 Should

Indicates a recommendation.

1.4.50 Silo

An above-ground, tower-like, weatherproof structure capable of receiving and discharging bulk solids.

1.4.51 Stack

A number of packages, pallet-loads or intermediate bulk containers of the same material, or compatible materials, grouped together, but without racking or other supporting structures.

NOTE: Some combinations of Division 5.1 dangerous goods can be incompatible or can react dangerously.

1.4.52 Subsidiary Risk (Subrisk)

A reference to any additional hazard that the dangerous goods might have, indicated by the Subsidiary Risk number to which the goods are assigned. Dangerous goods are assigned as Subsidiary Risk if they—

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

1.4.53 Tank

A container other than package or IBC, intended for the storage or transport of a liquid. For the purposes of this Standard, 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 tank container, which is fitted with frames to international freight container dimensions in accordance with AS 3711.6. (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.

1.4.54 Transit storage

The storage of oxidizing agents, in accordance with the requirements of Section 3 of this Standard, held in transit for not less than 12 h and not more than five consecutive days.

1.4.55 Under lock and key

Any of the following:

- (a) A compound with a security fence (see Clause 1.4.41).
- (b) A locked building.
- (c) A secure shed with lockable entrances and, where relevant, windows that are locked or barred.
- (d) A secure and locked freight container or explosives magazine.
- (e) In the case of liquids or emulsions, a lockable tank.

1.4.56 Unexplained loss

Any loss of product that cannot be explained.

1.4.57 UN Number

The identification number assigned to dangerous goods by the United Nations Committee of Experts on the Transport of Dangerous Goods and listed in the ADG Code.

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

1.4.58 Vulnerable facilities

The term ‘vulnerable facilities’ includes, but is not limited to—

- (a) multistorey buildings, above four storeys in height;
- (b) large, glass-fronted buildings with high populations;
- (c) health care facilities, childcare facilities and schools;

- (d) public buildings or structures of major historical value;
- (e) major traffic terminals, e.g. railway stations and airports; and
- (f) major public facilities, e.g. gas, water and electricity works.

1.5 SECURITY OF STORAGE AREAS

All storage areas shall be appropriately secured from access by unauthorized persons.

Where 'security sensitive' materials are to be stored or handled, the relevant regulatory authority shall be consulted and the appropriate regulations complied with.

NOTE: Any regulatory requirements take precedence over the requirements of this Standard.

SECTION 2 MINOR STORAGE

2.1 SCOPE OF SECTION

This Section specifies the criteria for ‘minor storage’ of oxidizing agents, and the requirements for such storage.

This Section does not apply to the storage and handling of ammonium nitrate. For the storage and handling of any quantity of ammonium nitrate, Section 9 applies.

Where the storage of oxidizing agents does not exceed the quantities given in Table 2.1 and complies with the requirements of this Section, it may be classified as minor storage.

Minor storage is exempted from the other sections of this Standard except as required by this Section.

2.2 MINOR STORAGE QUANTITIES

The maximum quantities of oxidizing agents, in packages or intermediate bulk containers (IBCs), allowable as minor storage are given in Table 2.1.

TABLE 2.1
MAXIMUM MINOR STORAGE QUANTITIES
(OTHER THAN AMMONIUM NITRATE)

Type of premises	Maximum quantity, kg or L		
	PG I	PG II	PG III
Residential premises*	5	25	100
Farms	50	250	25 000†
All other premises‡	50	250	1000

* The quantities given in this line may be aggregated.

† This maximum quantity only applies if—

- (a) the area of the farm is at least 2 ha;
- (b) the oxidizing agents are not for retail sale; and
- (c) the store is at least 10 m from any boundary or building.

If all of these requirements are not met, the maximum storage quantity shall be 1000 kg or L.

‡ The quantities specified on this line may be aggregated, provided that the total quantity of oxidizing agents kept does not exceed 1000 kg or L.

NOTES:

- 1 Units of kilograms apply to solids and units of litres to liquids.
- 2 This table does not apply to ammonium nitrate. For storage of ammonium nitrate, Section 9 applies.

2.3 MINOR STORAGE REQUIREMENTS

The following requirements apply to minor storage:

- (a) Adequate ventilation shall be provided (see Clause 4.4(g)).
- (b) Spill retention and collection measures shall be provided at places where packages are to be opened and their contents transferred or used.

- (c) Packages of oxidizing agents shall—
- (i) be kept on non-combustible surfaces that are not liable to attack or damage by the contents if spilt;
 - (ii) be securely stacked or suitably restrained from falling;
 - (iii) be kept at least 3 m away from sources of heat;
 - (iv) not be kept next to combustible materials (e.g. timber pallets) or any other incompatible substances, e.g. hydrogen peroxide shall not be kept next to sodium hydroxide;
 - (v) be opened only in appropriately ventilated areas; and
 - (vi) be kept securely closed when not in use.
- (d) A supply of water, from a garden hose or hose reel, shall be available nearby, for emergency use.
- (e) Dangerous goods of any other Classes or Divisions shall not be kept in the same cabinet as oxidizing agents.

NOTES:

- 1 A large number of proprietary chemicals (e.g. surfactants, brake fluids, lubricating oils) can react with oxidizing agents, and should be appropriately segregated from them. Caution is required in the storage of any unknown materials in the vicinity of oxidizing agents.
 - 2 Some Division 5.1 substances are incompatible with other Division 5.1 substances, e.g. sodium nitrite and ammonium nitrate; calcium hypochlorite and isocyanurates.
- (f) The contents of any package shall not be transferred to any other container for storage unless the latter is—
- (i) suitable for the storage of the oxidizing agent; and
 - (ii) clearly marked to indicate the identity and hazard potential of that substance.
- NOTE: Where the contents of a package have been transferred into another container, the resultant package, if it is to be used for transport, is required by the relevant regulatory authority to comply with the ADG Code.
- (g) Appropriate personal protective equipment (see Clause 10.13) shall be used when handling, or decanting from, containers.
- (h) At premises other than residential premises where the substance is not kept for resale, a suitable first aid kit and appropriate personal protective equipment shall be provided. Reference should be made to the material safety data sheet (MSDS) for the substance being kept.
- NOTE: MSDS are available from the supplier of the oxidizing agent.
- (i) All spills and leaks shall be cleaned up promptly. Any waste shall be disposed of in accordance with Section 13. Spilled or leaked material shall not be returned to its original packaging.

NOTE: Sections 10, 11 and 12 of this Standard deal with safety matters that may be pertinent to minor storage but may be regarded as being advisory.

SECTION 3 TRANSIT STORAGE

3.1 SCOPE OF SECTION

This Section specifies requirements for the temporary storage of oxidizing agents and of other dangerous goods and non-dangerous goods being held in the storage area with them, when in transit.

Sections 1, 10, 11 and 12 also apply to transit storage.

3.2 DELINEATION OF TRANSIT STORAGE AREAS

Areas used for the transit storage of oxidizing agents shall be deemed to be separate areas if apart from each other and from other storage areas by at least 15 m.

3.3 REQUIREMENTS FOR TRANSIT STORAGE

A large number of proprietary chemicals (e.g. surfactants, brake fluids, lubricating oils) can react with oxidizing agents, and should be appropriately segregated from them. Caution is required in the storage of any unknown materials in the vicinity of oxidizing agents.

The following requirements apply to the transit storage of oxidizing agents and of other dangerous goods being held in the storage area with them, unless there is a more stringent requirement imposed by regulation or another Standard applicable to the other dangerous goods.

- (a) The quantity of oxidizing agents held in each transit storage area shall not exceed 200 t. Where oxidizing agents are held in the one area with other dangerous goods, the aggregate quantity shall not exceed 200 t.
- (b) Oxidizing agents and other dangerous goods that are not permitted by the ADG Code to be stowed together on the same vehicle shall be segregated from each other by a minimum distance of 5 m while they are being held in a transit storage area.
- (c) Except when in freight containers, stacks of packages and IBCs in a transit storage area shall—
 - (i) each not exceed 25 t;
 - (ii) be accessible from all sides; and
 - (iii) be segregated from each other by at least 5 m.
- (d) Freight containers or tank containers containing packaged or bulk oxidizing agents in a transit storage area shall—
 - (i) not be stacked more than two containers high and two containers deep;
 - (ii) where stacked two containers deep, be provided with access to both sides of each stack;
 - (iii) not be in the same vertical stack as any container of other Classes or Divisions of dangerous goods; and
 - (iv) be separated from containers of other Classes or Divisions of dangerous goods by at least 3 m.

- (e) A spillage catchment and clean-up facilities shall be provided for the site. They shall be capable of handling at least 100% of the capacity of the largest tank, freight container, IBC or tanker compartment or 10% of the total packages in the transit storage area, whichever is the greater.

NOTE: In order to facilitate the management of emergencies, it is recommended that the compound capacity be about 10% greater than the minimal values specified above.

- (f) The base of the transit storage area shall be impervious, in order to retain any spillage.
- (g) Parked road vehicles loaded with oxidizing agents shall be separated from any other loaded vehicles by at least 3 m, and from any other dangerous goods stores within the area by at least 5 m.

NOTE: Greater distances may be required by another Australian Standard, the ADG Code, or the relevant regulatory authority.

- (h) Access and escape routes shall be clearly defined and kept clear.
- (i) Specific facilities, which may include a designated area, shall be provided at the site for dealing with tanks or packages that are—
 - (i) leaking;
 - (ii) damaged and likely to leak as a result of such damage; or
 - (iii) awaiting disposal.

NOTE: Containers or freight containers of oxidizing agents that are leaking, or are impaired and may spill or leak, should not be loaded on a vehicle.

- (j) Except in emergencies, or when transferring unopened packages, oxidizing agents shall not be transferred between containers or decanted when in the transit storage area.
- (k) Where relevant, and in emergencies, appropriate personal protective equipment (see Clause 10.13) shall be used.
- (l) All dangerous goods and freight containers shall be marked in accordance with the ADG Code.
- (m) Transit storage areas shall be kept clear of any extraneous matter.

3.4 AMMONIUM NITRATE IN TRANSIT STORAGE AREAS

Where the transit storage area is in continual use, i.e. it is usual to have ammonium nitrate in that area, it shall be considered a permanent storage area, and the requirements of Section 9 shall apply.

SECTION 4 STORAGE AND HANDLING OF PACKAGES

4.1 SCOPE OF SECTION

This Section sets out requirements relating to the storage and handling of packages of oxidizing agents in package stores, in quantities greater than those classified as minor storage in Section 2.

Additional requirements for the storage and handling of ammonium nitrate in packages and IBCs are given in Section 9.

NOTES:

- 1 This Section does not apply where Section 3 is applicable.
- 2 Stores for 'mixed classes' of dangerous goods are addressed in AS/NZS 3833.
- 3 Large packagings and intermediate bulk containers (IBCs) having a capacity not exceeding 1.6 m³ may be stored and handled in accordance with this Section in the same manner as packages, provided that the large packagings and IBCs have all openings closed at all times during such storage and handling.

4.2 APPLICATION OF SECTION

Clauses 4.3, 4.4, 4.5, 4.7 and 4.9 apply to all package stores. Clauses 4.4, 4.5 and 4.6 do not apply to storage in cabinets. Clause 4.8 specifically applies to storage in cabinets.

4.3 TYPES OF PACKAGE STORES

An installation for the storage or handling of packaged oxidizing agents may be, but is not limited to, any of the following:

- (a) An open-air, unroofed enclosure.
- (b) A freestanding roofed structure or building.
- (c) A room or area attached to an external wall of another building.
- (d) A room or area within a building, having one or more walls that form part of the external walls of the building.
- (e) A storage cabinet.
- (f) A freight container.

NOTE: Items (b), (c) and (d) are illustrated in Figure 4.1.

4.4 DESIGN AND CONSTRUCTION OF PACKAGE STORES

The design and construction of all package stores for oxidizing agents shall comply with the following requirement and recommendations:

- (a) Internal stores, other than cabinets, shall be located on a floor that has immediate access from outside the building.
- (b) Stores shall be constructed of non-combustible materials that are resistant to attack by the oxidizing agents being kept. Where appropriate, the surface shall be treated in such a manner as to render it resistant to attack by the oxidizing agents being kept.
- (c) Any shelving shall be designed and fitted to prevent oxidizing agents from building up along the ledges or in corners, and to permit ready observation and cleaning up of any spillage.
- (d) The layout of any racking shall allow the clear passage of personnel.

- (e) Except where they are designed as spill trays or compounds, any racks or shelves shall be designed and constructed in such a manner as to prevent the accumulation or pooling of liquid.
- (f) Lighting shall comply with Clause 10.2.3.
- (g) Stores shall be adequately ventilated by either natural or mechanical means, so as to prevent accumulation of any harmful dusts or vapours. The exhaust from any mechanical ventilation system shall be directed away from sources of ignition and areas where people are likely to congregate.

NOTES:

- 1 Ventilation should be sufficient to maintain exposure levels to any vapours or dusts in the storage area below recommended workplace exposure standards.
- 2 Reference should be made to AS/NZS 1668.2.

- (h) In stores where there is a risk of corrosion, all electrical equipment, wiring and lighting shall have a rating of not less than IP65 in accordance with AS 60529.

NOTE: Examples of oxidizing agents causing corrosion are calcium hypochlorite and ammonium nitrate.

- (i) Packages containing liquid oxidizing agents shall be kept in such a manner that they cannot fall and cause spillage outside the compound.

NOTE: Such packages should be kept at least 1 m from the inner edge of the bund wall, or restraints provided to prevent falls or spills occurring outside the compound.

- (j) Where liquid oxidizing agents are kept, the storage area shall be provided with a means of either containing a spill or diverting it to a safe containment area within the boundaries of the premises. The net capacity of any containment area shall be—

- (i) for PG I liquids, 100% of the aggregate volume of liquids kept; and
- (ii) for liquids of PG II or III, 25% of the aggregate volume of liquids kept.

In any case, the net capacity of any spill containment provision shall be at least the capacity of the largest container kept.

- (k) Where fire sprinklers are required, they shall be installed in accordance with the Building Code of Australia (BCA) and the appropriate parts of AS 2118. The capacity of the containment area shall be increased to include the output of the fire sprinklers over a 20-minute period.

NOTE: The area of sprinkler operation and the rate of flow, i.e. the design density, need to be considered when determining the allowance for the 20-minute containment.

- (l) Appropriate gloves, and water for the washing of hands shall be provided.
- (m) For stores where packages are opened, eyewash facilities complying with AS 4775 shall be provided.
- (n) All relevant requirements of Clause 10.2.1 shall apply.
- (o) All areas used for decanting shall have floors that are sealed and are drained to a suitable compound.
- (p) Where stores have a floor area greater than 250 m², at least two means of egress should be provided.

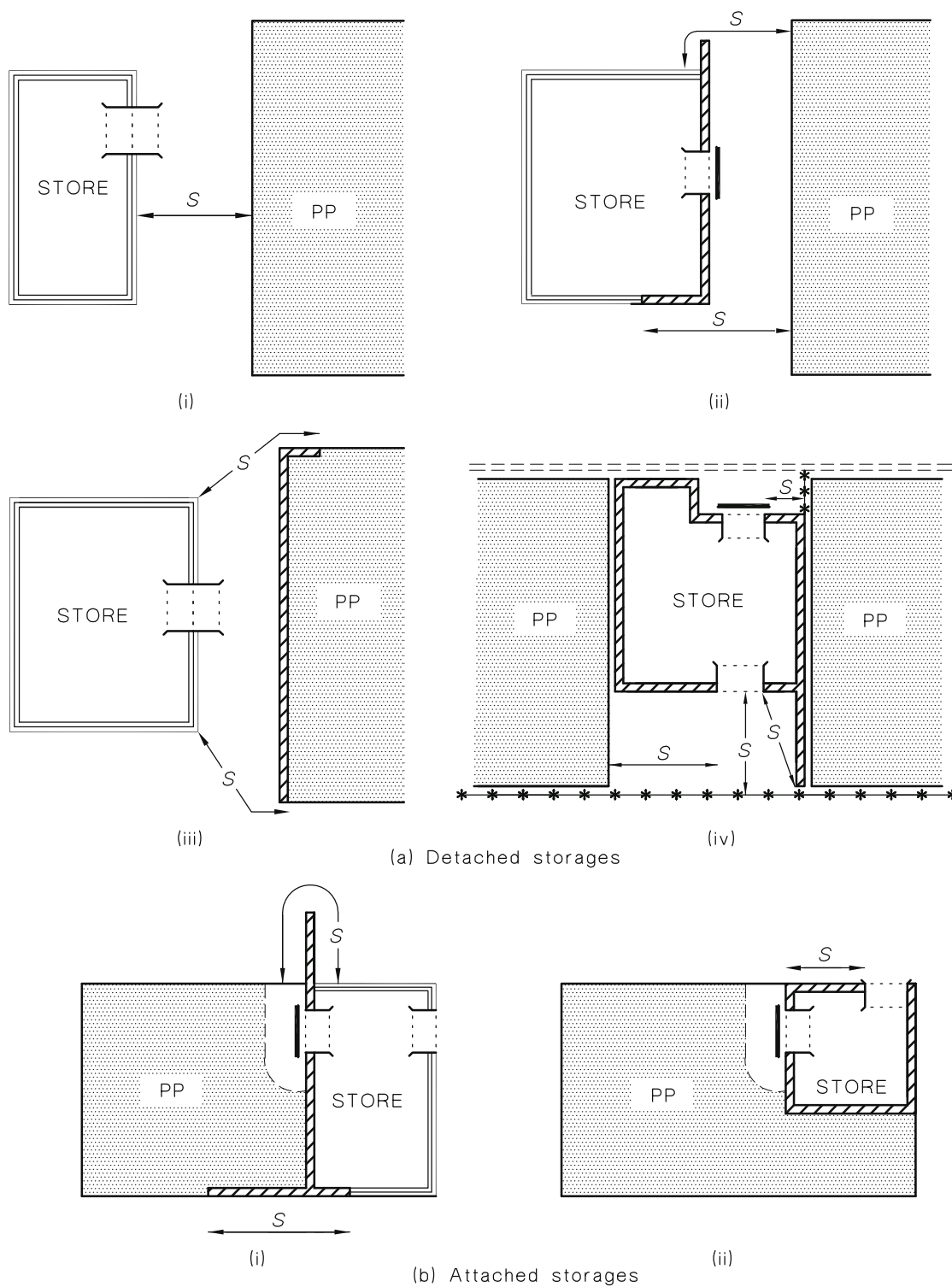


FIGURE 4.1 EXAMPLES OF PACKAGE STORES

4.5 STORAGE IN STACKS

Where packages of oxidizing agents are kept in stacks (i.e. pallet racking is not used), the maximum capacities of such stacks shall be as set out in Table 4.1. Where pallet racking is not used—

- (a) stacks of packages shall be limited to 3 m in height; and
- (b) a free air space of not less than 1.2 m shall be maintained between stacks of oxidizing agents and the outer walls of the building.

The requirements of Items (a) and (b) do not apply where pallet racking is used.

NOTE: Where containers are to be stacked, the relevant MSDS or the supplier of the oxidizing agent should be consulted for further advice on maximum stacking heights.

Stacks shall be separated from each other by at least 3 m or by concrete walls of not less than 100 mm thickness.

TABLE 4.1
CAPACITIES AND SEPARATION OF
STORAGE STACKS AND STORES OF OXIDIZING AGENTS
(OTHER THAN AMMONIUM NITRATE)

Oxidizing agent	Maximum capacity of an individual stack	Maximum capacity of an individual store	Distance between stacks
	t	t	m
Stacked on combustible pallets	20	250	3
Stacked without pallets, or on non-combustible pallets	50	500	3

4.6 STORAGE OF IBCs

IBCs may be kept in accordance with the requirements of this Section as if they were packages, provided that—

- (a) their capacity does not exceed 1600 kg or 1600 L;
- (b) they remain closed while in storage; and
- (c) they do not contain oxidizing agents of PG I.

The requirements of Section 5 also apply.

4.7 SEPARATION AND SEGREGATION

4.7.1 Oxidizing agents having Subsidiary Risks

Where the oxidizing agent being kept in packages has one or more Subsidiary Risks, reference shall be made to the Australian Standards relevant to the Classes of those Risks and the greatest specified separation and segregation distances shall apply.

4.7.2 Separation of package stores from protected places and boundaries

4.7.2.1 Separation distances

With due regard being given to Clause 4.7.1 and except where ammonium nitrate is stored, package stores of oxidizing agents shall be separated from protected places and boundaries by the minimum distances set out in Table 4.2.

Ammonium nitrate stores shall be located in compliance with Section 9.

4.7.2.2 Measurement of separation distances

Separation distances may be measured in a horizontal plane around an intervening screen wall in the following circumstances:

- (a) The wall and the roof, if any, have an FRL of at least 120/120/120.
NOTE: Where an FRL is required, reference should be made to the *Building Code of Australia* (BCA) for guidance.
- (b) The wall is marked such as to indicate the maximum permissible storage height.
- (c) Where the height of the store is greater than or equal to that of the protected place, the wall extends at least 1 m above the highest container in the store.
- (d) Where the height of the store is less than that of the protected place, the wall extends—
 - (i) at least 1 m above the protected place; or
 - (ii) to meet a roof having the same FRL above the store.

TABLE 4.2

**MINIMUM SEPARATION DISTANCES FOR OXIDIZING AGENTS
(OTHER THAN AMMONIUM NITRATE)
FROM PROTECTED PLACES AND BOUNDARIES**

Aggregate quantity kept kg or L	Minimum distance from protected places and boundaries m		
	PG I	PG II	PG III
≤ 1 000	5	3	0*
>1 000 ≤10 000	8	5	3
>10 000 ≤50 000	10	8	5
>50 000	15	10	8

* Despite a minimum separation distance of zero being applicable, stores shall not be located *inside* any protected places.

NOTES:

- 1 Separation distances to on-site protected places that are an integral part of the storage, processing or handling of oxidizing agents may be reduced subject to appropriate risk identification, assessment and control.
- 2 Where oxidizing agents of differing Packing Groups are kept in the one store, the distances shall be—
 - (a) those that apply to the most dangerous Packing Group present; and
 - (b) based on the aggregate quantity of all oxidizing agents being kept.
- 3 Regulatory authorities may require greater separation distances.
- 4 For stores of ammonium nitrate, Section 9 applies.

4.7.3 Segregation of oxidizing agents

4.7.3.1 Segregation

Packaged oxidizing agents shall be segregated from incompatible substances and substances with which they might react dangerously in accordance with the following:

- (a) Where the substances being kept are incompatible, they shall be—
 - (i) kept in separate compounds; or
 - (ii) segregated by a distance of at least 5 m except that, where both substances are solids, the distance may be reduced to 3 m.

- (b) Where the substances being kept might react dangerously, they shall—
- (i) be separated by a minimum distance of 5 m; and
 - (ii) not be kept within the same compound, or in compounds that share a common drainage system.

NOTES:

- 1 A large number of proprietary chemicals (e.g. surfactants, brake fluids, lubricating oils) can react with oxidizing agents, and should be appropriately segregated from them. Caution is required in the storage of any unknown materials in the vicinity of oxidizing agents.
- 2 Some Division 5.1 substances are incompatible with other Division 5.1 substances, e.g. sodium nitrite and ammonium nitrate, calcium hypochlorite and isocyanurates.

Where necessary, appropriate precautions, e.g. the provision of bunds, kerbing or sloping floors, shall be taken to ensure that spills of molten incompatible products (e.g. resulting from a fire) cannot mix.

For retail premises devoted principally to the sale of swimming pool chemicals, provided that the maximum quantity of oxidizing agents and other dangerous goods being kept on the premises does not exceed 5000 kg or 5000 L, the distances given in Items (a) and (b) may be halved.

NOTE: AS/NZS 3833 provides further information for retail shops for pool chemicals.

4.7.3.2 *Measurement of segregation distances*

The above-specified distances may be measured in a horizontal plane around an intervening screen wall.

Where any of the goods being segregated are dangerous goods of Classes, Divisions or Subsidiary Risks 2.1, 2.3, 3, 4 or 5.2, or combustible liquids, the screen wall shall—

- (a) have an FRL of at least 120/120/120;
- (b) extend at least 1 m above the highest item in the store; and
- (c) be marked to indicate the maximum permissible storage height.

4.8 STORAGE IN CABINETS

4.8.1 **Types of substances kept**

Cabinets for the storage of oxidizing agents shall not be used for the storage of other types of substances. Where more than one oxidizing agent is kept in a cabinet, the oxidizing agents shall be compatible.

4.8.2 **Maximum quantities to be kept**

The maximum quantity of Packing Group I substances kept in a single storage cabinet shall not exceed 50 kg or 50 L. The maximum quantity of Packing Group II substances kept in a single storage cabinet shall not exceed 250 kg or 250 L.

Subject to these provisions, the maximum quantity of all oxidizing agents kept in a single storage cabinet shall be—

- (a) 250 kg or 250 L if the cabinet is indoors; or
- (b) 850 kg or 850 L if the cabinet is outdoors.

NOTE: Units of kilograms apply to solids and units of litres to liquids.

4.8.3 **Cabinet design and construction**

The following requirements apply to the design and construction of cabinets:

- (a) The walls, floor, roof and door of the cabinet shall be constructed of double-walled steel with a space of at least 40 mm between its walls. This space may be either an air space or filled with non-combustible material.
- (b) The cabinet shall be provided with one or more doors that are—
 - (i) self-closing;
 - (ii) close-fitting; and
 - (iii) held shut by catches that release in the event of a build-up of pressure within the cabinet.
- (c) Door catches and hinges shall not be constructed of plastics or zinc die castings.
- (d) The cabinet's lower compartment shall be—
 - (i) liquid-tight;
 - (ii) at least 150 mm deep; and
 - (iii) capable of containing at least 25% of the total storage capacity.
- (e) Any shelves within the cabinet shall be perforated to permit free air movement.
- (f) Where appropriate, cabinets shall be vented to atmosphere, away from ignition sources and areas where persons are likely to congregate.

4.8.4 Cabinet location

The following requirements apply to the location of cabinets:

- (a) Cabinets shall be located at least 3 m from any source of heat that could affect the cabinet or its contents.
- (b) Where cabinets are installed in a building—
 - (i) irrespective of the occupancy of the building, not more than one cabinet shall be installed in each 100 m² of building area, and the separation distance between any two cabinets shall be not less than 3 m;
 - (ii) the cabinets shall be located where they will not impede escape in an emergency; and
 - (iii) cabinets shall be located near a provision for the washing of hands.
- (c) Cabinets kept outdoors shall be protected from the weather.

4.8.5 Cabinet marking

Cabinets shall be marked in accordance with Clause 10.3.

4.9 OUTDOOR STORAGE

Packaged oxidizing agents shall only be stored outdoors if—

- (a) the storage area complies with Clause 4.3(a);
- (b) the product, container and label will not be adversely affected by exposure to the elements;
- (c) the enclosure is located away from any building; and
- (d) the crystalline structure of the oxidizing agents is not crucial, or will not be affected by the storage conditions.

4.10 REQUIREMENTS FOR PACKAGE FILLING OPERATIONS

The following requirements apply to package filling operations:

- (a) The transfer of oxidizing agents from packages to other containers shall be conducted in a dedicated area away from racking or shelving associated with the storage area.
- (b) In retail outlets, e.g. in shops supplying swimming-pool chemicals, containers shall be filled in a dedicated area—
 - (i) to which the public do not have access; and
 - (ii) that complies with the relevant requirements of Clause 4.7.

NOTE: For safety reasons, the filling of containers in retail outlets is not recommended.

- (c) Adequate ventilation shall be provided in the package filling area. Dependent on the nature of the vapours or dust, it may be necessary to install a scrubber prior to the discharge point.

NOTE: Ventilation should be sufficient to maintain exposure levels to any vapours or dusts in the storage area below recommended workplace exposure standards.

- (d) A safety shower and eyewash facilities, both complying with AS 4775, shall be located close to the filling point.
- (e) Chemical goggles or face shields, and protective gloves, shall be worn (see Clause 10.13).
- (f) Care shall be taken to prevent and control spills and leaks.
- (g) Containers, tools and equipment shall be of materials that are compatible with, and resistant to, the oxidizing agents being handled.
- (h) Containers, tools and equipment shall be thoroughly cleaned and dried prior to their use with oxidizing agents.
- (i) Where oxidizing agent powders are removed from the original pack with a dedicated hand scoop, no residues shall be allowed to remain on that scoop after transfer.
- (j) Dedicated and proper drum taps, pumps or other devices to control drips and spills shall be used when liquids are to be decanted. Oxidizing agents shall not be sucked up by mouth; mechanical aids for siphoning and pipetting shall be used.
- (k) Oxidizing agents that have been removed from their original package shall not be returned to that package.
- (l) Original packages shall be resealed after use, and any venting arrangements shall be maintained. These containers, provided that they are in a clean condition, may be left at the dispensing point.
- (m) All spilled or contaminated materials shall be dealt with immediately, in accordance with Clause 11.5 and Section 13.
- (n) Empty containers shall be dealt with in accordance with Section 13.

SECTION 5 STORAGE IN INTERMEDIATE BULK CONTAINERS

5.1 SCOPE OF SECTION

This Section sets out considerations specific to the storage of oxidizing agents in intermediate bulk containers (IBCs).

Additional requirements for the storage and handling of ammonium nitrate in IBCs are given in Section 9.

NOTES:

- 1 Throughout this Clause, units of kilograms apply to solids and units of litres to liquids.
- 2 IBCs that are to be filled with an oxidizing agent need to comply with the quality and types requirements of the ADG Code.

5.2 CONSIDERATIONS SPECIFIC TO IBC STORAGE

The following requirements and considerations are specific to the storage of oxidizing agents in IBCs:

- (a) IBCs may be kept in accordance with the requirements of Section 4 of this Standard, as if they were packages, provided that—
 - (i) their capacity does not exceed 1600 kg or 1600 L; and
 - (ii) they remain closed while in storage; and
 - (iii) they do not contain oxidizing agents of PG I.
- (b) Where the capacity of IBCs exceeds 1600 kg or 1600 L—
 - (i) in the case of storage of PG III substances, the maximum capacities of individual stacks and stores shall be as set out in Table 4.1;
 - (ii) in the case of storage of liquids of other than PG III, Section 7 of this Standard shall apply; and
 - (iii) in the case of storage of solids of other than PG III, Section 6 of this Standard shall apply.
- (c) Where liquids are kept, the requirements relating to bunds and compounds (as set out in Clause 7.5) apply to storage in IBCs, except that, where an IBC is shielded with a compatible material, the distance specified in Clause 7.5.3(e) does not apply.
- (d) Separation and segregation distances for IBCs shall comply with Clause 4.7.2 or 4.7.3, as appropriate.
- (e) Where IBCs are to be kept in a factory—
 - (i) the capacity of the IBCs shall not exceed 1600 kg or 1600 L; and
 - (ii) the separation distances in Item (d) above shall be measured to any areas that are not associated with the use of the oxidizing agent.
- (f) IBCs designed for single-trip use shall not be reused for dangerous goods. IBCs designed for multi-trip use shall be inspected prior to filling, to ensure that they are free from contamination or damage and have sufficient strength for their further use.
- (g) Where IBCs are connected to a process, the relevant clauses of Section 7 shall apply.
- (h) Where IBCs containing ammonium nitrate are kept, the requirements of Section 9 of this Standard apply in addition to those above.