

Australian/New Zealand Standard™

Safety in laboratories

Part 10: Storage of chemicals



AS/NZS 2243.10:2004

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee CH-026, Safety in Laboratories. It was approved on behalf of the Council of Standards Australia on 27 April 2004 and on behalf of the Council of Standards New Zealand on 7 May 2004. It was published on 1 June 2004.

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New Zealand Microbiological Society
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Australian/New Zealand Standard™

Safety in laboratories

Part 10: Storage of chemicals

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PREFACE

This Standard was prepared by Joint Standards Australia/Standards New Zealand Committee CH-026, Safety in Laboratories to supersede AS 2243.10—1993.

The objective of this Standard is to provide information on appropriate storage of chemicals and dangerous goods both within laboratories and within dedicated storage areas that are support areas for a laboratory.

This edition has been prepared to take into account several new Standards published on storage and handling of chemicals, to align it with current editions of other referenced documents and to make it appropriate for use in New Zealand.

The major changes in this edition are—

- (a) consolidation of storage area requirements from two types differentiated by capacity to one;
- (b) addition of more specific requirements for storage of chemicals within a laboratory; and
- (c) an increased alignment with and reference to the requirements in other Standards covering storage of chemicals.

Existing storage facilities will, in many instances, not comply with this Standard. In the interests of laboratory safety, a high priority should be allocated to the preparation of a program for upgrading storage facilities to meet the requirements of this Standard. Existing facilities should be assessed for risk and interim control measures implemented, depending on the time frame decided for the upgrading program.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

The term ‘informative’ has been used in this Standard to define the application of the appendix to which it applies. An ‘informative’ appendix is only for information and guidance.

This publication is Part 10 of a series of Standards prepared to promote safe working in laboratories. The Parts in the series are as follows:

Part 1: General

Part 2: Chemical aspects

Part 3: Microbiological aspects and containment facilities

Part 4: Ionizing radiations

Part 5: Non-ionizing radiations—Electromagnetic, sound and ultrasound

Part 6: Mechanical aspects

Part 7: Electrical aspects

Part 8: Fume cupboards

Part 9: Recirculating fume cabinets

Part 10: Storage of chemicals (this Part)

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FOREWORD

Some legislation refers to various parts of the AS/NZS 2243 series and AS/NZS 2982.1 as the guidelines for the use and storage of dangerous goods in laboratory environments. Readers of this Standard should investigate if legal requirements are applicable to their situation as these will take precedence over the requirements in this Standard.

AS/NZS 2243.1 deals in a general manner with operational safety matters and AS/NZS 2243.2 covers operational safety when using chemicals, without giving guidelines on the method of storage or the amounts of chemicals that can be stored in laboratories. AS/NZS 2982.1 deals briefly with the design of chemical stores and refers to AS 1940 for the design of stores for flammable and combustible liquids.

The information in the above Standards is not comprehensive and does not specify the manner in which chemicals, including dangerous goods of various classes, should be stored in laboratories and associated stores. This Standard provides detailed specifications for the storage of chemicals, including dangerous goods, in laboratories. It does not deal with the following dangerous goods: Class 1 (Explosives); Class 6.2 (Infectious substances); and Class 7 (Radioactive substances). However, other parts of AS/NZS 2243 cover the safe storage and handling of some of these materials.

In most storage situations, several Standards may need to be considered. For laboratories, the Standards to be considered may be as follows:

- (a) This Standard.
- (b) The relevant Australian, New Zealand or Joint Australian/New Zealand Standard for each individual class of dangerous goods or type of chemical to be stored.
- (c) AS/NZS 3833 for the storage of mixed classes of dangerous goods.

This Standard allows a high level of flexibility if a large range of chemicals need to be stored but is severely limiting in the total quantities that can be stored. This Standard also sets out requirements for storage within a laboratory, which is not addressed in other Standards.

For storage separate from a laboratory, there will be situations when any of the three options listed above may be applied.

Sections 5 and 6 of this Standard may be applied except where quantities or pack sizes larger than those permitted in this Standard need to be stored. In such cases, the Standard applicable to the Class of dangerous good or the type of chemical, or AS/NZS 3833 for mixed classes of chemicals would be applicable.

The relevant Standard for the particular Class of dangerous goods or type of chemical (see list in Appendix A) may be preferable if only non-flammable dangerous goods or only one or two Classes of dangerous goods or types of chemicals are stored, or they are in dominant quantities.

AS/NZS 3833 is intended mainly for the storage of large quantities of predetermined dangerous goods but excluding Packing Group I. It does not allow the storage flexibility often required for research and experimental laboratories. Its required segregation distances are not normally available in laboratory stores. It might be more suitable for industrial applications where larger quantities of raw materials or finished products are held 'in quarantine' awaiting quality assurance testing.

Whichever Standard is chosen for the separate chemical storage area, it needs to be applied in full.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

**Australian/New Zealand Standard
Safety in laboratories****Part 10: Storage of chemicals**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out the requirements for the safe keeping of chemicals in packages—

- (a) when stored inside a laboratory;
- (b) stored in associated storerooms or spaces which are support areas to the laboratory; and
- (c) when opening packages.

NOTE: The relationship between this Standard and other Standards on the storage of chemicals is provided in the Foreword.

1.2 APPLICATION

This Standard applies to —

- (a) substances defined as hazardous in NOHSC 1008.
- (b) dangerous goods, as defined in Clause 1.4.6, except for dangerous goods of Class 1 (Explosives), Class 6.2 (Infectious substances) or Class 7 (Radioactive substances);
- (c) combustible liquids as defined in Clause 1.4.15.1; and
- (d) goods too dangerous to be transported under the ADG Code.

NOTE: There are separate National, State and Territory legislation on explosives and National, State and Territory requirements for infectious substances, carcinogenic materials, scheduled poisonous substances and storage in bulk. In Australia, radioactive substances are covered by State and Federal legislation with Federal requirements for the safe handling and transport of radioactive substances.

This Standard also applies to chemicals not classed as hazardous substances or dangerous goods if compatibility problems could arise during storage.

NOTE: The term 'chemical' includes, but is not limited to, a pure element, a compound of a number of elements, or a mixture of two or more such compounds, and any solution, suspension, fume or aerosol thereof.

The requirements of this Standard apply only to the keeping, in use or storage, of chemicals in packages. There are no restrictions on the size of packages of chemicals that are not classed as hazardous substances or dangerous goods.

The storage requirements do not apply if the chemicals are—

- (i) currently being processed or used in experimental operations such as reaction, blending or mixing; or
- (ii) kept in the laboratory prior to use within the next 12 h or following use within the previous 12 h and their quantity or inherent hazard do not create any significant danger to persons or the environment.

Where the size of packages of hazardous substances or the aggregate quantities to be stored exceed the limitations of this Standard, (see Clauses 4.2, 4.3, 4.4 and 5.4.2), reference should be made to—

- (A) AS 1940, for storage of flammable and combustible liquids;
- (B) AS/NZS 1596, for LP Gas; or
- (C) other appropriate Australian, Australian/New Zealand or New Zealand Standards.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- | | |
|--------|---|
| 1375 | Industrial fuel-fired appliances |
| 1894 | The storage and handling of non-flammable cryogenic and refrigerated liquids |
| 1940 | The storage and handling of flammable and combustible liquids |
| 2430 | Classification of hazardous areas |
| 2430.1 | Part 1: Explosive gas atmospheres |
| 2714 | The storage and handling of hazardous chemical materials—Class 5.2 substances (organic peroxides) |
| 3780 | The storage and handling of corrosive substances |
| 3961 | Liquefied natural gas—Storage and handling |
| 4332 | The storage and handling of gases in cylinders |

AS/NZS

- | | |
|--------|---|
| 1020 | The control of undesirable static electricity |
| 1596 | The storage and handling of LP Gas |
| 2022 | Anhydrous ammonia — Storage and handling |
| 2243 | Safety in laboratories |
| 2243.1 | Part 1: General |
| 2243.2 | Part 2: Chemical aspects |
| 2243.8 | Part 8: Fume cupboards |
| 2381 | Electrical equipment for explosive atmospheres—Selection, installation and maintenance |
| 2381.1 | Part 1: General requirements |
| 2430 | Classification of hazardous areas (series) |
| 2927 | The storage and handling of liquefied chlorine gas |
| 2982 | Laboratory design and construction |
| 2982.1 | Part 1: General requirements |
| 3000 | Electrical installations (known as the Australian/New Zealand Wiring Rules) |
| 3833 | The storage and handling of mixed classes of dangerous goods in packages and intermediate bulk containers |
| 4452 | The storage and handling of toxic substances |
| 4681 | The storage and handling of Class 9 (miscellaneous) dangerous goods and articles |
| 4801 | Occupational health and safety management systems—Specification with guidance for use |

AS/NZS

- 61241 Electrical apparatus for use in the presence of combustible dust
 61241.3 Part 3: Classification of areas where combustible dusts are or may be present

NZS

- 5433 Transport of dangerous goods on land
 6101.1 Flammable gas and vapour atmospheres

ACTDG (Advisory Committee on the Transport of Dangerous Goods)

ADG Code Australian Dangerous Goods Code

Volume 1: Requirements and recommendations, comprising the Australian Code for the Transport of Dangerous Goods by Road and Rail (6th edition) and the Rail (Dangerous Goods) Rules, and including the Road Transport Reform (Dangerous Goods) Regulations.
 Volume 2: Technical Appendices

NOHSC (National Occupational Health and Safety Commission)

- 1008 Approved criteria for classifying hazardous substances
 2012 National code of practice for the labelling of workplace substances
 10005 List of designated hazardous substances

New Zealand Environmental Risk Management Authority

Hazardous Substances and New Organisms Act 1996

Hazardous Substances (Emergency Management) Regulation 2001

Hazardous Substances (Minimum Degrees of Hazard) Regulations 2001

ASTM

- D92 Test method for flash and fire points by Cleveland open cup tester

NFPA (National Fire Protection Association (USA))

- 68 Guide for venting of deflagrations

UNITED NATIONS

Manual of Tests and Criteria

Recommendations on the Transport of Dangerous Goods —Model Regulations

1.4 DEFINITIONS

For the purpose of this Standard, the definitions of AS/NZS 2243.1, AS/NZS 2243.2, AS/NZS 2982.1 and those below apply.

1.4.1 Attached room

A room which is attached to another room with one or more common wall, or a room within another room.

1.4.2 Capacity

The internal volume of a container.

1.4.3 Chemical storage cabinet

A storage cabinet constructed in accordance with the requirements of Clause 3.3.

1.4.4 Classes of dangerous goods

The classification assigned to various substances in the ADG Code. Where the word 'Class' is used in this Standard with a corresponding number, it refers to classes of dangerous goods.

1.4.5 Cryogenic liquid

A liquid having a normal boiling point below -90°C at atmospheric pressure (101.3 kPa).

1.4.6 Dangerous goods

(Australia) Substances and articles that —

- (a) satisfy the UN tests and criteria for determining whether they are dangerous goods;
- (b) are listed in the ADG Code; or
- (c) are determined to be dangerous goods by the competent authority under Regulation 2.2 of the *Road Transport Reform (Dangerous Goods) Regulations*.

(New Zealand) Substances having properties described in Table A of NZS 5433:1999, and includes packaging and empty containers that have not been cleaned after containing dangerous goods.

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

1.4.7 Explosion vent

A vent or an opening intended to relieve promptly the pressure caused by an explosion and thus minimize damage to the protected space.

1.4.8 Hazardous area

A space in which a flammable or explosive atmosphere is present, or may be expected to be present, continuously or intermittently, at a concentration that requires special precautions with respect to ignition sources.

NOTE: AS 2430.1 and the AS/NZS 2430 series should be consulted for classification of hazardous zones arising from the storage and handling of flammable liquids and flammable gases. AS/NZS 61241.3 should be consulted for classification of areas where combustible dusts may be present.

1.4.9 Hazardous chemicals

Those chemicals that fall into the categories described in Items (a), (b), (c) and (d) of Clause 1.2.

1.4.10 Hazardous substance

(Australia) A substance which has been classified as hazardous in accordance with NOHSC 1008 or is listed in NOHSC 10005.

(New Zealand) Any substance that triggers any one of the threshold levels defined in the *Hazardous Substances (Minimum Degrees of Hazard) Regulations 2001* for any of the hazardous properties listed in the *Hazardous Substances and New Organisms Act, 1996*.

1.4.11 Ignition source

A source of energy sufficient to ignite a flammable or explosive atmosphere. It may include naked flames, hot surfaces, exposed incandescent material, electrical arcs, hot particles, electrical discharge including from static electricity, chemical reactions, high intensity electromagnetic radiation including visible light or ultraviolet radiation, mechanical sparks, fixed and portable electrical equipment, portable tools or vehicles such as forklifts.

1.4.12 Incompatible

In relation to substances, where the substances —

- (a) when brought in contact with one another, may react or combine in a manner that —
 - (i) could increase the hazard of an individual substance, for example, by causing a fire, explosion, violent reaction, liberating flammable or poisonous gases;
 - (ii) could cause the deterioration of the container or substance;
 - (iii) could otherwise cause injury to people or endanger property; or

(b) are declared by a relevant regulatory authority to be incompatible.

In relation to a substance and packaging or equipment, where the container or item of equipment is constructed of a material with which the substance is likely to interact and weaken or damage the container or item to the extent that risk increases.

1.4.13 In use

Applicable to chemicals that are kept in a laboratory for frequent use, e.g. on a daily or weekly basis; and to gas cylinders, kept inside or outside a laboratory, that are connected to a system for use.

NOTE: This term is only relevant to a laboratory. Chemicals, including gases and cryogenic liquids, are not considered to be 'in use' when kept in a storeroom.

1.4.14 Laboratory

Any building or part of a building used, or intended to be used, for scientific or technical work, including research, quality control, testing, teaching or analysis. Such work may involve the use of chemicals (including dangerous goods and hazardous substances), pathogens and radiation or processes including electrical or mechanical work. The laboratory includes such support areas as instrument and preparation rooms, laboratory stores and any offices attached or adjacent to the laboratory.

NOTES:

- 1 In a multi-occupancy building, the area occupied by the laboratory may be referred to as the laboratory area.
- 2 AS/NZS 2982.1 contains definitions of various types of laboratories.

1.4.15 Liquid

1.4.15.1 Combustible liquid

A liquid other than a flammable liquid that has a flash point, and that has a fire point less than its boiling point.

For the purposes of AS 1940, combustible liquids are divided into two classes as follows:

Class C1—a combustible liquid that has a flash point of 150°C or less.

Class C2—a combustible liquid that has a flash point exceeding 150°C.

NOTE: The boiling point is taken to mean that point at which it is no longer possible to achieve the rate of temperature rise required by ASTM D92 for the fire point test.

1.4.15.2 Flammable liquid

A liquid that has been defined in the ADG Code/NZS 5433 as a Class 3 liquid.

1.4.16 Material safety data sheet (MSDS)

A document that describes the properties and uses of a material, that is, identity, chemical and physical properties, health hazard information, precautions for use and safe handling information.

NOTE: MSDSs are also known as safety data sheets (SDSs) in New Zealand.

1.4.17 May

Indicates the existence of an option.

1.4.18 On-site protected place

A building where people are employed within the property boundary, including offices, warehouses, manufacturing areas, amenities and other dangerous goods stores, except for those defined as minor storages in AS 1940 or the New Zealand equivalent.

1.4.19 Packing Groups (PG)

A series of three hazard groups into which dangerous goods (of Classes other than Classes 1, 2, 6.2 and 7) are designated in the ADG Code/NZS 5433, in decreasing order of hazard, by the Roman numerals 'I' (great danger), 'II' (medium danger) and 'III' (minor danger).

NOTE: A list of dangerous goods for which Packing Groups have already been assigned is given in the ADG Code/NZS 5433. Criteria for assigning Packing Groups is provided in the UN *Manual of Tests and Criteria* and in Addendum I to Appendix 2 of the sixth edition of the ADG Code.

1.4.20 Protected place

Any of the following:

- (a) A dwelling, residential building, place of worship, public building, school or college, hospital, theatre and any building or open area in which persons are accustomed to assemble whether it is within or outside the property boundary of the installation.
- (b) A factory, workshop, office, store, warehouse, shop, or building where persons are employed, that is outside the property boundary of the installation.
- (c) A ship lying at permanent berthing facilities.
- (d) Any storage facility for dangerous goods outside the property boundary of the installation, except for those defined as minor storages in AS 1940 or the New Zealand equivalent.

1.4.21 Public place

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

NOTE: Commercial building parking areas are not considered to be public places.

1.4.22 Risk assessment

The overall process of estimating the magnitude of risk and deciding what actions will be taken. [AS/NZS 4801]

1.4.23 Sampling

Taking a sample for analysis or quality control.

NOTE: This term has special significance and refers to the withdrawal of a small amount from a package.

1.4.24 Segregation

Keeping incompatible goods apart from one another in one room, using a barrier or an intervening space.

1.4.25 Shall

Indicates that a statement is mandatory.

1.4.26 Should

Indicates a recommendation.

1.4.27 Storage

The keeping of chemicals in a laboratory or an associated store.

1.5 INTERPRETATION

Where separation distances are specified, these shall be measured horizontally unless stated otherwise in the accompanying text.