

**Code of Practice for
CRI and University
Exempt Laboratories**

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Code of Practice for CRI and University Exempt Laboratories

Preface

This Code of Practice is approved pursuant to Sections 78 and 79 of the Hazardous Substance and New Organisms Act. The Environmental Risk Management Authority has delegated the power to approve Codes of Practice to the Chief Executive of the Authority, and this Code is approved in accordance with that delegation. It is confirmed that the requirements of Sections 78 and 79 have been met.

This code has been developed by the New Zealand Vice Chancellors Committee and the Association of Crown Research Institutes, and is intended primarily for the use of laboratories in CRIs and Universities. However, it may also be applied elsewhere until or unless Codes are developed which apply to exempt laboratories in other situations.

Notice of approval of this Code has been published in the Gazette dated 17 June 2004.

Pursuant to Section 80(1)(a) of the Act, the Code may be inspected on request at the Wellington office of ERMA New Zealand or alternatively, can be downloaded free of charge from the ERMA New Zealand website. Pursuant to Section 80(1)(b) of the Act, a copy of the Code is available for purchase from ERMA New Zealand at a price of \$15.

Approved this 10th day of June 2004.

Bas Walker
Chief Executive

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1. About this Code

1.1. Introduction

Importation, synthesis and use of hazardous substances for teaching and research is exempt from the provisions of the Hazardous Substances and New Organisms Act (HSNO Act) relating to the requirement for ERMA approval (section 33) provided that the laboratories meet requirements specified in the HSNO (Exempt Laboratories) Regulations 2001.

Compliance with this Code of Practice shall meet the requirements of part (a) of section 33 of the Hazardous Substances and New Organisms Act, for exemptions for small-scale research and development or teaching involving Hazardous Substances. It shall also provide compliance with the Hazardous Substances (Exempt Laboratories) Regulations 2001.

This document is a HSNO Approved Code of Practice for Exempt Laboratories in Crown Research Institutes (CRIs) and Universities. CRIs and Universities have a wide range of laboratory facilities which have been constructed within purpose-built buildings. Both organisations undertake a diverse range of research activities and by necessity use a wide range of Hazardous Substances. This document is designed to be supplemented by a Safe Methods of Use drafted for all types of hazardous substance used in the laboratory.

This Code of Practice in conjunction with the appropriate Safe Method of Use shall allow laboratory staff to not only identify hazards and assess potential risks associated with each individual Hazardous Substance or procedure, but also to select and use appropriate Personal Protective Equipment and containment procedures.

Universities and CRIs employ Health and Safety Practitioners (HSP) or engage Health and Safety Consultants who, with line management in these organisations, oversee most aspects of statutory compliance. This document has been promulgated with HSP and line managers in mind.

This document shall be updated or amended as necessary. If you consider amendments are required please advise your Health and Safety or Hazards Manager.

Where classes or hazard categories are referred to in this Code of Practice, they refer to the HSNO classification system unless another classification system is specified. Use of radioactive materials is regulated by the Radiation Protection Act and its associated Regulations. Use of such materials (above exempt quantities) must be undertaken by a holder of a license issued by the National Radiation Laboratory (NRL) or under instruction or supervision of that license holder. The reader is referred to the NRL and the appropriate NRL Safe Code of Practice.

1.2. Scope and Application

This Code of Practice is applicable to the use of hazardous substances in all Crown Research Institute and University laboratories meeting exempt laboratory status under s33 of the HSNO Act, 1996. This Code of Practice shall also apply to laboratories occupied by companies that are leasing space from the host organisation.

The exemption from having to obtain an approval under the HSNO Act for a Hazardous Substance shall NOT apply if:

- 1) The hazardous substance or any substance created from the exempt use of the hazardous substance is sold as a substance or in a product containing or derived from that substance.
- 2) The use creates or involves a hazardous substance for which any application for approval has been declined for approval by the Environmental Risk Management Authority (ERMA).
- 3) The hazardous substance is being evaluated in field trials. Field trials are considered to be research in containment and are subject to section 31 of the HSNO Act.
- 4) The use of the substance creates or involves a persistent organic pollutant (as defined by the Stockholm Convention Amendment Act, 2003).

There are three types of substances that may be used in exempt laboratories:

- 1) Environmental Risk Management Authority approved hazardous substances
- 2) unapproved hazardous substances
- 3) *de novo* synthesised substances whose hazardous nature has not been fully characterised.

Exempt laboratories may include a wide range of laboratories such as research laboratories; undergraduate laboratories; quality control, quality assurance, or analytical laboratories; diagnostic and forensic laboratories.

The definition of a laboratory is given a very broad meaning by the inclusion of the word “structure”. Thus, any structure that can meet the design requirements for a laboratory could be included. It is possible to include such structures as stock pens, research vessels and boats, provided they meet the laboratory design requirements.

Laboratories are not compelled to use the provisions of s33 of the HSNO Act. In some circumstances, it may be more appropriate to comply with the controls assigned to approved substances.

Section 3 of this Code of Practice specifies the measures required to comply with the Regulations 10 and 11 Hazardous Substances (Exempt Laboratory) Regulations, 2001. These regulations requires hazardous substances to be handled and stored in the way in which a substance of the same or similar hazard classification must be managed under the applicable provisions of the Hazardous Substances (Classes 1 to 5 Controls) Regulations, 2001 and the Hazardous Substances (Classes 6, 8 and 9 Controls) Regulations, 2001.

1.3. Definitions

Act---means the Hazardous Substances and New Organisms Act 1996.

Apparatus---Apparatus and equipment shall be used interchangeably.

Approved hazardous substance---means a substance for which an approval to import or manufacture for release, or to import into containment or to manufacture in containment, has been issued by the Environmental Risk Management Authority under the Hazardous Substances and New Organisms Act. This includes a hazardous substance approved through the transfer process and those approved under s48 of the *Act* for release or use in an emergency.

Authorised person in relation to a HSNO Laboratory Facility---means a person (person A) who, in the normal course of his or her work, research and development, or teaching, is required to enter the laboratory, and includes any other person under person A's supervision while person A is present in the laboratory.

Classification System---means the classification system used in the Hazardous Substances (Classification) Regulations 2001, unless otherwise indicated.

Documentation---documentation shall be accorded its widest interpretation and includes electronic records.

Emergency response plan---means an emergency response plan referred to in regulation 16 of the Hazardous Substances (Exempt Laboratories) Regulations 2001. These requirements are covered in the section 5.1 of this Code of Practice entitled Emergency Response Plans.

Entrance in relation to a HSNO Laboratory Facility or Laboratory ---means a door, gate, or passage that is a point of entry into the HSNO Laboratory Facility or Laboratory.

Equipment --- Apparatus and equipment shall be used interchangeably.

ERMA---means the Environmental Risk Management Authority.

General Knowledge --- means a knowledge of the hazards associated with each HSNO class of substance and general precautions to mitigate these hazards.

General Technical Knowledge--- means sufficient knowledge to carry out duties/responsibilities specified in this code of practice.

Hazardous Substance---means, unless expressly provided otherwise by regulations, any substance with one or more of the following intrinsic properties:

- a) Explosiveness
- b) Flammability
- c) A capacity to oxidise
- d) Corrosiveness
- e) Toxicity (including chronic toxicity)
- f) Ecotoxicity, with or without bioaccumulation; or

which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any one or more of the properties specified in this definition.

The Hazardous Substances (Minimum Degrees of Hazard) Regulations 2001 define what constitutes a hazardous substance for each hazardous property. There is a level below which a substance is not considered hazardous under this legislation.

HSNO Laboratory Facility---means a laboratory that meets the requirements of the Hazardous Substances (Exempt Laboratories) Regulations 2001. These facilities are generally a building (or a part thereof) that contains multiple laboratory rooms.

HSNO Laboratory Facility Director (or equivalent position)---means a person designated as in charge of a HSNO Laboratory Facility and has specified duties and functions in respect to this Code of Practice.

Laboratory---means a vehicle, room, building, or any other structure set aside and quipped for scientific experiments or research, for teaching science, or for the development of chemical or medicinal products.

Laboratory Manager--- is responsible for one or more laboratories (rooms) and has specified duties and functions in respect to this Code of Practice.

Locking---means that a person can only enter the laboratory by using a tool, a key, or any other device used to operate a lock. This would include magnetic swipe cards, combination locks (including the push button type) or biometric recognition (finger print, voice, retina verification etc) or access control.

May--- implies a discretionary statement.

Place---Place is not defined in the *Act* or Regulations except that it includes any vehicle, ship, aircraft or other means of transport. In the context of this Code of Practice, a place can range from a specific point in a room, to a group of rooms.

Pooling substance---means a *Hazardous Substance* that is in fluid form.

Research and development, in relation to a *Hazardous Substance*--- means systematic investigation or experimentation activities that involve innovation or technology transfer for the purpose of gaining knowledge about the properties or uses of that substance.

Requirements for disposal, in relation to a *Hazardous Substance*--- means the relevant disposal controls described in this Code of Practice.

Safe Method of Use --- a method of use developed in accordance with, and/or meeting the requirements of Appendix 4.

Safety Data Sheets (SDS) --- Material Safety Data Sheets (MSDS).

Secondary containment system, in relation to a place;

- a) means a system or systems in which pooling substances shall be contained if they escape from the container or containers in which they are being held; and
- b) from which they can, subject to unavoidable wastage, be recovered.

Shall --- implies a mandatory statement.

Should ---implies an advisory statement.

Small container---

- a) means a container in which a *Hazardous Substance* is being held before or during use in a laboratory, in quantities typically used for that purpose; and
- b) includes any laboratory equipment in which any *Hazardous Substance* remains after that use.

Storage cabinet---means a cabinet or cupboard, with close fitting door(s), intended for the storage of Hazardous Substances. Specific guidance on storage cabinet construction can be obtained from AS/NZS 2982 (1987 and/or 1997).

Substance means-

- a) Any element, defined mixture of elements, compounds, or defined mixture of compounds, either naturally occurring or produced synthetically, or any mixtures thereof;
- b) Any isotope, allotrope, isomer, congener, radical, or ion of an element or compound which has been declared by the Authority, by notice in the *Gazette*, to be a different substance from that element or compound;
- c) Any mixtures or combinations of any of the above;
- d) Any manufactured article containing, incorporating, or including any *Hazardous Substance* with explosive properties.

Total pooling potential, in relation to a place, means the aggregate quantity of all *pooling substances* held in the place.

Tracked Substance---means a substance specified in the Hazardous Substances (Tracking) Regulations 2001.

2. Management of Laboratories

2.1. Definition of a Laboratory

The definition of laboratory in the HSNO Act provides considerable flexibility as to what exactly constitutes a “laboratory”. Therefore an organisation *should* choose an arrangement which best suits their individual operations. When considering what shall constitute a “HSNO laboratory”, consideration *should* be given to treating the whole building as the “laboratory” rather than the individual rooms within the building.

Note: This section is divided into two separate subsections. Section 2.2 discusses the requirements for managing a room as a laboratory while Section 2.3 discusses the requirements of managing a building as a laboratory. The reader should follow the relevant section only.

2.2. Management Structure for Rooms as Laboratories

Where rooms (or parts thereof) are classified as laboratories (rather than a building) the hazardous substances in the laboratory are under the supervision of a Laboratory Manager. Where a laboratory room is shared by two or more laboratory groups, each group occupying a part of a laboratory may appoint their own Laboratory Manager. The following management scheme applies:

2.2.1. Designation and Functions of Laboratory Manager

- a) At least 1 person *shall* be designated as Laboratory Manager.
- b) If more than 1 person is designated as a Laboratory Manager:
 - i) The terms and conditions of the designation *shall* be recorded in writing; and
 - ii) A method to clearly identify who is in charge shall be established to ensure that only 1 person is in charge of the Laboratory, at any given time.
- c) A Laboratory Manager:
 - i) Is in charge of all Hazardous Substances contained within the Laboratory.
 - ii) *May* nominate any other appropriate person to be in charge in his or her absence.
 - iii) *Shall* ensure that the provisions of this Code of Practice are adhered to.
 - iv) *May* delegate some of their functions but cannot delegate their responsibility.
 - v) *Shall* ensure that an unapproved hazardous substance is handled and stored in the same way as a similar approved substance (ie similar chemical, physical, or biological properties).
 - vi) *Shall* ensure that the requirements for information on the use and maintenance of Protective Equipment, as required in Section 4.5, are available.
 - vii) *Shall* ensure that the requirements for information on the use and maintenance of equipment, as required in Section 4.5.1, are available.

- viii) **Shall** ensure that procedures for the disposal of Hazardous Substances are included in the Laboratory Safety/Procedures manual or other appropriate documentation. The procedures shall comply with requirements specified in Appendix 6 of this code.

2.2.2. Skill and Knowledge Requirements for Laboratory Manager

A person designated as a Laboratory Manager **shall** have---

- a) a general technical knowledge of the physical and chemical properties of all substances managed or used in the portion of the Laboratory that they are responsible for, including the likely hazardous properties of substances being synthesised, in order to prevent or manage the adverse effects of those substances; and a general knowledge of---
 - i) precautions for handling the Hazardous Substances managed or used in the specified portion of the laboratory; and
 - ii) disposal of those substances in accordance with this Code of Practice; and
- b) the most recent version of any relevant code of practice approved by ERMA New Zealand under section 78 of the Act; and
- c) any specific knowledge and skill requirements contained in the Laboratory Emergency Response Plan relevant to the area they are responsible for; and
- d) the ability to demonstrate the correct operation and maintenance of equipment, including personal protective equipment, necessary to manage the substances used in the specified area of laboratory throughout their life cycle; and
- e) access to the detailed knowledge supporting the general knowledge requirements of paragraphs (a) to (d) above, within 10 minutes.

Note: New Zealand Certificate in Science Level 5, National Diploma in Science Level 6, Science Degree, or equivalent qualification where the course of study has included papers on physical, chemical, and toxic properties of chemicals would satisfy the requirement for “a general technical knowledge of the physical and chemical properties of all substances. At least 5 years laboratory experience would also satisfy this requirement.

2.3. Management Structure for Buildings as Laboratories

2.3.1. General comment

- a) When a building (or a part thereof) is defined as a laboratory, the building **shall** be referred to as a HSNO Laboratory Facility.
- b) The requirements to ensure there is no unauthorised entry to the laboratories **shall** still apply. Therefore, the building or floor **should** have adequate perimeter security to ensure no unauthorised entry even within, or outside of normal working hours.
- c) If adequate perimeter security is not possible then each laboratory room within the HSNO Laboratory Facility **shall** be locked if unoccupied.

2.3.2. Management of HSNO Laboratory Facilities

- a) The HSNO Laboratory Facility *shall* be supervised at all times when unlocked. In order to achieve this, and in recognition of existing line management structure, the HSNO Laboratory Facility *shall* have an overall manager referred to as the HSNO Laboratory Facility Director (or similar designation). Laboratory Managers *shall* still be responsible for hazardous substances within each room.
- b) The management of HSNO Laboratory Facilities *should* make use of existing management structures and functions. Many of the functions outlined in this section should already be included in current management structures and responsibilities.
- c) There is an obligation for each institution to designate at least one person as the HSNO Laboratory Facility Director for each HSNO Laboratory Facility. Organisations are free to assign the functions as they see fit, within their existing management structure.

2.3.3. Designation and Functions of HSNO Laboratory Facility Director

- a) A HSNO Laboratory Facility Director (or similar designation):
 - i) *may* nominate, in writing, any other appropriate person to be in charge in his or her absence.
 - ii) where one or more person is nominated, a method of clearly identifying who is in charge *shall* be established to ensure that only one person is in charge of the HSNO Laboratory Facility, at any given time.
 - iii) *shall* ensure that the provisions of this Code of Practice are adhered to.
- b) The HSNO Laboratory Facility Director (or similar designation) *should* be a senior person (such as Head of Department, Research Manager, or Research Director) with authority to ensure that the provisions of the Act and Regulations are implemented and enforced within their area of responsibility.

Note: It is unlikely that the HSNO Laboratory Facility Director (or similar designation) shall have a detailed knowledge of all the requirements or means of compliance. However, they can ensure compliance by delegating specified functions to members of their management team.

- c) This Code of Practice does not preclude additional tiers of management being implemented by specific organisations.

2.3.4. Delegations to be Published

- a) The HSNO Laboratory Facility Director (or similar designation) *shall* ensure that:
 - i) The delegated HSNO responsibilities within the HSNO Laboratory Facility are in writing and are made available to all staff, and
 - ii) Delegated responsibilities shall be specified in the Emergency Plan.
 - iii) All staff is aware of the delegated responsibilities and the people fulfilling the specified roles.

- iv) The provisions of this Code of Practice are adhered to in the HSNO Laboratory Facility
- v) The published delegations remain current.

2.3.5. Functions of Laboratory Manager(s)

- a) Laboratory Managers *shall* be responsible for a specified Laboratory room (s) (or part thereof); and
 - i) are in charge of all Hazardous Substances contained within the specified part of the HSNO Laboratory Facility; and
 - ii) *may* nominate any other appropriate person to be in charge in his or her significant absence.
 - iii) *shall* ensure that an unapproved hazardous substance is handled and stored in the same way as a similar approved substance (ie similar chemical, physical, or biological properties).
 - iv) *shall* ensure that the requirements for information on the use and maintenance of Protective Equipment (as required in Section 4.5) are available.
 - v) *shall* ensure that the requirements for information on the use and maintenance of Equipment (as required in Section 4.5.1) are available.
 - vi) *shall* ensure that procedures for the disposal of Hazardous Substances are included in the Laboratory Safety/Procedures manual or other appropriate documentation. The procedures *shall* comply with requirements specified in Section 4.10 and Appendix 6
 - vii) Procedures developed in a Safe Method of Use *shall* meet the information requirements of 2.3.5 (iv) – (vi) above
- b) As the Laboratory Manager is not required to be present at all times, significant absence (section (ii) above) is taken to be longer than 3 days. An alternative *shall* be nominated when the Laboratory Manager's absence would cause non-compliance with this Code of Practice.
- c) Laboratory Managers *shall* ensure that the provisions of this Code of Practice are adhered to in the area they are responsible for.
- d) If more than 1 person is designated as the Laboratory Manager:
 - i) The terms and conditions of the designation *shall* be recorded in writing; and
 - ii) A method to clearly identify who is in charge *shall* be established to ensure that only 1 person is in charge of the HSNO Laboratory Facility, at any given time.

2.3.6. Person in Charge

A person who is nominated to be in charge by a Laboratory Facility Manager or HSNO Laboratory Facility Director *shall* assume the responsibilities associated with those positions during the period they are in charge.

2.3.7. Skill and Knowledge Requirements for HSNO Laboratory Facility Director

A person designated as a HSNO Laboratory Facility Director (or similar designation) *shall* have---

- a) a general knowledge of the hazardous properties of all substances managed or used in the laboratory, including a general knowledge of the likely hazardous properties of substances being synthesised, in order to prevent or manage the adverse effects of those substances; and
- b) general knowledge of--
 - i) precautions for handling the Hazardous Substances managed or used in the laboratory; and
 - ii) disposal of those substances in accordance with this Code of Practice; and
 - iii) the most recent version of any relevant code of practice approved by ERMA New Zealand under section 78 of the Act.

2.3.8. Skill and Knowledge Requirements for Laboratory Manager

A person designated as a Laboratory Manager *shall* have---

- a) a general technical knowledge of the physical and chemical properties of all substances managed or used in the part of the HSNO Laboratory Facility that they are responsible for, including the likely hazardous properties of substances being synthesised, in order to prevent or manage the adverse effects of those substances; and a general knowledge of--
 - i) precautions for handling the Hazardous Substances managed or used in the specified portion of the laboratory; and
 - ii) disposal of those substances in accordance with this Code of Practice; and
- b) the most recent version of any relevant code of practice approved by ERMA New Zealand under section 78 of the Act; and
- c) any specific knowledge and skill requirements contained in the laboratory's emergency response plan relevant to the area they are responsible for; and
- d) the ability to demonstrate the correct operation and maintenance of equipment, including personal protective equipment, necessary to manage the substances used in the specified portion of laboratory throughout their life cycle; and
- e) access to the detailed knowledge supporting the general knowledge requirements of paragraphs (a) to (d) above, within 10 minutes.

Note: New Zealand Certificate in Science Level 5, National Diploma in Science Level 6, Science Degree, or equivalent qualification where the course of study has included papers on physical, chemical, and toxic properties of chemicals would satisfy the requirement for “a general technical knowledge of the physical and chemical properties of all substances. At least 5 years laboratory experience would also satisfy this requirement.

2.4. Duties and Knowledge requirements of Persons Handling Hazardous Substances

Regardless of which management structure is chosen, the following requirements *shall* apply.

2.4.1. Knowledge Requirements for Persons Handling Hazardous Substances

A HSNO Laboratory Facility Director/Laboratory Manager *shall* ensure that every person handling a hazardous substance in the laboratory has access to the following information before handling the substance:

- a) A Safe Method of Use for the categories of hazardous substances they are handling. The Safe Method of Use shall fulfil the requirements specified in Section 3 of this Code of Practice.
- b) Procedures to prevent the contamination of any equipment or part of the laboratory
- c) If the substance is an approved hazardous substance, procedures to ensure that persons in the laboratory are not exposed to the substance, or if exposure cannot be avoided, they are exposed to the lowest practicable level and in all cases no higher than the relevant workplace exposure standard. (WES).
- d) If the substance is not an approved hazardous substance, the method of management specified in the laboratory safety/procedures manual prepared in accordance with Section 3 of this Code of Practice.
- e) The above requirement can be met by complying with the operational requirements specified in this Code of Practice for approved and non-approved hazardous substances.
- f) The method of disposal of the hazardous substance in accordance with this Code of Practice.
- g) The actions required under the Laboratory's Emergency Response Plan in the event of an accident or accidental exposure to the substance.

2.4.2. Duties of Personnel Handling Hazardous Substances

- a) Prior to introducing any new hazardous substance into a laboratory, the person intending to introduce the substance *shall* determine if the hazardous substance falls into HSNO categories already covered by existing Safe Methods of Use, and whether any amendments are required to Safe Methods of Use, the Laboratory Safety Procedures or the Emergency Response Plan. If the hazardous substance is not covered by existing Safe Method of Use, that person *shall* inform the Laboratory Manager in writing of its introduction.

Note: A copy of email or requisition/order form can be considered a form of written notification.

- b) All persons handling hazardous substances *shall* comply with the requirements specified in this Code of Practice and the Safe Method of Use applicable to the Hazardous Substances being used.

Note: Section 19 of the Health and Safety in Employment Act requires that an employee takes all practical steps not to injure themselves or any other person.

3. Managing Laboratory Hazards – The Safe Method of Use

3.1. Hazard Assessment

- a) Good laboratory practice requires that all users of any hazardous substance (approved or unapproved) used for the first time, inform themselves (and when appropriate, their colleagues) of the properties and hazards associated with that substance. The Health & Safety in Employment Act already dictates that an employer or delegated person **shall** assess hazards, take practicable steps to control them, and provide appropriate training, information and supervision. It also dictates that **every** worker **shall** take all practicable steps to ensure their own safety, and the safety of other people.
- b) A Safe Method of Use provides a means of undertaking a hazard assessment and recommending mitigating measures.

3.2. Safe Method of Use

- a) Generic safety information and procedures for use, storage and disposal (incorporating good laboratory practice) **shall** be provided by a Safe Method of Use for a HSNO sub-class or HSNO hazard classification. The reader is referred to section 3.3 below for the requirements of such generic Safe Methods of Use and Appendix 5 for an example of a generic Safe Method of Use.
- b) Safe Methods of Use **shall** incorporate the requirements of this Code of Practice for storage, handling and use of hazardous substances. This applies particularly to Section 4 of this Code of Practice.
- c) Where a substance or procedure has been identified by the organisation as possessing a high hazard or the process involves a high risk, the organisation **shall** provide a greater level of detail. This level of detail may be provided in the generic Safe Method of Use or it may be provided in the form of a Safe Method of Use for Substances or Procedures of Higher Risk (refer section 3.4 below).
- d) For guidance, a Safe Method of Use for Substances or Procedures of Higher Risk **should** be developed for any substance that is sufficiently hazardous to warrant assignment to HSNO hazard classifications 6.1A-6.1C, 6.7A 3.1A or 8.2A. Procedures of high risk are those in which there is a high inhalation exposure, chronic inhalation exposure or large quantities of the hazardous substance are involved). This is particularly important where hazard and control mechanisms outlined in a more generic Safe Method of Use are not adequate to ensure safe handling of these substances.
- e) Organisations may develop Safe Method of Use for Substances or Procedures of Higher Risk for any substance or process where that organisation believes there is sufficient justification.
- f) Guidance on the specific issues that **shall** be addressed in Safe Methods of Use and Safe Method of Use for Substances or Procedures of Higher Risk is detailed below. The provisions of Section 4 of this Code of Practice **shall** be incorporated into the Safe Method of Use.
- g) The Safe Method of Use for Substances or Procedures of Higher Risk shall demonstrate that the Lab Manager or HSNO Laboratory Facility Director has

identified the hazardous properties of the hazardous substance(s) and that appropriate measures have been implemented to minimise any potential risk.

- h) All Safe Methods of Use **shall** identify the hazardous properties or the likely hazardous properties based on the best information or data available. The Safe Method of Use **should** reduce the risk to an acceptable level, based on experience and prudent laboratory practice.
- i) The Safe Method of Use **shall** be kept in the Laboratory and be readily available. Safe Methods of Use **should** cross reference Material Safety Data Sheets and other sources of information, provided these sources of information are readily available where the hazardous substances are being used.

Note: A central database accessible from a laboratory or place where the Hazardous Substance was used would meet these requirements.

3.3. General Safe Method of Use.

- a) The General Safe Method of Use **shall** evaluate the degree of exposure to people and the environment and **shall** include the following:
 - i) Complying with requirements specified in section 4 of this Code; and
 - ii) Ensuring safe storage of the substance, including specific consideration/provision for appropriate containment if the substance is a liquid.
 - iii) An evaluation of the capabilities of fume cupboards available for use. The Safe Method of Use **shall** indicate if all fume cupboards may be used or if the Hazardous Substances can only be safely used in specified fume cupboards.
 - iv) Specific consideration or provision is made to ensure that the concentration in air is as far below, as practicable, the Workplace Exposure Standard (WES).
 - v) Specific procedures are considered or developed to maintain or repair any equipment or apparatus in which the Hazardous Substance is contained or used.
 - vi) Specific procedures are considered or developed in the event of a spill or other likely adverse effect.
 - vii) Specific consideration or provision is made for the safe handling and carriage of containers of the substance.
 - viii) Specific consideration **shall** be given to the secure storage of the substance.
 - ix) Consideration of adequacy and suitability of existing spill kits for the substance, taking into account the volumes handled in the laboratory.
 - x) Instruction on the use of spill equipment, the use of absorbent material and reinstatement of containment.
 - xi) Instruction on the use of safety equipment.
 - xii) Specific evaluation is made for any special personnel requirements (e.g. work alone, pregnant staff, etc) to work in the laboratory with the substance or procedure.

- xiii) Specific evaluation is made for the disposal of the substance.
- xiv) Specific evaluation is made whether to modify the Emergency Response Plan
- b) Generic instructions for the use of substances in each HSNO sub-class or hazard classification **shall** suffice for a Safe Method of Use.
- c) Safe Methods of Use **should** refer the user to specific SDS for identification of specific hazards associated with each hazardous substance. Where substances or procedures with higher risk are proposed, a Safe Method of Use specific for the substance or procedure **shall** be developed (see below)

3.4. Safe Method of Use for Substances or Procedures of Higher Risk.

- a) Safe Method of Use for Substances or Procedures of Higher Risk **should** be developed for any substance that is sufficiently hazardous to warrant assignment to HSNO hazard classifications 6.1A-6.1C, 6.7A 3.1A or 8.2A. Procedures of high risk are those in which there is a high inhalation exposure, chronic inhalation exposure or large quantities of the hazardous substance are involved. This is particularly important where hazard and control mechanisms outlined in a more generic Safe Method of Use are not adequate to ensure safe handling of these substances.
- b) In such instances, the Laboratory Manager **shall** be required to ensure that a documented Safe Method of Use for the Substances or Procedures of Higher Risk is prepared.
- c) The Laboratory Manager **shall** ensure that all laboratory personnel have access to the Safe Method of Use and the evaluation.
- d) In preparing the Safe Method of Use for Substances or Procedures of Higher Risk consideration of all matters in the evaluation and preparation of a generic Safe Method of Use (see section 3.3 above) **shall** be undertaken. Particular attention **shall** be paid to the following:
 - i) Safe and secure storage of the substance and appropriate containment if the substance is a liquid.
 - ii) An evaluation of the capabilities of fume cupboards available for use with the substance, and if fume cupboards only can be safely used for storage.
 - iii) Specific consideration or provision is made to ensure that the concentration in air does not exceed the WES. Where the concentration exceeds 50% of WES a programme **shall** be established to monitor exposure. If the substance is flammable its concentration in air **shall** be maintained below 10% of the Lower Explosive Limit (LEL). Laboratory Managers are referred to the requirements in the section 4 of this Code entitled “Handling Flammable, Toxic or Corrosive Substances” for guidance.
 - iv) Specific procedures are considered/developed in the event of a spill or other likely adverse effect. This may include any instruction in case of medical emergencies involving the hazardous substance.
 - v) Consideration is given to alternative methods or substances that pose less risk.

- vi) Specific instruction on the use of spill equipment, the use of absorbent material and reinstatement of containment.
 - vii) Specific instruction on the use of safety equipment. Preparation of Safe Method of Use for Substances or Procedures of Higher Risk shall include a specific evaluation of suitability of types of glove materials for handling the substance.
 - viii) Specific evaluation is made for any special personnel requirements (e.g. work alone, pregnant staff, etc) to work in the laboratory with the substance or procedure.
 - ix) Specific evaluation is made whether to modify the Emergency Response Plan
- e) It is strongly recommended that a hard copy of the SDS is made available to laboratory personnel in each laboratory room in which the substance or procedure is conducted. The organisation **may** choose to issue specific instructions for the use of the identified substance or procedure.
 - f) Where no information about unapproved substances is available, a specific procedure for this class or type of substance **shall** suffice, taking account of the considerations specified above.

3.5. Application of Safe Method of Use

- a) Before the first use of a Hazardous Substance by any person, that person **shall** develop or obtain a Safe Method of Use for that substance, its HSNO sub-class or HSNO hazard classification.
- b) If the Laboratory Manager is not involved in developing the Safe Methods of Use, the hazardous properties identified **shall** be conveyed to the Laboratory Manager, along with proposals for procedures for use.
- c) Any new action(s) determined from the Safe Method of Use and required by the Laboratory Manager to maintain compliance **shall** be drawn to the Laboratory Manager's attention.
- d) The Laboratory Manager **shall** ensure that the resulting procedures for use is added or recorded in the Laboratory Safety/Procedures manual or in other suitable documentation.
- e) The Laboratory Manager **shall** ensure that all laboratory personnel **shall** have access to this documentation.

3.6. Duties of Personnel Handling Hazardous Substances

- a) Prior to introducing any new hazardous substance into a laboratory, the person intending to introduce the substance *shall* determine if the hazardous substance falls into HSNO subclasses or hazard classifications already covered by existing Safe Methods of Use, and whether any amendments are required to Safe Methods of Use, the Laboratory Safety Procedures or the Emergency Response Plan. If the hazardous substance is not covered by existing Safe Method of Use, that person *shall* inform the Laboratory Manager in writing of its introduction.

Note: A copy of email or requisition/order form can be considered a form of written notification.

- b) All persons handling hazardous substances *shall* comply with the requirements specified in this Code of Practice and the Safe Method of Use applicable to the Hazardous Substances being used.

4. Laboratories – Operational Requirements

4.1. Basic Safety Requirements

The following basic good laboratory practices are to be observed:

- a) Food intended for human consumption **shall** not be consumed or stored where hazardous substances are handled.
- b) Food or drink for human consumption **shall** not be stored in a refrigerator used to store laboratory materials.
- c) Appropriate protective clothing and equipment **shall** be worn when handling hazardous substances of the following hazard classifications: 6.1A-6.1D, 6.3A, 6.4A, 6.5A/B, 6.6A/B, 6.7A/B, 6.8A-C, 6.9A/B, and class 2, 3, 4, 5 and 8 substances. However, it is recommended that eye protection and a laboratory coat, overalls or similar protection be worn at all times when working in the laboratory (refer Section 4.5).
- d) Protective clothing **should** only be worn in any area where hazardous substances are handled.

Note: Laboratory coats should be removed when going from laboratory areas to the tearooms or office areas

- e) Non-slip footwear, appropriate to the risk, **shall** be worn where hazardous substances are handled. Footwear **should** prevent any part of the foot from contacting the floor during sudden or unusual movement. Jandals and open sandals are not suitable.

Note: This shall usually require footwear to be attached at the fore-foot and heel or substantially cover the foot (e.g. clogs)

- f) Skin that has come into contact with hazardous substances (irrespective of the concentration) **shall** be washed.
- g) Hands **should** be washed after handling hazardous substances and before leaving the area where the hazardous substances were handled or used.
- h) Safety carriers or trolleys (for large containers) **should** be used for transporting plastic or glass containers of hazardous substances with a capacity of 2 litres or more.
- i) A fume hood or fume cupboard or other means of ventilation, isolation or extraction (e.g. an isolating cabinet or a 'cytotoxics' cabinet) **shall** be used when working with highly toxic, volatile or odouriferous substances, or particulate/dusty matter, to ensure a safe working environment, in accordance with the Safe Method of Use developed for the substance. (see Section 3.5.5)
- j) Waste hazardous substances, containers and packaging **shall** be disposed of in an appropriate way (section 3.7.6, Appendix 6 and section 3.11 of this Code of Practice).
- k) All hazard labels on surplus containers and packaging **shall** be defaced or rendered illegible before discarding the empty container and/or packaging.

4.2. Entry

- a) The laboratory **shall** be locked when it is not supervised by:
 - i) A laboratory manager,
 - ii) A HSNO Laboratory Facility Director (if a building); or
 - iii) Any other person nominated in writing by a laboratory manager or a HSNO Laboratory Facility Director to be in charge in his or her absence.
- b) Only one person **shall** be in charge of the laboratory or part thereof at any one time. The order of seniority should be clear where more than one person is nominated.
- c) Where the building is designated a laboratory the HSNO Laboratory Facility Director **shall** nominate sufficient persons to ensure that the building is supervised at all times during normal working hours.

Note: While the laboratory **shall** be locked in the absence of the HSNO Laboratory Facility Director or their nominee, this does not preclude people being in the laboratory when it is locked. The requirement is to exclude people from entering without a key etc, not to prevent people leaving.

The requirement to secure the HSNO Laboratory is not intended to prevent or hinder escape in an emergency or access for emergency personnel. Once the emergency has passed, the laboratory **shall** be brought into compliance again, as soon as possible.

- d) Non-authorized persons (such as visitors) **may** enter the laboratory provided they are under the supervision of an authorized person.

Note: The definition of Authorized Person includes a person required to be in the laboratory by virtue of his or her normal course of work, research and development or teaching. This therefore includes cleaning personnel, maintenance workers, and chemical and equipment company representatives. It also includes students and staff carrying out research and development, teaching or management duties. It also includes undergraduate students required to carry out laboratory work as part of their course.

The definition of work **should** be the common English meaning and not be limited to that used in the Health and Safety Act.

- e) Children under the age of 16 years **shall** not be permitted where hazardous substances are used, unless on an arranged and supervised study or tour or during open days.

Note: Children may be permitted in areas where Hazardous Substance are not being used i.e. in offices, cafeterias etc., within a HSNO Laboratory Facility. Permission **shall** be at the discretion of the individual organisation or HSNO Laboratory Facility Director.

- f) The Laboratory Manager, or HSNO Laboratory Facility Director (in the case of a building as a laboratory), **shall** ensure that:
 - i) cleaning and maintenance personnel are made aware of the hazards associated with the hazardous substances that are at the place where they are to carry out their functions, and have been instructed in and understand the emergency procedures to follow; or
 - ii) arrangements have been made to isolate cleaning and maintenance personnel from the hazardous substances at that place.

Note: Compliance with 3.2 (f) (i) and (ii) could be achieved by adding suitable clauses in the cleaning and maintenance contracts.

4.3. Information and Labelling Requirements for Containers

4.3.1. Labelling Requirements for Containers of Hazardous Substances

- a) If any hazardous substance is being used in a laboratory, or is being held in small containers in a laboratory and is available for use, the following information **shall** be provided:
- i) the identity of the substance; and
 - ii) the concentration, if applicable and
 - iii) for *approved* hazardous substances of hazard classifications in the table (g) below, a brief warning of the hazardous properties. For *all unapproved* hazardous substances, a brief warning of the hazardous properties must be provided, if such information is available. This information can be provided by use of a United Nations (UN) or Globally Harmonized System (GHS) pictogram or written warning. This warning must be available to the person using the substance within 10 seconds, be durable and readily understood.

Note: The warning label is not a substitute for information which is provided by a Safe Method of Use, or any specific information about the substance obtainable from a MSDS. Laboratory personnel must read and comply with the directives of the Safe Method of Use or Safe Method of Use for Procedures for Substances or Procedures of Higher Risk

- b) Substances that are labelled in accordance with current European Union, United States, Canadian or Australian regulatory requirements are deemed to comply with the requirements for labelling of small containers.
- c) Working containers of Hazardous Substances are those containers used to contain Hazardous Substances for 48 hours or more.
- d) Contents of working containers of Hazardous Substances **shall** be identified by the concentration and identity of the Hazardous Substance or by a code that can be cross-referenced to provide information on the identity, and concentration of the contents.
- e) The contents of reaction vessels **should** be identifiable. An identification code on the reaction vessel, that can be cross-referenced to provide information on the reactants and the probable or intended products of the reaction, **may** be used to identify the contents of the vessel.
- f) The reaction vessel **shall** be labeled where the reactants remain in the vessel for more than 24 hrs.

g) Means of Compliance

The warnings required by 4.3.1 (a) (iii) are:

HSNO Classification	Information requirements
1.1, 1.2, 1.3, or 1.4	Explosive + Hazard Classification
3.1A, 3.2A,	Highly flammable liquid, or UN Class 3 label
4.1.2A, 4.1.2B, 4.1.3A, 4.2A, 4.3 ^a	Flammable + physical state + general type of hazard (eg Flammable solid, dangerous when wet), or conveyed by the UN Class label
5.1.1A	Oxidizing or UN Class 5.1 label
5.1.2A	Oxidizing gas
5.2A, 5.2B	Oxidiser, Organic Peroxide or UN Class 5.2 label
6.1A, 6.1B, 6.1C	UN Class 6.1 label
8.2A, 8.3A	Corrosive or UN Class 8 label
9.1A, 9.2A, 9.3A, 9.4A.	Ecotoxic

h) Standard of Information

- i) UN, GHS and EU Pictograms are an acceptable means of providing the required information. UN and GHS pictograms are shown in Appendix 3.
- ii) The identity, concentration and hazardous properties, when expressed in words *shall* be in English or commonly accepted scientific notation and in a style or form commonly used in science or industry.

4.3.2. Specifications for Containers Used to Hold Hazardous Substances

- a) Laboratory Managers shall ensure that all containers of hazardous substances are not cracked or leaking and that labels or markings can be easily read. Any containers not meeting the required standard should be disposed of immediately.
- b) Containers for hazardous substances supplied by the manufacturer should provide adequate long-term storage of hazardous substances. The containers shall, when closed, contain the substance within the range of temperatures in which the container will be used. The container must also be resistant to the hazardous substance and prevent entry by any organism capable of transporting the substance out of the laboratory.

- c) Laboratory Managers **shall** ensure an annual review and inspection of all containers (and closures) used for long-term storage of hazardous substances to ensure adequate containment. Any leaking containers or closures **shall** be disposed of immediately. Substances shall be disposed of in accordance with Appendix 6.

Note: Particular attention **should** be paid to those containers holding:

- Mineral acids
- Phosphorus or sulfur halides
- Water reactive substances

4.4. Handling Hazardous Substances

4.4.1. General Considerations

- a) Before handling any hazardous substance all laboratory personnel **shall** be aware of the general safety procedures as outlined in Sections 4.1 and 4.5. Relevant SDS sheets **should** be consulted and Safe Method of Use **shall** be consulted to ensure all personnel are familiar with hazardous properties of the substance and how these properties affect the following:
- i) Storage
 - ii) Any incompatibilities with other substances
 - iii) Safe handling and containment within the laboratory facility.
 - iv) How and where the chemical is to be decanted or weighed
 - v) Whether fume hoods are to be used
 - vi) What Personal Protective Equipment is to be used and what types of glove material provide adequate protection
 - vii) How to deal with a spill and how to dispose of clean-up material
 - viii) How to dispose of the substance
- b) Laboratory personnel **shall** also comply with the requirements of this Code of Practice.
- c) The requirements in Section 4 of this Code of Practice do not apply to permanently **sealed** containers (such as sealed specimen containers) where there is no release of hazardous substance (including diluent) or vapour and the container contents are not available for use under normal circumstances.
- d) Containers of:
- i) 2.1.1A (Flammable Gas, Category A), or
 - ii) 3.1A (Flammable Liquid, Category A), or
 - iii) 3.2A (Liquid Desensitised Explosive, Category A), or
 - iv) Any Class 6 (Toxic) Category A or B substance, with a high inhalation hazard (i.e. gases, very dusty material and very volatile liquids).

- v) Any Class 8 (corrosive) volatile Category A or B substance.
shall only be opened or used in fume cupboards or other facilities providing protection to the person opening and using the hazardous substance and to others in the laboratory.

4.4.2. Flammable Gases

- a) Flashback arresters *shall* be fitted to regulators attached to flammable gas bottles attached to or used near any source of ignition.
- b) Cylinders of flammable gases *should* only be stored in areas provided with adequate ventilation to ensure any leaked gas does not accumulate to levels that are 10% of the Lower Explosive Limit (LEL).

4.4.3. Flammable Liquids

- a) The opening and decanting of all flammable liquids *should* be carried out in a suitable fume cupboard.
- b) Category A flammable liquids *shall* only be opened and poured:
- i) in a suitable fume cupboard, or
 - ii) at a location where flammable vapours *shall* not accumulate and local ventilation *shall* ensure that the concentration of flammable vapour does not exceed 10% of the LEL at any actual or potential ignition source.
- c) When pouring, decanting, or pumping any flammable liquid from one metal container to another, precautions to prevent the build up of static should be taken.

Note: Static can be generated by swirling, splashing, high flow rates, venturi effects, turbulence, cavitation or microfiltration. Minimising these effects *shall* reduce the static generated.

Due care *should* be exercised when subjecting high purity flammable liquids (with low conductivities and a flash point of less than 10 degrees C above ambient temperature) to any process that generates static electricity. [Suggested values are 10 pico Siemens per metre for low flow rates. The potential for a fire or explosion is higher where there is a flammable atmosphere.]

Before pouring, decanting pumping or micro-filtering from a metal container into another metal container the containers *shall* be efficiently bonded together and connected to a common earth. The resistance between earth and any container *shall* not exceed 10 ohms.

- d) The refilling or “topping up” of containers that contain, or have contained, flammable liquids, with a flash point less than 10 degrees C above ambient temperature *shall*:
- i) be carried out in a fume cupboard; or
 - ii) at a location where flammable vapours *shall* not accumulate and local ventilation *shall* ensure that the concentration of flammable vapour does not exceed 10% of the LEL at any actual or potential ignition source.

Note: Less than 0.5 ml of residual ethanol in a 2.5 litre Winchester can produce a saturated air/ethanol vapour mixture. Refilling a 2.5 litre Winchester which has held ethanol at 19°C shall release 2.5 litres of a saturated ethanol vapour/air mixture. This can result in over 42 litres of flammable vapour.

Liquids with a higher vapour pressure and /or lower explosive limit shall produce a larger flammable zone.

- e) Where opening and pouring operations cannot be carried out in a fume cupboard and the laboratory is well ventilated, the requirements of clause 4.4.3 (f) **shall** apply to the handling of flammable liquids (other than Category A flammable liquids)

Note: Pouring 100ml of ethanol into a clean dry 250 ml beaker shall produce very little if any flammable vapour, outside of the beaker.

- f) Containers **should** be opened for as short a time as possible and never near any source of ignition. In any one place, the duration that any container of flammable liquid is opened **shall** not exceed 10 minutes and the volume **should** not exceed:
- i) 1500 ml decanted volume of any flammable liquid with a flashpoint less than or equal to 10 degrees C above ambient temperature; or
 - ii) 5000 ml decanted volume of any flammable liquid with a flashpoint greater than 10 degrees C above ambient temperature.

4.4.4. Toxic and Corrosive Gases

- a) Toxic gas such as carbon monoxide, and corrosive gases, **should** be stored in well-ventilated areas. Notwithstanding, the requirement in 4.5.2 (a) (iv) to keep fume hoods free of containers, small cylinders of toxic reactive or flammable gas **should** be stored in a fume cupboard.
- b) The Laboratory Manager **should** ensure that at least one other person is present when work with compressed toxic gas is undertaken.

Note: It is highly recommended that gas alarms are installed in areas where toxic gas with poor odour thresholds are used (e.g. carbon monoxide).

4.4.5. Toxic and Corrosive Liquids and Solids

- a) These requirements do not apply to a closed package containing hazardous substances that meets the requirements of the Hazardous Substances (Packaging) Regulations 2001.
- b) The opening and decanting of Class 6 toxic substances or Class 8 corrosive substances that have a Category A or B hazard, to which personnel are likely to be exposed (i.e. gases, dusts, volatile liquids) **shall** be carried in a fume cupboard, or other equipment that shall provide protection to the person using the substance. Where engineering controls cannot be used to provide protection, precautions additional to the use of Personal Protection Equipment **shall** be taken.

Note: Additional precautions over and above use of fume hoods that might be considered include minimising the quantity of substance used, having backup / rescue personnel standing by or having antidotes available.

Note: There may be some procedures that result in a high risk of exposure to the substance. Note should be taken of the distinction between hazard and risk in Appendix 4.

4.5. Protective Clothing and Equipment

Appropriate protective clothing and equipment *shall* be worn when handling hazardous substances of the following hazard classifications: 6.1A-6.1D, 6.3A, 6.4A, 6.5A/B, 6.6A/B, 6.7A/B, 6.8A-C, 6.9A/B, and class 2, 3, 4, 5 and 8 substances.

- a) The Laboratory Manager *shall* ensure that adequate instruction with regard to appropriate protective clothing and equipment is provided to all laboratory personnel handling hazardous substances.
- b) The information *shall*:
 - i) Provide instruction on the proper use of the protective equipment.
 - ii) Provide instruction on the maintenance required to ensure that the protective equipment continues to provide protection from the hazardous substance(s).
 - iii) Be available to a person handling the substance concerned within 10 minutes.
 - iv) Be readily understood by any trained person required to have access to it.
- c) It is recommended that the Laboratory Manager provides instruction to ensure :
 - i) proper selection and use of gloves
 - ii) that eye protection (goggles, glasses or face shield) is appropriate
 - iii) that fume hoods are operated correctly.
- d) This information requirement can be met by providing this information in Laboratory Manuals or in the Safe Method of Use.
- e) Every person who handles any hazardous substance *shall* ensure that the exposure is kept to the lowest practicable level below the Workplace Exposure Standard (WES) for the substance. Where adequate control cannot be achieved by any other means, adequate protective equipment shall be available, maintained and used as specified in the Laboratory Safety/Procedure manual or other appropriate documentation.
- f) Safety showers and/or eye wash facilities *should* be provided within 10 m of where corrosive substances and category A toxic substances are used.
- g) The requirements of this section do not apply if the substance is in a closed package that meets the requirements of the Hazardous Substances (Packaging) Regulations 2001.

Note: Any package that is leaking does not meet the requirements of the Hazardous Substances (Packaging) Regulations 2001. Laboratory procedures shall take such incidents into account (see Section 6.2)

4.5.1. Equipment and Apparatus used with Hazardous Substances

- a) Every person who handles or uses any hazardous substance *shall* ensure:
 - i) That all equipment used to handle, and that comes into contact with a hazardous substance operates correctly, does not leak and is appropriately maintained.

- ii) That the equipment used in conjunction with a hazardous substance is used and maintained as specified in the Laboratory Safety/Procedure Manual or other appropriate documentation; and
 - iii) Failure of equipment to comply with (i) above is reported to the Laboratory Manager or the person delegated to be in charge.
- b) Laboratory Managers **shall** ensure:
- i) That all equipment used to handle, or that comes into contact with, a hazardous substance operates correctly, does not leak and is appropriately maintained.
 - ii) That information regarding correct use of the equipment is documented, readily understandable by laboratory staff and is available to a person using the equipment within 10 minutes.
- c) **Method of compliance.** Information regarding equipment used to handle hazardous substances **should** be included in the Laboratory/Department Safety/Procedures Manual or other documentation.

4.5.2. Fume Cupboards and Local Ventilation.

- a) Fume cupboards **should**:
- i) be designed to AS/NZS 2243.8 (1992 or 1996) or NZS 7203 (1987 or 1992).
 - ii) be operated long enough, after the hazardous substances have been removed from the cupboard, to flush the hazardous substances substantially from the exhaust ducting.
 - iii) have a means to indicate they are operating (such as a 'tell tale'). While not mandatory, it is strongly recommended that fume cupboards intended to extract hazardous substances while unattended should have an alarm that is activated if the airflow drops by more than 20% or stops. It is also strongly recommended that the alarm is monitored.
 - iv) NOT be used to store closed containers of Hazardous Substances. Exception may be made for the storage of small bottles of toxic gases (see section 4.4.4) or any compound specifically specified in the Safe Method of Use for substances or procedures of higher risk (see Appendix 4)
- b) Isolating cabinets (such as cytotoxics cabinets) **should** be tested annually against appropriate Australian or NZ Standard or to comply with manufacturers' requirements.
- c) Local ventilation systems **shall** be professionally designed to recognised standards or tested periodically to ensure effectiveness.
- d) When installing new fume cupboards or upgrading fume cupboards the design and testing criteria given in AS/NZS 2243.8, 2001 **should** be considered.
- e) Fume cupboards and local ventilation systems intended for use with a limited range of Hazardous Substances **should** be clearly marked as to their limitations.

4.6. Storage of Hazardous Substances in the Laboratory

4.6.1. General

- a) Quantities of hazardous substances in the laboratory *should* be kept to a minimum, commensurate with needs and shelf life.
- b) Substances unstable at room temperature may require controlled temperature or other specific storage requirements. SDS *shall* be referred to for specific requirements.
- c) Incompatible substances *shall* be segregated. Consideration *should* be given to providing secondary containment. Appendix 2 lists the hazard categories legally incompatible under HSNO. Substances not included in Appendix 2 may also be incompatible. Safety Data Sheets *should* be referred to for information on incompatibilities. The IMDG Code and reference works such as Bretherick's Handbook of Reactive Chemical Hazards provide more comprehensive information on incompatible substances.
- d) The purpose of segregation is to prevent inadvertent mixing of incompatible substances that would lead to a dangerous reaction. The distance required for segregation *shall* depend on the quantity of the incompatible substances and their mobility. Secondary containment *shall* allow smaller segregation distances.

Note: The segregation requirement does not apply to the purposeful mixing of incompatible substances during the course of experimentation

- e) Hazardous substances *should* be kept in dedicated storage cabinets, storage rooms or areas separated from areas where people regularly work. Such storage areas are operationally part of the HSNO Laboratory Facility and are the responsibility of the HSNO Laboratory Facility Director or nominee. General guidance on storage can be found in AS/NZS 2243.10 and AS/NZS 2982.

4.6.2. Bench Top Storage

- a) The quantity of hazardous substances stored on bench tops or shelves *should* be kept to a minimum. Storage cabinets *should* be used where practical. Hazardous substances not in regular use *shall* be stored in storage cabinets.
- b) Bottles and jars of ready-to-use reagents stored on benches or on shelves between benches *should* not exceed:
 - i) 1 litre capacity for Category A hazardous substances
 - ii) 2.5 litres capacity for all other hazardous substance categories
- c) Shelves *should* have a lip or other means (such as thin plastic sheet turned up 12-20 mm at the sides of the shelf) to reduce the likelihood of containers “marching” off shelves, during mild earthquakes. Trays used for secondary containment *may* also serve this purpose, but *may* need some additional securing. In areas prone to earthquakes, consideration *should* be given to a second higher restraint to prevent containers toppling from shelves or bench tops.

4.6.3. Storage Cabinets and Refrigerators.

- a) Storage cabinets *should* have secondary containment if they are used to store pooling or incompatible substances.

- b) Secondary containment **should** be provided by:
 - i) Plastic trays underneath corrosive substances
 - ii) Metal trays for organic solvents
- c) No more than 100 litres **should** be stored in any one cabinet and secondary containment **shall** be able to retain at least 50% of contents of the cabinet.
- d) Storage cabinets containing incompatible substances **shall** be separated by at least 1.0m horizontally. Cabinets with secondary containment in each cabinet **shall** be separated by not less than 0.5m.
- e) Storage cabinets and refrigerators **should** be secured to prevent them toppling over during moderate earthquakes.
- f) Doors on storage cabinets and refrigerators **should** have latches that prevent the doors opening during moderate earthquakes.
- g) General guidance can be found in AS/NZS 2982:1997.

4.6.4. Storage of Flammable Liquids

- a) Quantities of flammable substance in the laboratory **should** be kept to a minimum.
- b) Storage Cabinets for flammable substances **shall** not contain any ignition sources.
- c) Flame-proof cabinets are recommended storage for flammable substances, although solid timber cabinets (see Section 1 – Definition of a storage cabinet) with appropriate secondary containment **shall** suffice for 3.1C and 3.1D flammable substances.
- d) No more than 100 litres of flammable liquid **should** be stored in any one cabinet and secondary containment **shall** be able to retain at least 50% of contents of the cabinet.
- e) Refrigerators used to store open containers of Class 3.1A and Class 3.1B flammable substances, with a flash point less than 15 °C, **shall** be spark proofed (ie thermostats have been externally mounted and light fittings removed). The refrigerator **shall** be labelled as suitable for use with these substances.

4.6.5. Storage of Compressed Gases

- a) Quantities of flammable, toxic and oxidising gases stored in the laboratory room **shall** be kept to a minimum.
- b) No more than 2 cylinders of each formulation of gas **should** be stored adjacent to each instrument. All gas cylinders **shall** be securely tethered to immovable objects such as walls or rendered immobile in secure gas bottle stands.
- c) Large cylinders stored outside the laboratory room (or in areas such as pickup and delivery points) shall be stored in well ventilated areas so that in the event of a leak (over a 48 hour period) of flammable gas, the concentration shall not exceed 10% LEL. All gas cylinders **shall** be securely tethered to immovable objects such as walls.

4.6.6. Storage of HSNO Class 5 Hazardous Substances

- a) Oxidising substances *shall* be segregated from HSNO Class 3 and 4 substances. See Section 4.6.1 for further guidance on methods of segregation.

Note: The segregation requirement does not apply to the purposeful mixing of incompatible substances during the course of experimentation

- b) Storage of many organic peroxides requires controlled temperature storage. SDS *shall* be consulted for storage requirements and the recommendations *shall* be followed.

4.6.7. Storage/Collection of Waste Hazardous Substances

Containers for collecting and storing hazardous substances wastes in laboratory rooms:

- a) *Shall* not exceed 5 litres for category A substances or 20 litres for all other categories.
- b) *Shall* not be placed on the floor under or between benches, in walkways or corridors unless containers are attached to analytical equipment.
- c) *Should* be kept in a storage cabinet unless the atmosphere, where flammable liquids are being collected, is ventilated to ensure that flammable vapour shall not exceed 10% of the LEL, or safety containers are used that are self closing and have a flash arrester.
- d) Containers not stored in storage cabinets *shall* be provided with secondary containment.

Note: these subclauses do not apply to dedicated storage areas complying with section 4.7.

4.7. Dedicated Storage Areas

- a) Dedicated storage areas for hazardous substances *shall* also be constructed in accordance with current building requirements.
- b) The requirements for storage of flammable substances *shall* meet the controls specified in Schedule 10: Controls relating to the adverse effects of unintended ignition of Class 2 and 3.1 hazardous substances, of the NZ Gazette Notice of Thursday 25, March 2004, Issue Number 35, Hazardous Substances (Dangerous Goods and Schedules Toxic Substances) Transfer Notice 2004. Note should be made of the requirement to establish a controlled zone and to maintain separation distances in accordance with the type of construction of the storage location and volume of material stored in these storage areas. Controlled zones are required to be established at hazardous substance locations where hazardous substances are present in excess of the trigger quantities specified in the Hazardous Substances (Classes 1 to 5 Controls) Regulations as given in the table below:

Hazard classification	Quantity
2.1.1A and B	100 kg (or 100 m ³ where a permanent gas)
2.1.2A	3000 L (aggregate water capacity)
3.1A	20 L
3.1B	100 L in containers greater than 5 L 250 L in containers up to and including 5 L
3.1C	500 L in containers greater than 5 L 1500 L in containers up to and including 5 L

- c) Ignition sources are not permitted in the controlled zone specified above or where oxidisers or organic peroxides are stored.
- d) Any electrical fittings **shall** comply with relevant NZ Electricity Regulations 1997.

4.8. Import or Purchasing

- a) Where the import is made directly by the laboratory or institution carrying out the investigation or teaching activity, the exemption from the provisions of the *Act* applies. Importation can be made without an approval to import from the Authority provided the laboratory complies with this Code of Practice.
- b) A substance for which the Authority has declined an approval can not be imported under this exemption. Substances defined as ‘persistent organic pollutants’ by the Hazardous Substances and New Organisms (Stockholm Convention) Amendment Act, 2003 cannot be imported under this provision – an application under s31 of the HSNO Act must be made for these compounds.
- c) Where a specialist supplier, or another exempt HSNO Laboratory Facility, is in receipt of a purchase order for a hazardous substance from an institution or laboratory that meets the Exempt Laboratories requirements, the supplier can import that substance (in the amount specified in the purchase order) without having to obtain an approval to import from the Authority. The supplier, through the purchase order, is regarded as being an agent of the **Exempt** Laboratory.
- d) Laboratories and institutions purchasing through a specialist supplier, or another Exempt Laboratory, **should** provide a written declaration to the effect that they comply with the Exempt Laboratory Regulations. This declaration **should** be on the organisation’s letter head and signed by the HSNO Laboratory Facility Director. Such a letter shall be deemed sufficient proof for the importing agent.
- e) In cases (c) and (d), the suppliers **shall** meet the requirements of the HSNO Regulations for storage and handling of the Hazardous Substances. The key regulations here are the Identification, Emergency Management, Packaging, Tracking, Classes 1-5 Controls, and Classes 6, 8 and 9 Controls Regulations. Requirements relating to Identification, Emergency Management and Packaging can be met by meeting the international transport requirements.
- f) An approved hazardous substance **shall** comply with the controls assigned by the Authority to that substance until it enters the Exempt Laboratory.

4.9. Recording of Inventory

- a) A record **shall** be kept of all containers of approved hazardous substances falling within HSNO classifications that are required to be tracked under the Hazardous Substances (Tracking) Regulations. The record **shall** be kept for at least 12 months after the substance is used up or removed from the laboratory. The relevant hazard classifications are:

Classes 3.1A and 3.2A

Classes 4.1.2A and 4.1.2B

Class 4.1.3A

Classes 4.2A and 4.3A

Class 5.1.1A

Classes 5.2A and 5.2B

Classes 6.1A, 6.1B and 6.1C

Classes 9.1A, 9.2A, 9.3A and 9.4A

- b) A record **shall** be kept of all containers of unapproved hazardous substances. The record **shall** be kept for at least 12 months after the substance is used up or removed from the laboratory.
- c) Laboratory records or purchasing records shall meet the requirements of (a) and (b).
- d) In the case of *de novo* synthesis, by-products and intermediates that are unlikely to be present for longer than 24 hours or where small quantities that remain in a single room, a record in a laboratory book **shall** suffice.
- e) It is recommended that a copy of records pertaining to any approved compound that requires tracking under the Hazardous Substances (Tracking) Regulation [and any unapproved substance that is sufficiently hazardous that it would require tracking if it was approved] is sent to the organisational Health and Safety Practitioner.

Note: Consideration **should** be given to combining this requirement with other inventory requirements such as stock and ordering control, insurance purposes, and information for emergency services.

4.10. Disposal

Hazardous substances and packaging that has been in direct contact with hazardous substances **shall** only be disposed of in accordance with procedures specified in the Laboratory Safety/Procedures manual or other appropriate documentation. The methods of disposal **shall** comply with the requirements specified in Appendix 6.

4.11. Transport of Hazardous Substances

Hazardous Substances which are also Dangerous Goods for Transport *shall* comply with all the transport requirements. Persons transporting Dangerous Goods on land *shall* comply with the requirements of Land Transport Rule 45001 “Dangerous Goods”. These include the requirements for packing, marking and labelling the substance, refer to Appendix 7. The driver of a vehicle carrying Dangerous Goods may need a license endorsement. If the substance is a tracked substance, the requirements of the Hazardous Substances (Tracking) Regulations 2001 *shall* also apply.

5. Design Requirements

5.1. Application to Laboratories

- a) Guidance on laboratory design can be found in AS/NZS 2243 and AS 2982.
- b) All parts of a laboratory that could come into contact with a hazardous substance during normal use or as a result of spillage, **shall** either---
 - i) be made of a material that is not capable of absorbing or retaining the substance; or
 - ii) be treated and finished to prevent the absorption or retention of the substance; or
 - iii) be covered by a disposable material that is capable of absorbing or retaining the substance.

Means of compliance.

- AS/NZS 2982.1(1997)
- Floors: – section 2.3
- Walls: – section 2.4
- Ceilings: – section 2.5
- Benches: – section 2.7
- Disposable covering materials: – numerous materials are available including Whatman Benchkote or disposable incontinence sheets.

The Laboratory Manager shall determine a product's suitability for use with the specific substance(s).

- c) The laboratory **shall** be designed and operated to prevent the substance from inadvertently escaping from the laboratory and entering the environment.

Localised secondary containment within storage cabinets, cupboards and on shelves or bench tops shall minimise the volume and the likelihood of the substance inadvertently escaping the lab. Absorbent material, booms, and socks should prevent the Hazardous Substances from entering the drain.

- d) Disposal of an approved hazardous substance using a disposal system complying with this Code of Practice does not constitute escaping from the laboratory and entering the environment.

Note: This requirement does not preclude the use of fume cupboards, general and local ventilation for most Hazardous Substances. Refer to Appendix 6

5.2. Signage

- a) All entrances to a laboratory (which may be a building) **shall** be clearly marked with the following (or similar) sign:

Entry for Authorised Persons only

- b) The text **shall** be in a bold non serif font and a minimum upper case letter height of 20mm. The preferred letter height is 35mm.
- c) Every **entrance** to a HSNO Laboratory Facility **shall** have signage advising an Emergency Action Code (e.g. the Hazchem Code) and UN Class labels for the hazards within the HSNO Laboratory Facility.
- d) Rooms containing hazardous substances equal to or exceeding the quantities specified in Appendix 1 **shall** be identified by one of the following signs at the entrances of all such rooms:

Laboratory

or

Hazchem

- e) Rooms where hazardous substances are stored or used in quantities equal to or exceeding quantities specified in Appendix 1 **should** be individually marked with UN Class labels or other suitable pictograms.
- f) Dedicated storage rooms or areas (e.g. the ‘Dangerous Goods store’, Flammable Liquid store etc) **shall** be marked with UN Class labels or other suitable pictograms.
- g) In rooms where hazardous substances are stored or used in quantities equal to or exceeding quantities specified in Appendix 1, signs **shall** be provided that state what to do in an emergency. This requirement could be met by a sign indicating that the fire alarm **should** be activated and the laboratory evacuated. The exact wording **shall** depend on the hazards and the procedures specified in the emergency plan.
- h) Further guidance on signage can be found in the ERMA New Zealand Approved Code of Practice “Signage for Premises Storing Hazardous Substances and Dangerous Goods”

5.3. Fire Extinguishers

- a) Fire extinguishers, appropriate for the hazardous substances present, *shall* be provided (on the same floor of a multi-level building) no more than 30 m from where hazardous substances are located.
- b) A five yearly assessment *shall* be made of the provision of fire extinguishers to ensure adequacy of coverage.

5.4. Additional Design Requirements for Laboratories using Unapproved Hazardous Substances.

- a) The design of the laboratory *shall* include provisions for the storage of the substance (Refer to Section 3).
- b) Those design, operational, and storage arrangements *shall* remain in place until
 - i) the substance becomes an approved hazardous substance; or
 - ii) the substance is treated so that it is no longer a hazardous substance; or
 - iii) the substance is lawfully exported from New Zealand;
 - iv) or the substance is disposed of in accordance with Appendix 6.

6. Emergency Information

6.1. Emergency Response Plans

- a) Laboratories/Laboratory Facilities **shall** have an Emergency Response Plan regardless of the quantities of Hazardous substances present. Emergency Plans meeting the requirements of the Health and Safety in Employment Act **shall** form the basis for HSNO Emergency Response Plans. Existing Plans **may** have to be modified to include procedures in the event of a chemical emergency.
- b) Emergency Plans **may** have to be modified to provide for specific testing of the preparedness of laboratory personnel in the event of an emergency involving a spill of a hazard substance in that laboratory. Many organizations shall have already considered these particular emergencies in their emergency response procedures. Tests **may** be applied at the time of trial Building Evacuation which shall meet the requirements of Section 6.4. Trial Building Evacuations are part of Building Evacuation Schemes mandatory under the Fire Safety and Evacuation of Buildings Regulations, 1992.
- c) The Laboratory Manager, in conjunction with the Health and Safety practitioner for the organisation, **shall** determine, as part of the Safe Method of Use, the adequacy of generic emergency plans and spill containment procedures in relation to the volume of the hazardous substances and their hazardous properties.
- d) The Laboratory Manager shall ensure specific protocols are developed to deal with all likely emergencies that may arise from the breach or failure of controls on hazardous substances and ensure they are documented in the organisation's Emergency Response Plan. The emergency response plan will address:
 - i) Containment of the spill
 - ii) Absorption of the spill
 - iii) Safe disposal of the absorbed material
 - iv) Procedures to notify people at the site that an emergency has occurred
- e) The availability of personnel with key roles identified in the plan shall be recorded in the Emergency Plan. Contact details for all relevant personnel and their specific duties will also be recorded in the Emergency Plan.
- f) The Laboratory Manager **shall** ensure by training, all relevant staff is given a copy of any protocol in accordance with 6.1 (d) along with specific instruction about the use of absorbent material, reinstatement of containment and any other procedures that are necessary.

6.2. Minor Emergencies - Spills

- a) All laboratory personnel **shall** be told of the location of the nearest spill kit and extinguishers at the time of their induction. Instruction on use of spill kit and fire extinguishers **should** be repeated annually.

- b) The Laboratory Manager **shall** ensure that laboratory personnel in charge are able to determine if the laboratory must be evacuated, and how to call for extra assistance.
- c) The Laboratory Manager **shall** ensure that 24 hour emergency numbers and contact details for key personnel are posted in an easily accessible place (near entrance to the room or near the telephone).
- d) The Laboratory Manager **shall** ensure that laboratory personnel know the location of the fire alarm and how to operate it.
- e) All of the above **shall** be tested annually. These tests could be applied at time of a trial building evacuation or done as a separate exercise. It is suggested that the Health and Safety practitioner choose two laboratory rooms at random and test the knowledge of the laboratory personnel in these rooms with respect to above requirements.

6.3. Evacuation in the Event of Chemical Emergency

- a) Evacuation in the case of chemical emergency shall trigger the same series of events as an alarm in the event of a fire (see Building Evacuation Scheme in 6.1 b above)
- b) The Laboratory Manager or person in charge **shall** call the Fire Service to alert them to a chemical emergency and identify those chemicals involved.
- c) The Laboratory Manager **should** be able to access any additional information relevant to the chemical(s) concerned within 5 minutes.
- d) The location of significant quantities of hazardous substances in the building are required as part of the Building Evacuation Scheme. This information shall assist Emergency Services locate major chemical hazards quickly.
- e) All of the above **may** be tested at time of trial building evacuation or done as a separate exercise. It is suggested that the Health and Safety practitioner choose two laboratories at random. The knowledge and ability of the laboratory personnel to provide correct information **should** be tested. The location of significant quantities of hazardous substances for 6.1(c) **should** also be checked to ensure currency.

6.4. Testing Plans

- a) The emergency response plan **shall** be tested at least every 12 months and it is suggested that they be included with building evacuation tests. The test **shall** demonstrate that every action in the plan is workable and effective.
- b) If there is a change to the building, procedures, persons or actions specified in the Emergency Response Plan, the Plan **shall** be tested within 3 months of the change and the test shall demonstrate that each change is workable and effective.
- c) The carrying out and the results of every test must be documented; and the documentation **shall** be retained for at least 2 years.

6.5. Emergency Preparedness

- a) All Dangerous Goods Stores **shall** be checked annually to ensure Hazchem or other signage is up-to-date, correct and legible.
- b) All Dangerous Goods Stores **should** be checked annually to ensure inventory matches capacity rating and that incompatible materials are correctly stored.
- c) A copy of all keys to Dangerous Goods Stores **shall** be available to custodial or security staff to ensure Emergency Services are able to access the stores any time.
- d) Where laboratory staff are in charge of a chemical store, specific provision **should** be made for emergency alarms, communication devices, or panic buttons to enable staff to raise the alarm or call for immediate assistance. Communication devices that are intrinsically safe **shall** be used where a flammable hazardous zone exists.

Appendix 1: Quantities Requiring Signage

Kinds of substances	Hazard Classification	Quantity	
Explosive substances	Fireworks subject to the Hazardous Substances (Fireworks) Regulations 2001	1 000 kg (gross weight)	
	Safety ammunition, including pre-primed cartridges and primers of class 1.4S	10 000 kg (gross weight)	
	Airbag initiators and seatbelt pretensioners of class 1.4G and 1.4S	5 000 kg (gross weight)	
	Cable cutters of class 1.4S (UN 0070)	5 000 kg (gross weight)	
	Power device cartridges of class 1.4S (UN 0323)	5 000 kg (gross weight)	
	Signal or shock tubes of class 1.4S (UN 0349)	5 000 kg (gross weight)	
	Cassette degradation devices of class 1.4S (UN 0432)	5 000 kg (gross weight)	
	Propellants of class 1.1C (UN 0160) and 1.3C (UN 0161 and UN 0499), gun-powder of class 1.1D (UN 0027), and substances of classes 1.3G, 1.4G, and 1.4S not listed above	50 kg	
All remaining explosive hazardous classifications	Any quantity		
Flammable substances	2.1.1A	250 kg non-permanent gas 100 m ³ permanent gas	
	2.1.1B	500 kg non-permanent gas 200 m ³ permanent gas	
	2.1.2 (aerosol)	3 000 L aggregate water capacity	
	3.1 A, 3.2A, 4.1.3A, 4.2A, 4.3A	50 L liquids 50 kg solids	
	3.1B, 3.2B, 4.1.3B, 4.2B, 4.3B	250 L liquids 250 kg solids	
	3.1C, 3.2C, 4.1.3C, 4.2C, 4.3C	1 000 L liquids 1 000 kg solids	
	3.1D	10 000 L liquids	
	4.1.1A	250 kg solids	
	4.1.1B	1 000 kg solids	
	4.1.2A, 4.1.2B	50 L liquids 50 kg solids	
	4.1.2C, 4.1.2D	250 L liquids 250 kg solids	
	4.1.2E, 4.1.2F, 4.1.2G	1000 L liquids 1 000 kg solids	
	Oxidising substances	5.1.1A	50 L liquids 50 kg solids
		5.1.1B	500 L liquids 500 kg solids
		5.1.1 C	1 000 L liquids 1 000 kg solids
		5.1.2A	250 kg non-permanent gas 500 m ³ permanent gas

Kinds of substances	Hazard Classification	Quantity
	5.2A, 5.2B	1 L liquids 1 kg solids
	5.2C, 5.2D, 5.2E, 5.2F	10 L liquids 10 kg solids
Toxic substances	6.1A	50 L liquids 50 kg solids
	6.1B	250 L liquids 250 kg solids
	6.1C	1 000 L liquids 1 000 kg solids
	6.1D	10 000 L liquids 10 000 kg solids
	6.1A, 6.1B, 6.1C	5 kg non-permanent gas 2.5 m ³ permanent gas
Corrosive substances	8.1A	1 000 L liquids 1 000 kg solids
	8.2A	5 kg non-permanent gas 2.5 m ³ permanent gas 50 L liquids 50 kg solids
	8.2B	50 kg non-permanent gas 25 m ³ permanent gas 250 L liquids 250 kg solids
	8.2C, 8.3A	1 000 L liquids 1 000 kg solids
Ecotoxic substances	9.1A, 9.2A, 9.3A, 9.4A	100 L liquids 100 kg solids
	9.1B, 9.1C, 9.2B, 9.2C, 9.3B, 9.4B, 9.4C	1 000 L liquids 1 000 kg solids
	9.1D, 9.2D, 9.3C	10 000 L liquids 10 000 kg solids

Appendix 2: Substances and materials incompatible with class 2, 3, and 4 substances

Hazard classification	Incompatible substances and materials
2.1.1	All class 1 substances Class 2.1.2 substances All class 3 substances All class 4 substances All class 5 substances
2.1.2	All class 1 substances All class 3 substances All class 4 substances All class 5 substances
3.1	All class 1 substances All class 2 substances Class 3.2 substances All class 4 substances All class 5 substances
3.2	All class 1 substances All class 2 substances Class 3.1 substances Class 4.1.2, 4.2, and 4.3 substances All class 5 substances
4.1.1 (readily combustible solids)	All class 1 substances All class 2 substances Class 4.1.2, 4.1.3, 4.2, and 4.3 substances All class 5 substances
4.1.1 (those solids which cause fire through friction only)	Any substance likely to cause a spark when struck against a class 4.1.1 substance
4.1.2	All class 1 substances All class 2 substances Class 3.1 and 3.2 substances Class 4.1.3 and 4.2 substances All class 5 substances Catalytic impurities having a detrimental influence on the thermal stability and hazard presented by class 4.1.2 substances
4.1.3	All class 1 substances All class 2 substances Class 3.1 substances Class 4.2 substances All class 5 substances

Hazard classification

4.2

4.3

Incompatible substances and materials

All class 1 substances

All class 2 substances

All class 3 substances

Class 4.1.1, 4.1.2, 4.1.3, and 4.3 substances

All class 5 substances

Air

Oxygen

All class 1 substances

All class 2 substances

All class 3 substances

Class 4.1.1, 4.1.2, 4.1.3, and 4.2 substances

All class 5 substances

All class 8 substances

Water

Appendix 3: UN Labels & GHS Pictograms

Examples of UN labels and GHS pictograms:



HSNO Classes 1.1, 1.2, 1.3
(UN Classes 1.1, 1.2, 1.3)



HSNO Class 1.4
(UN Class 1.4)



HSNO Class 1.5
(UN Class 1.5)



HSNO Class 1.6
(UN Class 1.6)



HSNO Class 2.1.1A
flammable gases
(UN Class 2.1)

HSNO Class 2.1.2A:
flammable aerosols
(UN Class 2.1)



FLAMMABLE GAS

HSNO Class 2.1.1B
Flammable gases
(GHS pictogram)



UN Class 2.2: Gases
under pressure:

- Compressed gas
- High pressure liquefied gas
- Low pressure liquefied gas
- Dissolved gas & Refrigerated liquefied gas



HSNO Class 3.1A, B & C
flammable liquids
(UN Class 3)

HSNO Class 3.2 liquid desensitised
explosives
(UN Class 3)



FLAMMABLE LIQUID

HSNO Class 3.1D
flammable liquid
(GHS pictogram)



HSNO Class 4.1.1A and
B readily combustible
solids (UN Class 4.1)

HSNO Class 4.1.2B, C,
D, E & F self-reactive
(UN Class 4.1)

HSNO Class 4.1.3A, B &
C solid desensitised
explosives (UN Class 4.1)



FLAMMABLE SOLID

HSNO Class 4.1.2G
self-reactive
(GHS pictogram)



HSNO Class 4.2A spontaneously
combustible: pyrophoric liquids and
pyrophoric solids
(UN Class 4.2)

HSNO Class 4.2B & C spontaneously
combustible: Self-heating substances
(UN Class 4.2)



HSNO Class 4.3
substances which in contact
with water emit flammable
gases (UN Class 4.3)



HSNO Class 5.1.1A, B &
C: Oxidising liquids and
solids (UN Class 5.1)
HSNO Class 5.1.2A
Oxidising gases
(UN Class 5.1)



HSNO Class 5.2B, C,
D, E & F: organic
peroxides
(UN Class 5.2)



ORGANIC PEROXIDE
HSNO Class 5.2 G organic peroxides
(GHS pictogram)



Class 6.1A, B & C acute
toxic (UN Class 6.1)



HSNO Class 6.1A, B & C
acute toxic where the
substance is a gas
(UN Class 2.3)



TOXIC

HSNO Class 6.1D
acute toxic
HSNO Class 6.3A & B
skin irritant
HSNO Class 6.4A eye
irritant
HSNO Class 6.5B
sensitisers (dermal)
(GHS pictogram)



CHRONIC TOXIC

HSNO Class 6.5A sensitisers
(respiratory)
HSNO Class 6.6 mutagen
HSNO Class 6.7 carcinogen
HSNO Class 6.8
reproductive/developmental
HSNO Class 6.9 target organ/systemic
(GHS pictogram)



HSNO Class 8.1A
corrosive to metals
(UN Class 8)

HSNO Class 8.2 A, B
& C: skin corrosive
(UN Class 8)



CORROSIVE

HSNO Class 8.3 eye
corrosive
(GHS pictogram)



ECOTOXIC

HSNO Class 9.1A, B & C, aquatic
ecotoxicity
HSNO Class 9.2A, B & C, soil
ecotoxicity
HSNO Class 9.3A & B, terrestrial
vertebrate ecotoxicity
HSNO Class 9.4A, B & C, terrestrial
invertebrate ecotoxicity
(GHS pictogram).

Appendix 4: Determining Hazard

1. Determination of the Hazard of a Substance.

- a) Determine the HSNO classification if the substance is an approved substance (see section 3 below on determining hazardous properties below), or
- b) Determine the probable HSNO classification if the substance is not an approved substance, based on the substance's known or estimated hazardous properties (see section 3 below on determining hazards below).
- c) When determining the hazards for an un-approved hazardous substance, the following *shall* be considered:
 - i) Information available from the Safety Data Sheet if available for the substance; and
 - ii) The hazardous properties of all products that are likely to result from a reaction used to form the substance; and
 - iii) Any known physical or chemical properties of---
 - the substance; or
 - any of the compounds, elements, or chemical functional groups that make up the substance; and
 - Any known hazardous properties of substances that have a similar chemical structure; and
 - If the substance is a mixture, any known or likely interactions between the compounds, elements, or chemical functional groups that make up the mixture; and
 - If the substance was imported from another jurisdiction, any information about the substance available from that jurisdiction.

2. Determination of Risk

- a) When determining risk, each organisation *shall* take the following into account:
 - i) The hazard posed by the substance
 - ii) The quantity of the substances being used
 - iii) The procedures involved
 - iv) The availability of protective equipment to reduce the risk.
- b) Consideration *shall* also be given to the availability of sufficient air extraction systems to reduce vapour pressure or concentration of substance in the air.

3. Determination of HSNO Classification.

A. HSNO Approved Substances

- a) Information on the hazardous properties of substances approved under HSNO is available on the ERMA New Zealand Register, available on their website at (<http://www.ermanz.govt.nz/search/substance1.cfm>).
- b) To retrieve the records for decisions made on release applications, enter “HSR” in the “approval code” field. Hazard classifications are provided for all substances approved for release.
- c) To retrieve the records for decisions made on containment applications, enter “HSC” in the “approval code” field. Hazard classifications are not required for containment applications, but there will be limited hazardous property information in the Evaluation and Review Report.
- d) In order to retrieve all relevant records when searching the Register, enter a large number in the “maximum search rows” field.

B. HSNO Unapproved Substances

- a) If the substance has not been approved, determine the likely classification using the criteria in the Hazardous Substances (Minimum Degrees of Hazard) Regulations 2001 and Hazardous Substances (Classification) Regulations 2001. This information can also be found in the “*User Guide to HSNO Thresholds and Classifications*”. This document can be downloaded from the ERMA New Zealand web site under publications\guides <http://www.ermanz.govt.nz/resources/publications/pdfs/ER-UG-04-1.pdf>
- b) Material Safety Data Sheets, if available, can provide useful information on a substance’s hazardous properties and any regulatory limits imposed.
- c) If test data is not available for the substance or components of a substance, an approximation can be obtained by considering the known values of a similar substance.
- d) If the substance is a mixture, use the method outlined in the document “*User Guide to HSNO Thresholds and Classifications*” to estimate the hazardous properties.

4. Hazard versus Risk

Hazard

Hazardous properties of a substance are intrinsic properties of the substance and are a measure of the potential for that substance to cause or be a source of harm.

Risk

The probability of the hazardous substance causing damage or harm of a particular severity.

A substance with a high hazard can be handled in such a way that the resultant risk is low. However, the risk can change depending on the method of use (i.e. the controls imposed).

For example “Developer AA” is a liquid used to develop colour on chromatography plates. It has a very low dermal toxicity, extremely low volatility but a high inhalation hazard. The use of this developer liquid involves a risk of being poisoned.

When chromatography plates are dipped in this liquid, there is a very low risk of being poisoned, even without the use of protective equipment (gloves & tongs).

If however, the liquid is sprayed onto the chromatography plates the risk is dramatically increased.

If the spraying occurs in a fume cupboard, with sufficient airflow the risk is again reduced.

Appendix 5: An Example of a Safe Method of Use for HSNO 3.1B – Flammable Liquids

Safe Method of Use for HSNO 3.1B – Flammable Liquids

A. Classification

HSNO 3.1B Flammable Liquids are those liquids with a flashpoint below 23 degrees Celsius and an Initial Boiling Point above 35 degrees Celsius.

Halogenated organic compounds generally have much higher flashpoints than unsubstituted compounds and do not pose the same level fire safety hazard although these compounds are likely to be toxic.

The following safety rules apply to all Class 3.1B flammable liquids but you **MUST** consult MSDSs for details specific to the substance in use.

A List of selected HSNO 3.1B Flammable Liquids - Liquids with a flashpoint below 23 degrees Celsius and an Initial Boiling Point above 35 degrees Celsius

Substance	Flashpoint
Acetone	-17
Acetonitrile	5
Benzene	-11
2-Butanone	-3
n-Butyl acetate	22
sec-Butyl acetate	16
tert-Butyl acetate	15
tert-Butyl alcohol (2-methyl-2-propanol)	11
Cyclohexene	-12
Di-isopropyl ether	-12
Di-isopropylamine	-6
Di-n-propyl ether	4
Diethyl ketone	12
Diethylamine	-28
Dimethylamine	15
Dimethyldichlorosilane	-20
Dioxane	15
Ethanol	12
Ethyl acetate	-3
Ethyl acrylate	15

Substance	Flashpoint
Ethyl isobutyl ketone	13
Ethylene dichloride	6
Ethylene glycol diethyl ether	20
Ethylene glycol dimethyl ether	0
n-heptane	-1
Heptene	-8
n-hexane	-23
Isopropyl acetate	16
Methanol	11
Methyl acetate	20
Methyl acrylate	6
Methyl ethyl ketone	-3
Methyl formate	-32
Methyl isobutyl ketone	13
Methyl methacrylate	10
1-Methyl piperidine	3
Methyl propionate	6
Methyl propyl ketone	7
Methyltetrahydrofuran	6
Piperidine	4
n-Propanol	15
2-Propanol	23
n-Propyl acetate	12
Propionaldehyde	-26
Pyridine	20
Tetrahydrofuran	-17
Toluene	4
Triethylamine	-6
Vinyl acetate	-6

B. Incompatibilities

- HSNO Class 3.1B Flammable Liquids **shall not** be stored with any HSNO Class 1, 2, 3.2, Class 4 or Class 5 substances (refer Appendix 2)
- HSNO Class 3 Flammable Liquids **shall not** be stored or used near any sources of ignition.

C. Storage

- HSNO Class 3.1B Flammable Liquids shall be stored in a flame protected cabinet with sufficient secondary storage to retain at least 50% of the contents of the cabinets.
- Minimum quantities of UN Class 3 Flammable liquids *should* be stored in the laboratory outside a flame-proof cabinet. As a guide, no more than 100 litres should be stored in any flame-proof cabinet.
- Bulk solvents *shall* always be kept inside a designated Chemical Storage Area (i.e. Dangerous Goods store).

D. Storage - Limits on Storage Time

- Containers of flammable liquids *shall* be checked annually to ensure they are not leaking, the closures are vapour-tight and in good condition and labels are intact and legible.

E. Storage of Ethers with Higher Flashpoints - Special Precautions

- Ethers that have been exposed to the atmosphere for any length of time almost invariably contain peroxides. Peroxides are hazardous because they are unstable and decompose violently at elevated temperatures.
- Opened bottles of ethers *should* not be stored for longer than 18 months, especially if they are not stabilised and the presence of peroxides has not been tested.

F. Use of Class 3.1B Flammable Liquids

- Use of HSNO Class 3.1B solvents *should* be restricted to fume hoods or to areas where there is active ventilation.
- Minimal quantities of solvent *should* be kept in the laboratory at any one time.
- Ensure that these solvents are always placed in flame-proof storage cabinets after use.
- Sources of ignition should be kept well away from the area in which these solvents are being used. Highly flammable liquid substances *should* NOT be stored in refrigerators unless the refrigerator has been extensively modified by installation of spark-proof thermostatic switch and other components.
- Ethers *should* NEVER be distilled to dryness.

G. Personal Protective Equipment for Handling HSNO 3.1B Flammable Liquids

- Care *should* be taken to ensure gloves of appropriate material are used when handling organic solvents.
- The primary barrier *shall* be the use of a tested and certified fume hood to extract solvent vapours away from laboratory worker thus reducing the chance of fire and explosion and reducing the possibility of exposure to toxic solvents.

H. Toxicity of UN Class 3 Flammable Goods

The high vapour pressure of commonly used solvents means that the most likely pathway of absorption is inhalation, but dermal absorption can also occur. Compounds dissolved in these solvents shall often be absorbed by the skin much more freely, penetrating the body's first line of defence. Consult MSDS sheets for details specific to the compound in use.

Aliphatic hydrocarbons

C6 to C8 aliphatic hydrocarbons (hexanes to octanes) can be responsible for contact dermatitis as well as damage to the central nervous system. All n-alkanes are neurotoxic by virtue of the fact that their oxidised metabolites are potent neurotoxins.

Aromatic solvents

Benzene attacks the haemopoietic system and at higher exposures has been linked to aplastic anaemia and leukaemia - the metabolites of benzene are thought to have a major role in suspected genetic damage. Safe exposure levels have been revised downward in the last 20 years to less than 0.1 ppm.

Alkylbenzenes (toluene and xylene) are not as toxic as benzene, but at higher concentrations can result in headaches and nausea.

Alcohols and Aldehydes

Alcohols are metabolised into aldehydes which are considerably more toxic than their parent alcohol reacting with proteins and amine neurotransmitters.

I. Disposal

- HSNO Class 3.1B flammable liquids *shall* be disposed of by a licensed chemical waste contractor. Contact appropriate Laboratory Manager to arrange disposal.
- Keep chlorinated solvents separate from non-chlorinated solvents to facilitate distillation and recycling.

J. Spills

- Minor spills – *shall* be cleaned up immediately using Standard Protocol for Spills (see Laboratory Manual).
- Used absorbent material is to be placed in an impermeable bag and bag is to be sealed. Contact appropriate Laboratory Manager to arrange disposal.
- Major spills – extinguish all flames and clear area immediately. Contact Laboratory Manager or person in charge immediately.

K. Emergency Contacts

Fire Service:

CRI Security (24 hours):

Safety Manager:

Appendix 6: Disposal

Note: Disposal of *Hazardous Substances* is subject to the Resource Management Act and Council By-Laws in addition to HSNO requirements. The following specify the HSNO requirements only.

In general, substances must be disposed of by treatment using a method that changes the characteristics or composition of the substance so it is no longer a hazardous substance, or by exporting the substance from New Zealand as waste.

A summary of treatment methods is given in the following table. Detailed information is provided after the summary table.

Class	Disposal Treatment Systems	Methods Specifically Excluded
1	Controlled detonation, deflagration, or burning*.	Deposition in landfill or sewage facility
2,3,4	Controlled burning* Controlled environmental discharge (for 2.1.1, 2.1.2, 3.1, or 4.1.1)*	Deposition in landfill or sewage facility
5	Controlled burning* Controlled and segregated landfill*	Deposition in sewage facility
6,8	Environmental discharge provided Tolerable Exposure Limit (TEL) is not exceeded. (N.B. Can exceed TEL if rapidly biodegradable and degradation products are not hazardous) Landfill, sewage, combustion provided these techniques render the substance non-hazardous.	For class 6, dilution prior to discharge
9	Environmental discharge provided Environmental Exposure Limit (EEL) is not exceeded. Landfill, sewage, combustion provided these techniques render the substance non-hazardous. For 9.1 substances that are bio-accumulative and not rapidly degradable, treat before disposal so that the hazardous substance concentration is less than 1% by volume.	Dilution prior to discharge
Packages	Make incapable of containing any substance and dispose of as for the substance it contained taking account of the material the package is made of. Note: These requirements do not apply to packages that contained classes 1 to 5 substances if the contents have been made non-hazardous, or for classes 6, 8 or 9 substances if the contents are diluted to below hazard threshold and the quantity of dilute residue is less than 1% of the volume of the package.	Use for some other substance

* that meets the prescribed requirements of the HSNO (Disposal) Regulations in each case.

Laboratory Treatment

Other techniques for destroying a variety of hazardous chemicals have been documented by Lunn and Sansone (1994)¹. The methods of destruction described in this publication *should* be used only by workers who have received appropriate training and who are thoroughly familiar with the potential hazards and chemistry of the substance to be destroyed and any reagents used for that destruction.

Contracted Treatment

Specialist contractors *should* be used for disposal of *Hazardous Substances* when laboratory treatment is not feasible.

Tracked Substances

When a tracked substance is disposed of, the following records *shall* be kept.

- a) the manner of disposal; and
- b) the date on which the disposal occurred; and
- c) the amount of the substance disposed of; and
- d) the location of the place where the substance was disposed of.

Disposal of Non-Approved Hazardous Substances

Non-approved hazardous substances *shall* be

- a) Treated so they are no longer hazardous; or
- b) Exported from New Zealand; or
- c) Disposed of in a manner that is acceptable for an approved substance with similar properties. A record of the method of disposal, and the justification for using the method particular method of disposal, should be kept.

¹ Lunn, G and E B Sansone 'Destruction of Hazardous Chemicals in the Laboratory'. 1994, 2nd Ed, NY, J Wiley and Sons.

Appendix 7: Transport Requirements - Packaging and Emergency Management Tracking

The following packaging complies with the requirements for land transport in the Land Transport Rule 45001 Dangerous Goods and maritime transport in Maritime Transport Rule Part 24A. Air transport has different requirements. These can be found in the ICAO Technical Instructions or the IATA Dangerous Goods Regulations.

- 1) **Combination Packages or Overpacks.** It is sufficient for the outer packaging to be marked and labelled in compliance with transport requirements i.e. marked and labelled with the Proper Shipping Name, UN number and Class label (and subsidiary risk label(s), if required).
- 2) **Dangerous Goods in Limited Quantities *shall*** be packed in combination packaging (e.g. bottles inside a cardboard carton) and the outer packaging marked or labelled with at least one of the following:
 - a) The proper shipping name and UN Number of all the dangerous goods in the package; **or**
 - b) The Class and Division, including subsidiary risks, of all the dangerous goods in the package and the words ‘Dangerous Goods in Limited Quantities’, the abbreviation ‘DGLQ’, or similar words or abbreviations, to clearly identify the package as containing Dangerous Goods in Limited Quantities.
- 3) **Consumer Commodities *shall*** be marked or labelled with at least one of the following:
 - a) the proper shipping name and UN Number of all the dangerous goods in the package; **or**
 - b) the Class and Division, including subsidiary risks, of all the dangerous goods in the package and the words ‘Consumer Commodities’ or the abbreviation ‘Con Coms’, or similar words or abbreviations, to clearly identify the package as containing Consumer Commodities; **or**
 - c) the common or technical name of all the dangerous goods in the package and the words ‘Consumer Commodities’ or the abbreviation ‘Con Coms’, or similar words or abbreviations, to clearly identify the package as containing Consumer Commodities
- 4) **Single Sole Packaging**, such as a drum, ***shall*** comply with the full identification requirements specified in the Hazardous Substances (Identification) Regulations 2001. An indication of the general requirements is given below. For detailed information relating to each hazardous property the Regulations ***shall*** be consulted.
 - a) The nature of the hazard (toxic, flammable etc)
 - b) The degree of the hazard
 - c) The physical state of the substance or if it is an aerosol
 - d) Unequivocal identification of the substances
 - e) Information to allow the NZ importer, supplier, or manufacturer to be contacted

- f) Additional information if the substance becomes more hazardous over time or if additional hazardous properties develop. The information required includes details on the likely changes and the date they are likely to occur.
- g) Specific Precaution and Safety information.

5) Emergency Management Requirements

Substances that are marked, labelled, and documented in accordance with the transport requirement satisfy the level one and two emergency management information requirements (ref Hazardous Substances (Emergency Management) Regulations 11 & 15).

6) Tracked substances

When a tracked substance is transported outside of an exempt laboratory, the requirements of the Hazardous Substances (Tracking) Regulations 2001 shall also apply. These require:

Transfer of tracked substance (Regulation 6)

The person in charge of a place (an exempt laboratory) where a tracked substance is present **should** transfer the substance to another place only if he or she has received confirmation that

- a) an approved handler at the other place holds a test certificate as an approved handler of the substance, and is prepared to accept responsibility for the substance; and
- b) the other place has a test certificate for the amount and hazard Classification of the substance, if so required by the Hazardous Substances (Classes 1 to 5 Controls) Regulations 2001 or the Hazardous Substances (Classes 6, 8, and 9 Controls) Regulations 2001; and
- c) any place where the substance is to be held during transit to the other place complies with
 - i) the requirements of the Hazardous Substances (Emergency Management) Regulations 2001; and
 - ii) to the extent relevant, the requirements for a transit depot.

The following records are required:

- a) the unequivocal identification and amount of the substance transferred; and
- b) the address of the place, the identity of the approved handler who **shall** be in control of the substance at that place, and the position of that approved handler within his or her organisation; and
- c) the date on which the transfer occurred.

References

Lunn G and E B Sansone "Destruction of Hazardous Chemicals in the Laboratory.' 1994, 2nd Ed, NY, J Wiley and Sons

Standards

AS 2982, 1987: Laboratory Construction

AS/NZS 2982, 1997: Laboratory Design and Construction

AS/NZS 2243.1, 1997: Safety in Laboratories. Part 1: General

AS/NZS 2243.2, 1997: Safety in Laboratories. Part 2: Chemical Aspects

AS/NZS 2243.8, 1992: Safety in Laboratories. Part 8: Fume Cupboards

AS/NZS 2243.8, 1996: Safety in Laboratories. Part 8: Fume Cupboards

NZS 7203, 1987: Safety in Laboratories. Part 8: Fume Cupboards

NZS 7203, 1992: Safety in Laboratories. Part 8: Fume Cupboards

AS/NZS 2243.10, 1993: Safety in Laboratories. Part 10: Storage of Chemicals

Codes and Regulations

Hazardous Substances (Exempt Laboratories) Regulations 2001

Hazardous Substances (Identification) Regulations 2001

Hazardous Substances (Emergency Management) Regulations 2001

Hazardous Substances (Packaging) Regulations 2001

Hazardous Substances (Tracking) Regulations 2001

Hazardous Substances (Classes 1 to 5 Controls) Regulations 2001

Hazardous Substances (Classes 6, 8, and 9 Controls) Regulations 2001

The Hazardous Substances (Minimum Degree of Hazard) Regulations 2001

The Hazardous Substances (Classification) Regulations 2001

New Zealand Gazette Notice of Thursday 25, March 2004, Issue Number 35, Hazardous Substances (Dangerous Goods and Schedules Toxic Substances) Transfer Notice 2004

Fire Safety and Evacuation of Buildings Regulations 1992

Electricity Regulations 1997

Land Transport Rule Dangerous Goods 1999 Rule 45001

Maritime Rules Part 24A Carriage of Cargoes – Dangerous Goods

New Zealand Civil Aviation Rules Part 92 Carriage of Dangerous Goods

Cross Reference with the Hazardous Substances (Exempt Laboratories) Regulations 2001

Code of Practice	Exempt Laboratory Regulation Numbers	HSNO Act
2.2 and 2.3 Management of Laboratories	8(2), 10, 11, 13, 14	
2.4 Persons handling Hazardous Substances	10, 11, 15	
3.1–3.6 and Appendices 4 & 5: Hazard Assessment	10, 11, 14 and 15	
4.1 Basic Laboratory rules	15	
4.2 Entry	8(2) and 8(3)	
4.3.1 and Appendix 3: Information and Labelling of Containers	10(3), (4) and (5) 11(3), (4) and (5)	
4.3.2 Specifications for Containers	12	
4.4 Handling of Hazardous Substances	10(1) 11(1) 14 (b)(i)(d) 15 (a), (b) and (c)	
4.5 Protective Equipment	15 (a), (b) and (c) 14(b)(i)(d)	
4.6 and Appendix 2: Storage of Hazardous Substances, including Secondary Containment	10(1) and (2) 11(1) and parts of 14 6 and 7	
4.8 Import or Purchasing		s33
4.9 Recording of Inventory	9	
4.10 and Appendix 6: Disposal	6(2) and 7(3)	
5.1 Design Requirements	5, 6(1), 7(1)	
5.2 Signage	8(1)	
5.4 Design Requirements for Unapproved Hazardous Substances	7(2) and 7(3)	
6.1–6.5 Emergency Information	16	