

**Textile Care Federation of New Zealand Inc
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NEW ZEALAND**

**HSNOCOP 48
THE USE OF PERCHLOROETHYLENE
IN THE DRYCLEANING INDUSTRY**

**Approved Code of Practice
Under the
Hazardous Substances and New Organisms (HSNO) Act 1996**

**Code of Practice: Consultation Draft
Version:
Date of Approval:**

Preface

To come after consultation.

Making your submission

Written submissions in relation to the approval of this code can be made by mail, facsimile or email to:

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Submissions close on **12 November 2010**.

The code is available from Textile Care Federation of New Zealand Inc, C/o Rotorua Drycleaners, 1227 Pukuatua Street, Rotorua.

The code can also be inspected at the Wellington office of ERMA New Zealand, Level 1, BP House, 20 Customhouse Quay, Wellington, and is available on the ERMA New Zealand website

(http://www.ermanz.govt.nz/hs/compliance/codesofpractice.html#Codes_of_Practice_under_Consultation)

ACKNOWLEDGEMENTS

This Guideline was prepared with support of the following:

- Ministry for the Environment Sustainable Management Fund
- RITS@WRONZ Research Account
- Canesis Network Ltd
- AgResearch Ltd
- New Zealand Textile Care Federation (Inc)

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1 ABOUT THE CODE

1.1 Introduction

The drycleaning industry provides cleaning services for textile products to both the domestic and commercial markets. Drycleaning plants are found throughout New Zealand and most use perchloroethylene solvent.

Perchloroethylene drycleaning plants have a responsibility to safeguard the health and safety of the public and their employees and to protect the environment. Drycleaning operators **must** be familiar with:

- The properties of perchloroethylene
- The nature and extent of the hazards presented by perchloroethylene; i.e., its effect on human health and the environment
- The precautions to be taken when handling perchloroethylene
- Operation and maintenance of perchloroethylene drycleaning equipment
- Regulatory requirements for perchloroethylene, including labelling, packaging, transport, safety data sheets, workplace signage, drycleaning machines and approved handlers
- Safe disposal methods for perchloroethylene and perchloroethylene waste
- The actions to be taken in an emergency
- Containment in the event of a spill or leak

1.2 Purpose

The purpose of this Code is to provide a practical means of complying with the Hazardous Substances and New Organism Act for perchloroethylene solvent and also to provide best practice for the use of perchloroethylene in the drycleaning industry.

In particular the Code is an Approved Code of Practice under the Hazardous Substances and New Organisms Act. It provides guidance in the application of the Solvents (Toxic 6.7) Group Standard 2006 to the use of perchloroethylene in the dry cleaning industry.

The Code also provides a resource for agencies working with the industry.

1.3 Scope

The Code describes working practices for employers and employees in the drycleaning industry for the management of perchloroethylene in dry cleaning facilities. This Code is not applicable to other uses or other industries.

This code sets out a means of compliance with:

Solvents (Toxic 6.7) Group Standard 2006

in respect of perchloroethylene stored and handled in dry cleaning plants.

1.4 Limits of this code of practice

This Code applies to the storage and handling of perchloroethylene in the dry cleaning industry subsequent to the date of approval of this Code. This Code applies to packaged perchloroethylene and is not applicable to handling in bulk (i.e. in transportable containers or tank wagons or bulk tanks).

1.5 How the code is arranged

Section 2 covers the HSNO regulatory regime for perchloroethylene. The HSNO Controls set for perchloroethylene are summarized, and signage.

Section 3 covers the requirements for Approved Handlers,

Section 4 covers drycleaning machines (as stationary containers or process vessels)

Section 5 covers labels and safety data sheets

Section 6 covers signage

Section 7 covers disposal

Section 8 covers personal protective equipment,

Section 9 covers . emergency management

Annex A reviews the properties of perchloroethylene.

Possible additional Appendices ??

Checklists for handling perchloroethylene during various operations in a drycleaning plant.

First aid and emergency notices

Weekly production sheets.

In this code of practice, ‘must’ means that a requirement is mandatory, and thus reflects a legislative requirement. Throughout this document the word ‘**must**’, when used in relation to a requirement, is presented in bold type face.

‘Should’ means that a provision is a recommendation and is advisory only. Throughout this document the word ‘*should*’, when used in relation to an advisory provision, is presented in italics.

2 HSNO CLASSIFICATION AND CONTROLS

2.1 Regulatory regime for hazardous substances

The HSNO Act 1996 regulates the importation, manufacture and use of chemicals in New Zealand. The way adverse effects of hazardous substances are to be managed is set out in Hazardous Substances Regulations made under the HSNO Act. These regulations specify the HSNO Controls (i.e., requirements or “tools”) for both the management of hazardous properties and all stages of the life cycle of a hazardous substance.

2.2 Purpose of the HSNO Act

The purpose of the HSNO Act is to protect the environment as well as the health and safety of people and communities by preventing or managing the adverse effects of hazardous substances. The requirements of the HSNO Act are in addition to other statutory requirements such as those in the Resource Management Act 1991 (RMA) and the Health and Safety in Employment Act 1992. For example, under the RMA, there will be limits on the discharge of contaminants (including hazardous substances) into the environment.

2.3 Overview of regulatory regime for hazardous substances

HSNO Act 1996	Provides for the making of regulations and controls on hazardous substances.
HSNO classification scheme	Classifies hazardous substances according to their hazardous properties and degrees of hazard.
Hazardous Substances Regulations	The regulations cover all hazardous substances, and set out the HSNO controls or ways to manage the adverse effects of hazardous substances.
Transfer Notices	A legal mechanism for transferring the approval or controls of individual substances under previous legislation.
Group Standards	A group standard is an approval for a group of hazardous substances under Part 6A of the Hazardous Substances and New Organisms Act 1996. The group standard brings together all the controls relevant to that group.
HSNO controls	The controls for a particular substance can come from the above four boxes. The classification and control regulations provide the basic controls, but the controls for stationary containers and process equipment come from a transfer notice [the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice of 25 March 2004].

	The controls cover all aspects of the life-cycle of a substance, from manufacture to disposal. The controls from the regulations are performance requirements, i.e., hazard management tools. They are not prescriptive, but set out what is to be achieved. They do not detail how this is to be achieved.
Approved Code of Practice	A practical means of complying with the HSNO controls, that if followed provides a defense against prosecution.
Industry guidelines	Recommended industry practice, i.e., sets out methods that will meet relevant performance-based requirements in the HSNO controls.

2.4 ERMA New Zealand

The Environmental Risk Management Authority is the governing authority responsible for administering the HSNO Act. The agency of ERMA New Zealand supports the Authority.

For more information about these bodies, go the website of ERMA New Zealand at: <http://www.ermanz.govt.nz>

2.5 Enforcement at dry cleaning plants

The Department of Labour enforces the HSNO Act at places of work. Enforcement officers have the right to enter a property for the purpose of inspection. They will assist persons in dealing with the compliance requirements.

2.6 Person in charge is responsible

The person in charge is responsible for ensuring that all of the requirements of the HSNO Act are complied with including the requirement to hold a test certificate where necessary.

2.7 Test certifiers

Test certifiers are people approved by ERMA New Zealand to issue test certificates required by the HSNO Act. A test certifier will issue test certificates if compliance with the controls of the HSNO Act is demonstrated.

A register of test certifiers is on the ERMA New Zealand website: <http://www.ermanz.govt/search/tc.html>

2.8 HSNO classifications for perchloroethylene

Perchloroethylene has biological hazard classifications (human toxicity and ecotoxicity) but no physical hazard classifications, i.e. only Classes 6 and 9 apply.

2.9 HSNO controls for perchloroethylene

Perchloroethylene was approved by way of the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004. Subsequent to the transfer notice being issued in 2004, Schedule 5 of this Transfer Notice specified some variations to the generic HSNO controls specifically for perchloroethylene.

Table 2.1 HSNO Classifications for Perchloroethylene

Class 6, Toxicity			Class 9, Ecotoxicity		
Class	6.1E	Low acute toxicity	Class	9.1A	Very ecotoxic in aquatic environment
	6.3A	Skin irritant		9.2C	Harmful in soil environment
	6.4A	Eye irritant		9.3B	Ecotoxic to terrestrial vertebrates
	6.7A	Known or presumed human carcinogen			
	6.9B	Harmful to human target organs/systems			

Table 2.2 HSNO Controls for Perchloroethylene

HSNO Control	Requirement for perchloroethylene
Person in charge	Required
Approved handler	Required where ≥ 10 litres perchloroethylene is held.
Labels	Required on containers ≥ 0.1 litres
Safety Data Sheets	Required where ≥ 5 litres is held on the premises.
Carriage on passenger service vehicles	Maximum volume permitted is 1.0 litre. (Class 6.3A and 6.4A)
Packaging	Packaging UN Level PG III
Signage	Required where > 1000 litres is held.
Disposal	Consented disposal process required No unauthorised disposal permitted
Fire extinguishers	Not required
Secondary containment	Required for quantities > 100 litres.
Emergency response plan	Emergency Response Plan required > 100 litres
Process containers and equipment.	Stationary container and process container controls apply.
Maximum Workplace Exposure Standards set. (WES-Time Weighted Average, WES-Short Term Exposure Limit)	WES -TWA max. 50ppm (average over a 5 day working week, of 8 hour days) WES - STEL max. 150 ppm (over a 12 - minute exposure)
Personal protective equipment	Personal protective equipment (PPE) required

The practical application of these controls are elaborated on in subsequent sections of this Code.

3 PERSONNEL

3.1 Person in Charge

The person in charge of a perchloroethylene drycleaning operation is the person in control or possession of the site. This could be an owner/operator, manager, lessee, sub-lessee or occupier of that location.

3.2 Responsibilities of the Person in Charge

The person in charge is responsible for ensuring that hazardous substances are correctly managed and that the environment and health and safety of people are not adversely affected.

The person in charge **must** ensure that:

1. Approved handlers for perchloroethylene are appointed and that perchloroethylene is either under the personal control of the handler or secured at all times.
2. Incompatible substances and perchloroethylene are separated.
3. Safety Data Sheets are available in the workplace.
4. All containers are labelled and that labels are correct, intact and remain legible.
5. An emergency management plan is in place where >100 litres perchloroethylene is held.
6. Site signage is correct and in place where >1000 litres perchloroethylene is held.
7. A stationary container certificate is in place for any drycleaning machine with a total solvent capacity greater than 1000 litres. A Test Certificate is required to confirm that the drycleaning machine is designed, installed and maintained to the required standards.
8. All drycleaning machines meet the general HSNO requirements for process containers.
9. All equipment and containers that contain perchloroethylene, retain it without leakage and dispense it at a rate and in the manner that they were designed for.
10. The equipment is accompanied by documentation that contains information about using and maintaining the equipment so that it complies with 9 above.

3.3 Approved Handlers

Volumes greater than 10 litres of perchloroethylene **must** be either under the personal control of an approved handler, or, secured so that no-one can gain access to the solvent unless they have a key or other device used to operate the lock to the secure area.

An approved handler for perchloroethylene drycleaning is a person who is certified by a test certifier as knowledgeable about the solvent and competent to handle it when it is used as a drycleaning solvent.

The knowledge required covers hazards and safe handling of the solvent, how to prevent harm to people and the environment, and what to do in an emergency. An

Approved Handler **must** also know about the HSNO Act and the HSNO classifications, HSNO controls and any codes of practice that are applicable.

To demonstrate practical experience and competence a person **must** show that they can handle perchloroethylene and drycleaning processing equipment safely. They **must** also demonstrate the use and maintenance of the protective clothing and safety equipment required.

An approved handler is required for all perchloroethylene drycleaning plants.

3.4 Certification as an Approved Handler

Certification as an approved handler is achieved through a test certifier, a person approved by ERMA New Zealand to issue certificates in their area of competency. Names of test certifiers are available through the ERMANZ website: www.ermanz.govt.nz.

The evidence required for certification by a test certifier is gained by completing a recognised course on both perchloroethylene and the HSNO Act 1996 as well as providing evidence of competence in operating perchloroethylene drycleaning equipment.

A test certificate as an approved handler remains valid for five years from the date of issue. To renew the certificate, a person **must** show that they meet the requirements with respect to any changes in work practices, regulations or codes of practice that have occurred since the previous certificate was issued.

3.5 Persons other than Approved Handlers

Not everyone handling perchloroethylene has to be an approved handler. A person who is not an approved handler may handle the solvent provided:

1. They have been trained by a approved handler in the handling of perchloroethylene, and
2. An approved handler is present on the site and is available at all times to provide assistance when the solvent is being handled.

3.6 Perchloroethylene that is not in use

An approved handler does not have to be present when perchloroethylene is not being used, provided the solvent is secured so that a person cannot gain access to it without a key or similar device to operate the lock to the secure area.

4 DRYCLEANING MACHINES

4.1 Stationary Container Systems

A stationary container system is a stationary tank or process container and its associated equipment, pipe work and fittings, up to and including all heating (electrical and steam), and cooling systems and the operational systems such as the cage, still, filter, pump, condenser, water separators, tanks, pipe work and solvent adsorption systems. A dry cleaning machine is a form of process container.

All perchloroethylene drycleaning machines **must** be capable of containing perchloroethylene without leakage under all likely conditions of use. They **must** be of sound engineering design and maintained in good working order.

4.1.1 General requirements for drycleaning machines less than 1000 litre capacity

General requirements for all drycleaning machines are:

1. The machine **must** contain perchloroethylene at all operating temperatures and pressures without leakage.
2. The machine **must** be manufactured or repaired with materials that will not react with or be affected by perchloroethylene.
3. Maintenance records **must** be kept
4. Records of checks for leaks (i.e., safety of system) **must** be kept.
5. Secondary containment such as a spill tray or bund **must** be in place.

4.1.2 Drycleaning machines with capacity greater than 1000 litres

In addition to the general requirements for dry cleaning machines of < 1000 litres capacity, the equipment of drycleaning machines with capacity greater than 1000 litres:

1. **Must** be installed on foundations that will prevent subsidence.
2. **Must** have a stationary container test certificate issued by a test certifier.

4.1.3 Water separator

A double water separator **must** be fitted to each perchloroethylene drycleaning machine.

5.5 Ecotoxic effects and precautions

Container **must** be prominently labelled (Secondary panel/labels) as ECOTOXIC .

Information required:

Very toxic to aquatic organisms harmful in a soil environment and ecotoxic to terrestrial vertebrates: Class 9.1A, 9.2C, 9.3B

Precautions:

Protect drains; do not let this product enter the environment; drains or waterways.

5.6 Actions in an emergency

Perchloroethylene spills **must** be soaked up with absorbent rags or inert material. Rags **must** be placed in a drycleaning machine to retrieve the solvent and inert material place in a hazardous waste container for disposal.

5.7 How to manage risks

- Perchloroethylene **must** not be disposed of in any unauthorized place, and **must** only be disposed of in an approved landfill.
- Perchloroethylene and containers that have held perchloroethylene **must** be disposed of as hazardous waste.

5.8 Approved Handler's responsibilities

An Approved Handler for perchloroethylene drycleaning **must** ensure that all containers in the plant are labelled and that the labels remain legible and intact.

5.9 Person in Charge's responsibilities

The Person in Charge **must** ensure that:




- Containers of perchloroethylene are correctly labelled before supplying it to another person. All containers of decanted substances and sub-lots **must** also be labelled.
- Every person handling perchloroethylene has access to the SDS. This **must** be available within 5 minutes.
- Signage is in place where over 1,000 litres held.

6 SIGNAGE

Signage **must** be displayed where there is 1000 litres or more of perchloroethylene. This signage **must**:

- State that the hazardous substance is present; and
- Describe the general type of hazard, and
- Advise the action to be taken in an emergency.

A typical sign is

 <p>CHRONIC TOXIC</p>  <p>TOXIC</p>  <p>ECOTOXIC</p>	HAZCHEM
	2[Z]
	UN No.
	1897
	Perchloroethylene
	<p>IN EMERGENCY PHONE 111 FIRE, POLICE OR AMBULANCE</p> <p>IN THE CASE OF SPILLS PHONE THE REGIONAL COUNCIL HOTLINE 0800 - -----</p> <p>FOR URGENT MEDICAL ADVICE: NATIONAL POISONS CENTRE 0800 POISON (0800 764 766)</p>

If perchloroethylene is located

- in an outdoor area, a sign **must** be positioned next to that area.
- in a building, a sign **must** be positioned at every vehicular and pedestrian access to the building and every vehicular and pedestrian access to land where the building is located.
- in a room or compartment within a building, there **must** be a sign at positioned immediately next to that area.

7 DISPOSAL

As a hazardous waste product, drycleaning machine still waste containing Perchloroethylene cannot be disposed of in landfill sites, and **must** be disposed of only by a registered environmental waste management operator.

8 PERSONAL PROTECTIVE EQUIPMENT

Persons *should* be wearing personal protective equipment in the drycleaning plant during any operation that can result in exposure to perchloroethylene through splashes or vapour.

To avoid contact with skin and eyes, all persons handling perchloroethylene *should* use solvent impervious gloves and goggles. To prevent inhalation of perc waste vapour, a respirator with cartridge filter/s rated for organic solvent vapour mist meeting the requirements of AS/NZS1715 and AS/NZS1716 is recommended. An apron or coverall of some kind is recommended to avoid splashes and contamination of clothing.

9 EMERGENCY MANAGEMENT

9.1 General emergency management provisions

An emergency with perchloroethylene exists if there is a spill during handling or exposure to fumes resulting from a failure of systems associated with the operation and maintenance of the drycleaning machine. Responses require actions to minimize exposure of people and the environment to perchloroethylene. For small spills and in drycleaning premises holding less than 1000 litres, these actions are covered by the instructions on labels, safety data sheets and signage (see chapter 5) for ‘precautions’, ‘actions in an emergency’ and ‘how to manage risks’.

9.2 Emergency Response Plan

Where perchloroethylene is held in quantities greater than 1000 litres, there **must** be an emergency response plan (ERP). A single ERP is required for the drycleaning premises but **must** cover any other hazardous substances held or likely to be held there, such as other solvents, bleaches and spotting agents, as well as perchloroethylene.

The likely emergencies from perchloroethylene are a spill and exposure to fumes. For a minor spill of perchloroethylene:

- **actions to be taken** – evacuate the affected area. Immediately assist anyone that has spilt perchloroethylene in contact with eyes or skin to rinse immediately with plenty of water. Also immediately assist anyone that appears to have inhaled vapor to leave the area and get medical care if they feel unwell. If it is safe to do so, staff **must** then immediately soak up the spill with absorbent rags or inert material. Rags **must**

be placed in a drycleaning machine to retrieve the solvent and inert material placed in a hazardous waste container for disposal. If it is safe to do so, check the spill is contained by the secondary containment system, use absorbent rags or inert material to block the flow of spilt perchloroethylene to prevent this product entering a drain or waterway and shut down the source of the solvent.

Any contaminated clothing must be removed and placed in a dry cleaning machine to retrieve the solvent.

At all times, if entry into the affected area is to be made by staff, they **must** wear gloves, goggles and respirator (chapter 8).

- **people responsible** – the person in charge and/or approved handler for perchloroethylene shall lead emergency responses with all staff trained in what to do.
- **emergency contacts** – display the Regional Council Pollution Hotline for a spill entering a drain or waterway.
- **absorbent material** - the location of absorbent rags and inert material to be used in a spill is identified and known by all staff
- **decision-making and sequence of actions** - the person in charge and approved handler are notified as soon as practicable after staff have treated and evacuated any affected person and contained the spill.

For minor release of fumes from perchloroethylene:

- **actions to be taken** – evacuate the affected area. Anyone that appears to have inhaled vapor **must** be assisted to get medical care if they feel unwell. If entry into the affected area is to be made by staff, they **must** wear appropriate gloves, goggles and respirator (chapter 8). If it is safe to do so, staff **must** then immediately identify and take steps to shut down the source of the fumes.

Any contaminated clothing must be removed and placed in a dry cleaning machine to retrieve the solvent.

- **people responsible** – the person in charge and/or approved handler for perchloroethylene shall lead emergency responses with all staff trained in what to do.
- **emergency contacts** – display number for nearest medical centre able to treat someone that has inhaled perchloroethylene.
- **first aid box** - the location of the first aid box is identified and known by all staff
- **decision-making and sequence of actions** - the person in charge and approved handler are notified as soon as practicable after staff have evacuated any affected person to seek advice about steps to shut down the source of fumes.

For a larger spill of perchloroethylene, immediately contact the Fire Service and evacuate the affected area. Ensure public are kept away until the emergency services arrive and control the area.

This ERP **must** be tested at least every 12 months or within 3 months of a change to the plan (including persons identified in the plan). Testing **must** demonstrate that every procedure or action in the plan is workable and effective. Records of testing **must** be kept for at least 2 years. This plans can be part of other emergency plans required under the HSE Act or the RMA.

The person in charge *should* provide copies of the sites emergency response plan where it will be accessible to staff.

ERMA New Zealand in association with the Department of Labour has produced a printable flip chart in pdf form that will aid you in setting up your emergency response plans. Download at <http://www.ermanz.govt.nz/resources/publications/pdfs/ERMA%20Flip%20Chart.pdf>

9.3 Secondary Containment System

The secondary containment system;

1. **Must** prevent people from contacting the contents
2. **Must** not allow direct flow in from surrounding area, i.e., **must** be raised or have a lip or bund.
3. **Must** be able to hold 110% of the perchloroethylene that is contained.

A secondary containment system **must** be in place in stores where the volume of perchloroethylene stored is >100 litres, including the drycleaning machine, and the storage area of drums and packages containing perchloroethylene. Notwithstanding this however, it is best practice for all perchloroethylene to held within a secondary containment system. In addition, other liquid hazardous substances may trigger secondary containment requirements. Where the substances are incompatible, they **must** have separate arrangements for secondary containment.

Most modern drycleaning machines are now supplied from new with a leak and solvent proof tray or trough, either as a standard part of the machine, or as an optional extra. If unavailable, a tray or trough **must** be manufactured to retrofit beneath the drycleaning machine. Alternately, the floor on which the drycleaning machine is located **must** be sealed so as to be impervious to perchloroethylene solvent, and a bund or lip formed on the floor around the machine to contain any spills.

GLOSSARY

Acute toxicity	A toxic effect that occurs within a given time (usually 14 days) after administration of a single dose of a substance.
Approved handler	Person who holds a current certificate certifying that they have met the competency requirements specified by the Hazardous Substances and New Organisms (Personnel Qualification) Regulations 2001, in relation to handling specific hazardous substances during specified parts of the lifecycle.
Aquatic ecotoxicity	Injurious to life forms that live in a water environment
Azeotrope	An azeotrope is a mixture of two or more pure compounds in such a ratio that its composition cannot be changed by simple distillation. An azeotrope has a characteristic boiling point. The boiling point of an azeotrope is either less than the boiling points of any of its constituents or greater than the boiling point of any of its constituents. (Formerly known as a Constant Boiling Mixture)
Bioaccumulation	An increase in the concentration of a chemical over time in a biological organism compared to the chemical's concentration in the environment.
Azo dye	Dye containing the azo- or N=N functional group
Boiling point	Temperature at which the vapour pressure of a substance equals the atmospheric or other designated pressure.
Bund	A lip or embankment
Cage	Drum in a drycleaning machine that hold the load during processing
Cancer	A malignant tumour which can spread to other organs of the body, as distinct from a benign tumour, which cannot spread. While leukaemia and some other malignant diseases are not solid tumours, they meet other criteria for cancer and can be, and often are, included under this definition.
Carcinogen	Agent that is responsible for the formation of a cancer.
CAS Number or CAS No.	Chemical Abstracts Service Registry Number. A unique number assigned by the Chemical Abstracts Service, Columbus, Ohio, USA.
Chemical	Any element, compound or complex present as an entity or present in a mixture.
Chronic toxicity	A toxic effect which occurs after repeated or prolonged exposure. Chronic effects may occur some time after exposure has ceased.
Classification - HSNO	The process whereby the toxicological, physiochemical and ecotoxicological properties of a substance are identified and categorized according to the HS (Classification) Regulations 1991.
Code of practice	Any document issued or approved in accordance with Section 78 of the HSNO Act 1996
Combustible Compound	Means that a substance is capable of burning.
Containment	Any chemical combination of chemical elements The act of preventing release of a substance. Primary containment is through a package or tank, while secondary containment means of containing a hazardous substance if the primary container is breached.
Controls - HSNO	Any obligations or restrictions imposed on any hazardous substance, or on any person in relation to any hazardous substance, according to the HS Regulations.
Corrosive substance	A substance which has been classified as a corrosive according to the criteria in the HS (Minimum Degrees of Hazard) Regulations 2001.
Dangerous Goods	Substances that meet the classification criteria of NZ Standard 5433 Transport of Dangerous Goods on Land.
Disposal	- Treating a hazardous substance so that it is no longer hazardous.

	-Discharging a substance into the environment as waste -Exporting a substance as waste from New Zealand
EEL	Environmental Exposure Limit
Ecotoxic	Capable of causing ill health, injury or death to any living organism (human health, see Toxic)
Emergency	a) Actual or imminent danger to human health or safety, or b) A danger to the environment or chattels so significant that immediate action is required to remove the danger (arising from either a hazardous substance or a new organism)
ERMANZ	Environmental Risk Management Authority of New Zealand
Filter	System on drycleaning machine for removal of solid material from circulating perchloroethylene solvent.
Flammable	Substance that is capable of being ignited and burning in air.
Flashpoint	Lowest temperature at which a flammable liquid when tested in a closed cup flash point test, gives off vapour that ignites.
Generic name	Name applied to describe a group or category of chemicals, egg, azo dyes and halogenated aromatic amines.
Hazard	Intrinsic capacity associated with an agent or process capable of causing harm.
Hazardous substance	Any substance: a. With one or more of the following intrinsic properties i) Explosiveness ii) Flammability iii) Capacity to oxidize iv) Corrosiveness v) Toxicity (including chronic toxicity) vi) Ecotoxicity, with or without bioaccumulation. Or, b. 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 paragraph (a) of this definition (from the HSNO Act 1996)
HSNO	Hazardous substances and new organisms. Relating to the HSNO Act 1996.
HSNO Classification	See Classification
HSNO Controls	See Controls
Ignition	Setting fire to or being set fire to.
Importer	Person or company bringing product for an outside source especially a foreign country.
Ingredient	Any component of a substance (including impurities) in a mixture or combination.
Irritant	Substance that will produce local irritation or inflammation on contact with tissues and membranes such as skin or eyes, or that will, after inhalation, produce local irritation or inflammation of nasal or lung tissue.
KB value	Grease/oil solvency
Label	An appropriate group of written, printed or graphic information elements that is affixed to, printed on, or attached to a container which identifies the substance in the container, identifies whether the substance is hazardous and provides basic information about the safe use and handling of the substance.
Landfill	Any premises used for the lawful deposit or disposal of waste materials into or onto land
Lifecycle	Means the time for which the substance is in existence from (and including its manufacture or importation to its disposal

Mixture	A physical combination of chemicals resulting from the deliberate mixing of those chemicals or from a chemical reaction.
MSD sheet	See SDS
Oral	Ingested or administered via the mouth
Oxidise	The ability of a substance to combine with oxygen.
Package	Packaging and the contents
Packaging	Container that is a receptacle and any other component or materials necessary for the receptacle to perform its containment function, and includes inner packaging once its outer packaging has been removed
Person in charge	In relation to a place, a hazardous substance location, a transit depot, or a place of work, means a person who is – <ol style="list-style-type: none"> 1. The owner, lessee, sublessee, occupier, or person in possession of the place, location, or depot or any part of it. <p>Or,</p> <ol style="list-style-type: none"> 2. Any other person who, at the time, is in effective control or possession of the relevant part of the place, location or depot
Process container	A stationary container that contains or is intended to contain a hazardous substance in the course of manufacturing or use of a hazardous substance (egg, a mixing container, reaction vessel, distillation column, drier or dip tank) NOTE: A drycleaning machine is a process container
Product name	Means the brand name, trade name or code name or code number specified by the supplier
PPE	Personal Protective Equipment
PVA	Poly vinyl alcohol
PVC	Poly vinyl chloride
Risk	The likelihood that a substance will cause harm in the circumstances of use.
RMA	Resource Management Act 1991
SDS	Safety Data sheet
Signal word	Word used to indicate the relative level of severity of hazard and to alert the reader to a potential hazard on the label
Skin irritation	The production of inflammatory changes in the skin following the application of a test substance.
Stationary container	Any building or part of a building, or vessel supported by or incorporated in any building, which is expressly designed to contain any hazardous substance
Stationary container system	A stationary tank or process container and its associated equipment, pipework, and fittings, up to and including all transfer points
STEL	Short time exposure limit. See WES – STEL
Still	Distillation vessel on drycleaning machine
Substance	Any natural or artificial entity, composite material, mixture or formulation other than an article.
Supplier	An importer, manufacturer, wholesaler or distributor of hazardous substances
TEL	Tolerable exposure limit.
Test certificates	Any certificate issued by a test certifier in accordance with Section 82 of the HSNO Act 1996 which certifies that a requirement specified in the regulations has been met.

Test certificates provide a formal means of verifying that required HSNO controls have been met. Test certificates can be issued to either a person (to certify competence as an approved handler) or to a specific site or location (to certify compliance with certain safety and procedural requirements)

Test certifier	An individual who is authorized under the HSNO Act by ERMENZ to issue test certificates.
TCLP	Leachate level requirement
Toxic	Means capable of causing ill-health in, or injury to, human beings
Trade Waste Consent	Permission under Local Government Act to discharge waste or effluent to the industrial Trade Waste Sewer.
Trade Waste sewer	Pipeline for industrial waste
Transfer Notice	Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004 (as amended).
TWA	Time weighted average See WES – TWA
Use	The production, handling, storage, transport or disposal of substances
Vapour Pressure	The pressure created when a substance evaporates. This is the pressure of the vapour of the substance, at any given temperature, in equilibrium with its liquid or solid form. The higher the vapour pressure, the more the substance tends to evaporate.
Volatile	The ability to pass readily into the vapour state.
Water separator	Tank on drycleaning machine where water and perchloroethylene separate after distillation of perchloroethylene solvent
WES	Workplace Exposure Standards
WES - Ceiling	Workplace Exposure Standard – Ceiling. A concentration that must not be exceeded during any part of the working day
WES - STEL	Workplace Exposure Standards – Short-Term Exposure Limit. Applies to any 15-minute period in the working day
WES - TWA	Workplace Exposure Standards – Time Weighted Average. Applies to a 5 day working week of 8 hours per day.

Annex A: PROPERTIES OF PERCHLOROETHYLENE

Chemical names:	Ethene, tetrachloro- Ethylene tetrachloride Perchloroethylene 1,1,2,2, tetrachloroethene Tetrachlorethylene
CAS No.	127-18-4
Common names;	PCE Perklone Perclean Perc

A.1 Physical properties of perchloroethylene

Table A.1 Physical properties of perchloroethylene

Physical properties		Comment
Appearance	Clear liquid, strong ethereal odour	
Boiling point	121.1°C	Fixed boiling point. Convenient temperature for textile drying without the use of partial vacuum to lower the boiling point.
Solvent-water azeotropic boiling point	87.8°C	Solvent -water azeotrope is formed in live steaming of the still. The boiling point of the azeotrope is lower than either water or perc, which allows more efficient removal of perchloroethylene from the still.
Freezing point	- 22.5°C	Remains liquid at normal working temperatures
Specific gravity (@ 25°C)	1.62	Heavier than water, so forms a layer below water. This is taken into account in the design of the water separator unit in a perchloroethylene drycleaning machine.
Vapour pressure	18.47 mm Hg	Volatilises, but not rapidly. Exposure to solvent vapour <i>should</i> be minimised.
Odour threshold	50 ppm , odour threshold (very faint) to unacclimated; no physiological effects 100 ppm , odour (faint) definitely apparent to unacclimated; very faint to not perceptible during exposure; no physiological effects 200 ppm , odour (definite) moderate to faint upon exposure; faint to moderate eye irritation; minimal light-headedness; (eye irritation threshold 100-200 ppm).	

Physical properties	Comment	
Odour threshold cont.	<p>400 ppm, odour (strong) unpleasant; definite eye irritation, slight nasal irritation; definite incoordination (2 hr).</p> <p>600 ppm, odour (strong) very unpleasant but tolerable; definite eye and nasal irritation; dizziness, loss of inhibitions (10 min).</p> <p>1000 ppm, odour (very strong) intense, irritating; markedly irritating to eyes and respiratory tract; considerable dizziness (2 min).</p> <p>1500 ppm, odour (almost intolerable) "gagging"; irritation almost intolerable to eyes and nose; complete incoordination within minutes to unconsciousness within 30 min</p>	
Flash point	None	Does not ignite or explode.
Flammable limits (volume% solvent in air @ 25°C)	None	Non-flammable
Solubility (g/100g @25°C)	Very low solubility for both water in solvent and solvent in water.	
water in solvent	0.0105	
solvent in water	0.015	

A.2 Chemical properties of perchloroethylene

Table A.2 Chemical properties of perchloroethylene

Chemical property	Comment	
Chemical formula	C ₂ Cl ₄	Single organochlorine compound, not a mixture.
Kauri Butanol No. ¹	90	Good grease solvent.
Chemical stability	Stable	Does not react with water
Thermal stability	Reacts with hot metal and flame.	Forms hydrochloric acid on contact with hot metal, such as in a gas dryer.

¹ The Kauri Butanol (KB) Number and Kauri Butanol Scale compares grease solvency, i.e., the power of a solvent to dissolve grease, fats and oils. The higher the KB value the more efficient a solvent is in dissolving grease but also the more severe the solvent on dyes and textile finishes.

A.3 Identification of perchloroethylene

The presence of perchloroethylene can be identified by its distinctive pungent smell, but it should not be deliberately smelt to establish its presence in a container.

Because it is heavier than water, perchloroethylene is the bottom layer in a water/perchloroethylene mixture.

A.4 Properties of perchloroethylene relevant to drycleaning

Perchloroethylene is used in drycleaning because it combines a number of convenient properties, but some properties are also a disadvantage.

Table A.3: Advantages/disadvantages of perchloroethylene for drycleaning

Property	Advantages	Disadvantages
Stability	Chemically and thermally stable under normal conditions of use in an enclosed drycleaning machine.	Reacts with hot metal and flame. Adequate separation of gas-fired equipment and drycleaning machines, required, also separation of vents to atmosphere and incoming air vents for all equipment
Grease solvency KB Number	The KB value for perchloroethylene is higher than that for all other drycleaning solvents. The higher grease solvency of perchloroethylene allows shorter processing times than other drycleaning solvents, giving improved productivity. This is a major reason for commercial choice of this solvent.	Efficient stripping of oil-based material gives a harsher handle to textiles than other drycleaning solvents.
Effect on textiles	Perchloroethylene is safe for natural fibres and most manufactured fibres.	Specific dyes, such as azo dyes, and fibres, such as PVC and polypropylene, are adversely affected
Fixed boiling point	BP 121°C Drying can be done at temperatures appropriate for textiles. Drying temperatures can be achieved at the working pressure of a small industrial boiler, and partial vacuum is not required for processing, drying or distillation of perchloroethylene.	
Water-perc azeotrope	Formation of an azeotrope at 87.8°C. This assists in removal of perchloroethylene from the sludge when steam-cleaning the still.	
Low solubility of water in perchloroethylene and perchloroethylene in water	Allows rapid separation of water from solvent recovered after drying.	Perchloroethylene alone does not dissolve water-based material and/or stains. This necessitates addition of water-carrying detergents plus localized stain removal (spotting).

Table A.3 cont

Property	Advantages	Disadvantages
Non-flammable	Spark-inhibited equipment is not required. Perc drycleaning machines can be used in retail locations, allowing greater convenience for customers and drycleaners.	
Health, safety and environmental issues	Not ozone depleting Does not contribute to smog Non flammable. This allows perchloroethylene to be used in accessible retail areas.	Adverse human toxic effects Acute aquatic ecotoxicity

A.5 Precautions when using perchloroethylene

Textile products cleaned in perchloroethylene are safe when recognised procedures are used and the equipment is correctly maintained and operated.

A.5.1 Toxicity

Perchloroethylene can cause both immediate and chronic effects from over-exposure. Users **must** avoid:

- Inhalation of solvent vapour.
- Contact with the skin and eyes
- Swallowing the solvent

The most common form of contact with perchloroethylene is inhalation of the vapour. Loading and unloading the machine and cleaning out the still are times when high exposure to solvent can occur, and safe practices **must** be in place and followed for these operations. Exposure to perchloroethylene vapour *should* be kept as low as possible and in no case *should* it exceed the Workplace Exposure Standards set for perchloroethylene.

Perchloroethylene has been linked to lactation effects in mammals. Drycleaning, but not specifically perchloroethylene, has been linked to menstrual problems and spontaneous abortion in humans. These are not proven effects and do not trigger regulatory controls for perchloroethylene.

A.5.2 Ecotoxicity

Perchloroethylene kills life forms that live in a water environment (aquatic ecotoxicity). The solvent will evaporate from the surface of open water, but ground water contamination is a major problem. Drains and waterways **must** be protected so that perchloroethylene does not flow to them.

Perchloroethylene is toxic to soil-based vertebrates and invertebrates, and contamination of land or soil also leads to contamination of the ground water. Spills and leaks **must** be avoided.