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<table>
<thead>
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<th>Name</th>
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<tbody>
<tr>
<td>Dr. Michael Beasle</td>
<td>National Poisons Centre</td>
</tr>
<tr>
<td>Dr. Peter Cotton</td>
<td>Senior Consultant, Medibank Health Solutions, Melbourne, Australia</td>
</tr>
<tr>
<td>Prof. Philippa Gander</td>
<td>Director, Sleep Wake Research Centre, Wellington</td>
</tr>
<tr>
<td>Dr. Dianne Gardner</td>
<td>Senior Lecturer, Psychology. Massey University, Albany.</td>
</tr>
<tr>
<td>Hugh Norriss</td>
<td>Mental Health Foundation of New Zealand</td>
</tr>
<tr>
<td>Professor Grant Schofield</td>
<td>AUT</td>
</tr>
<tr>
<td>Peter Turner</td>
<td>Optometrist</td>
</tr>
<tr>
<td>Martin Gledhill</td>
<td>National Radiation Laboratory</td>
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<tr>
<td>Wayne Randall</td>
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</tr>
<tr>
<td>Dr. John Wallaart</td>
<td>ACC</td>
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<tr>
<td>Dr. Chris Walls</td>
<td>Occupational Physician, Auckland</td>
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INTRODUCTION

This booklet:
> summarises the HSE Act
> outlines the scope of a number of Worksafe NZ publications
> provides basic information about the topics
> helps to inform decisions about further actions that may be required in a workplace for health and safety and
> refers readers to the original source of the information.

Most of the entries are aides-memoir for a specific Worksafe NZ publication.

A few entries cover material that is not referenced to a Worksafe NZ publication. These are included because they address long standing important gaps (eg human error, silos, radiation) or because new responsibilities have been assigned to Worksafe (gas safety, electrical safety).

Many of Worksafe NZ’s guidelines and Codes of Practice are highly detailed and technical. You may need to a specialist to help understand and apply these details.

The booklet does not cover Worksafe NZ’s publications about Forestry, Agriculture or Construction.

This guide applies to the Health and Safety in Employment Act 1992 and the HSNO Act, 1996. It does not cover the new workplace health and safety act. It will be amended to reflect it in due course.
HOW TO USE THIS BOOKLET

The booklet carries one or two topics on each page. The pages are designed to be printed off - see the page numbers.

Each topic can be accessed by clicking its hyperlink on the four contents pages.

References to publications may be accessed by holding down the CTRL key and clicking on the links provided. These links were active at the time of publication.

More information can be assessed through the Worksafe NZ Publications page at: www.business.govt.nz/worksafe/information-guidance/all-guidance-alphabetical-listing?b_start:int=300

On that page you will find:

1. APPROVED CODES OF PRACTICE (ACOPS)
2. HAZARDOUS SUBSTANCES & NEW ORGANISMS (HSNO) CODES OF PRACTICE
3. GUIDANCE BY INDUSTRY
   > Adventure activities
   > Agriculture
   > Construction and building maintenance
   > Forestry
   > High hazard
   > Manufacturing
   > Hazardous Substances
4. GUIDANCE BY HAZARD TYPE
   > Asbestos
   > Bacteria, viruses & parasites
   > Chemicals
   > Heights
   > Machinery
   > Noise
   > OOS or manual handling
   > Hazardous material and preventing fires or explosions
   > Stress or fatigue
   > Temperature
5. GUIDANCE FOR INDIVIDUALS
6. AN ALPHABETICAL LIST OF ALL PUBLICATIONS
7. LEGAL FRAMEWORK
   > Introduction to the Health and Safety in Employment Act
   > Health and Safety in Employment Act 1992 (HSE Act)
   > Hazardous Substances and New Organisms Act 1996 (HSNO Act)
   > WorkSafe New Zealand – Prosecution policy
8. HAZARDOUS SUBSTANCES & NEW ORGANISMS REGISTERS
9. NATIONAL PROGRAMMES
   > Safer forest harvesting
   > Safe use of machinery in manufacturing
   > Preventing falls from height in construction
   > Quad bike safety
   > The Canterbury rebuild
   > HSNO – automotive spray painting, boat building and metal finishing
10. HEALTH AND SAFETY TRAINING
    > Training for health and safety representatives
    > Approved health and safety training
    > Timing of and application for leave
    > Entitlement to paid leave for training
    > Funding of approved health and safety training
    > Related information
TITLE ANNOTATIONS

Some titles are annotated to allow you to see quickly what publications are available in support of the topic. Eg:

Asbestos $^R, ACOP, W$

This indicates that Asbestos has Regulations and an Approved Code of Practice associated with it plus a website where information about the topic is collected.

The full range of annotations, with their URLs, is below.

Australian and New Zealand Standards are not referenced in this way. See the end of each entry for these.

The annotations are:

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KEEPING THIS BOOKLET UP TO DATE

It is hoped to revise this booklet from time to time. If an entry becomes obsolete or requires changes because Worksafe NZ publishes new material, for example, that will be posted on a Worksafe webpage at:

[worksafe.govt.nz](http://worksafe.govt.nz)

This icon 🕵️‍♂️ denotes a serial killer. See pages 68 and 175.
IN THIS SECTION:

1.1 The Health and Safety in Employment Act 1992
1.2 The HSE Regulations 1995
1.3 Approved codes of practice
1.4 Guidelines
1.5 All practicable steps
1.6 Employee participation
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1.16 The Hazardous Substances and Noxious Organisms Act (HSNO) 1996
1.1 THE HEALTH AND SAFETY IN EMPLOYMENT ACT 1992

1.1.1 THE HEALTH AND SAFETY IN EMPLOYMENT ACT:

> promotes excellence in health and safety management, in particular by encouraging employers to be systematic (s 5)
> defines hazards and harm in a comprehensive way including harm caused by work-related stress and hazardous personal behaviour (s 2)
> imposes duties that require employers and employees to take all practicable steps to prevent harm to people in or near workplaces. (Employers’ duties ss 6–15. Duties of other parties ss 16–19)
> sets requirements that relate to the taking of all practicable steps to ensure health and safety and to provide flexibility to cover different circumstances s2(a)
> encourages the health and safety of volunteers (ss3(c)and 3(d))
> requires employee participation in health and safety and encourages good faith cooperation in places of work (s19(a))
> provides a range of enforcement methods in response to failures (ss 39–44 and s 56).

Source: The HSE Act, Regulations and Schedules can be downloaded from: www.legislation.govt.nz/

1.1.2 WHAT ARE HAZARDS AND HARM?

Hazard - means

> an activity, arrangement, circumstance, event, occurrence, phenomenon, process, situation, or substance (whether arising or caused within or outside a place of work) that is an actual or potential cause or source of harm. A hazard includes:
  - a situation where a person’s behaviour may be an actual or potential cause or source of harm to the person or another person
  - without limitation, a situation described in subparagraph (i) resulting from physical or mental fatigue, drugs, alcohol, traumatic shock, or another temporary condition that affects a person’s behaviour

> Harm means illness, injury, or both; and includes physical or mental harm caused by work-related stress. (s 2).

1.1.3 WHAT ARE SIGNIFICANT HAZARDS AND SERIOUS HARM?

A significant hazard is one that can result in serious harm.

> Employers are required to assess each hazard they identify to find out if it is likely to result in serious harm.
> If it is, then it is a significant hazard and employers are required to take the steps outlined in ss7–10 of the HSE Act.

Serious harm is defined in a schedule to the HSE Act.

In summary, any of the following conditions that amount to or result in permanent loss of bodily function, or temporary severe loss of bodily function:

> respiratory disease, noise-induced hearing loss, neurological disease, cancer, dermatological disease, communicable disease, musculoskeletal disease, illness caused by exposure to infected material, decompression sickness, poisoning, vision impairment, chemical or hot-metal burn of the eye, penetrating wound of the eye, bone fracture, laceration, crushing, amputation of a body part
> burns requiring referral to a specialist medical practitioner or specialist outpatient clinic
> loss of consciousness from lack of oxygen
> loss of consciousness, or acute illness requiring treatment by a registered medical practitioner, from absorption, inhalation or ingestion of any substance
> any harm that causes the person harmed to be hospitalised for a period of 48 hours or more commencing within seven days of the harm’s occurrence (s 2 and Schedule I).

1.1.4 WHAT DOES THE HSE ACT REQUIRE OF EMPLOYERS?

> To take all practicable steps to ensure the safety of employees while at work.
> To take all practicable steps to ensure employees are not exposed to hazards while at work, in their place of work, or in the vicinity of their place of work.
> To be systematic in identifying hazards, to assess their significance and to use a hierarchy of controls – eliminate, isolate and minimise, in that order, when controlling them.
> To provide information, training and supervision for employees.
> To involve employees in health and safety.
> To take all practicable steps to protect volunteer workers and people who are not employees.
> To take all practicable steps to prevent harm to any person (ss6-19).

See also: www.business.govt.nz/worksafe/information-guidance/all-guidance-items/getting-started/employers-general-duties

and:

1.1.5 WHAT ARE ‘ALL PRACTICABLE STEPS’?

Many duties in the HSE Act are qualified by the words ‘take all practicable step’ (APS).

See section 2(a) of the HSE Act and part 1.5 in this booklet and a Worksafe NZ fact sheet: www.business.govt.nz/worksafe/information-guidance/all-guidance-items/all-practicable-steps-pdf-fact-sheet

1.1.6 WHAT DOES THE HSE ACT REQUIRE OF EMPLOYEES?

To cooperate with the employer regarding health and safety and, specifically, to:

> use PPE provided
> avoid harming oneself or any person

Employees may refuse dangerous work in certain circumstances. (s19) See:

1.1.7 WHAT DOES THE HSE ACT REQUIRE OF OTHER PEOPLE?

A person in control of a place of work (the owner, lessee, sublessee, occupier, or person in possession of the place of work or any part of it; or the owner, lessee, sublessee, or bailee, of any plant in the place of work) must take all practicable steps to ensure that no hazard that is or arises in the place harms people in the vicinity (including people in the vicinity for the purpose of recreation or leisure) or people who are lawfully at work in the place.

Self employed people shall take all practicable steps to ensure that no action or inaction of the self-employed person while at work harms the self-employed person or any other person.

Principals are people who engage any person, other than an employee, to do work for gain or reward. Principals have to take all practicable steps to ensure that no employee of a contractor or sub-contractor or an individual, nor a contractor or sub-contractor, is harmed while doing any work that the contractor was engaged for. See also 1.15.

See:

People selling or supplying plant for use in a workplace referenced in the HSE Act s 18 (a) which describes a range of duties for people who hire or sell plant for use by employees.
Hirers have a duty to find out if the hired item is for use in a workplace, its intended use and whether or not it is fit for purpose.

**Sellers** have a duty to make sure the plant is designed and made, and has been maintained, so that it is safe for any known intended use or any use of that plant that the person could reasonably expect (ss 16-18 and 18 (a)).

**1.1.8 WHAT DOES THE HSE ACT REQUIRE OF HEALTH AND SAFETY INSPECTORS?**

Inspectors’ duties are to help improve safety by providing information and education and to promote compliance with the HSE Act. (ss 29–30)

Inspectors are also empowered to ascertain whether or not the HSE Act is being complied with.

Inspectors may enter a workplace at any reasonable time to carry out these duties (s 31). They must prove their identity when they do so (s 32) and they may take samples to assist with the investigation (s 33).

Inspectors may issue improvement notices (ss 39–40) and prohibition notices (ss 41–43), using a prescribed format (s 42) and serving them in a prescribed manner (ss 43–44). They may also issue infringement notices (ss 56 a-h).

**1.1.9 WHAT DOES THE HSE ACT REQUIRE OF DEPARTMENTAL MEDICAL PRACTITIONERS?**

The Secretary for Labour may appoint departmental medical practitioners. They have similar powers of entry to inspectors. Under certain circumstances they can require an employee to undergo a medical examination, and can suspend an employee from work (ss 34–38).

**1.1.10 WHAT SHOULD HAPPEN IF THERE IS AN ACCIDENT IN A WORKPLACE?**

If an accident occurs in a workplace it should be recorded by the employer. If an employee is harmed, the Secretary for Labour must be notified of the accident as soon as possible. A written summary of the circumstances must be provided to the Secretary within seven days.

Where a person is seriously harmed, the accident scene should not be interfered with until an inspector has given permission. The only exceptions are to prevent further harm, to secure the scene from the public or if serious property damage will occur.

The Minister for Labour may direct that an inquiry about any accident be held before a District Court Judge.

A Coroner may ask for a written report about a fatal accident (ss 25–28).

**1.2 THE HSE REGULATIONS 1995**

Regulations made under the HSE Act describe requirements that apply to specific work situations. Like the HSE Act, these regulations are enforceable. Breaches may result in prosecution and fines.

Regulations are made under the HSE Act to:

- set minimum standards for the management of specific hazards where other control measures are not always effective
deal with administrative matters provided for in the Act including the appointment of inspectors
elaborate on some general duties in the HSE Act.

A regulation’s requirements are mandatory. However, while regulations must be complied with, the overriding responsibility is to comply with the duties in the Act. This may mean taking further steps than only meeting the regulations.

WHAT REGULATIONS ARE THERE?
The HSE Regulations 1995 cover:
facilities required for the safety and health of employees
precautions to be taken with some particular hazards
notification of hazardous construction and forestry work
certificates of competence for some kinds of work
young people in hazardous places of work
agricultural workers’ accommodation.

In addition, there are Regulations on the following specific hazards:
mining
pressure equipment, cranes, and passenger ropeways (see 5.1)
asbestos see the Occupational Health section
Petroleum exploration/extraction (see the HSNO section)
pipelines (see 7.6).

Regulations that were passed under earlier legislation and the Factory and Commercial Premises Act have been retained for:
abrasive blasting
amusement devices
electroplating
first aid (See section 3.8)
geothermal energy
lead processes
noxious substances
spray coating.

Some regulations have also been made for administrative purposes.

These cover:
the appointment of inspectors
forms for accident registers and reports
the setting of a levy to fund the administration of the HSE Act (ss 21–24).

APPROVED CODES OF PRACTICE

The Minister of Labour can direct that a Code of Practice (ACOP) be developed, and also issue a Code of Practice. Codes are statements of preferred work practices or arrangements.

The approval process is prescribed by the HSE Act, which sets out how Gazette notices, consultation and subsequent approval by the Minister should occur.

The Act requires that copies of all ACOP are available for the public to read and copy at each of the Worksafe NZ’s offices. A fee may be charged.

SUBJECT MATTER OF ACOPS

Section 20 (1) sets out the matters that may be covered by ACOP. They may be:

statements of preferred work practices or arrangements
regarding plant, protective clothing, or equipment
aims, arrangements, practices, or principles for their design
arrangements, characteristics, components, configurations, elements or states for their manufacture
> statements of preferred characteristics for manufactured or processed substances used: - in connection with protective clothing or equipment; or otherwise used in connection with protecting people from hazards.

**COMPLIANCE WITH ACOP**

ACOP are not legislation, but statements of preferred practice. They may be produced in Court as evidence of a means of compliance with the Act. They do not necessarily provide the only way of complying with the Act. Failure to follow an ACOP is not an offence in itself.

If an employer did not follow an ACOP the relevant questions would be:
> What did the employer do?
> Was it as good as the ACOP?

Enforceability of ACOPS is probably one of the most misunderstood aspects the HSE Act.

An ACOP is a statement of preferred practice. If an employer does not follow it then the questions become what did they do and was it as effective as what is in the ACOP.

If the answer was ‘yes’ to the latter question, then the employer has discharged their obligations.

In considering any prosecution for a breach of a section of the Act or regulation, a court may regard any ACOP that was in place at the time of the alleged failure, and that is relevant to the charge (s 20()). ACOP are admissible in court by either the prosecution or defence as evidence of good practice. The reliance placed on them is a matter for the judge. (s20)


**GUIDELINES**

Guidelines are similar to ACOP in that they are statements of preferred or best practice. They are generally developed in consultation with affected parties.

However, they are not subject to the rigorous process of notifying and consultation required for an ACOP, and it has often been said, therefore, that they are not admissible in a court.

However, the Evidence Act establishes the principle that **all relevant information** is generally admissible.

In a health and safety in employment matter the entire body of knowledge available is relevant to establishing if steps/controls are or were practicable in the circumstances. Guidelines are admissible from both the defence and the prosecution. A court, due to the specific reference to ACOP in the HSE Act, may tend to put a greater emphasis on an ACOP.

**ALL PRACTICABLE STEPS**

Many duties in the HSE Act are qualified by the words ‘take all practicable steps’ (APS). This phrase applies to:
> employers
> employees
> self-employed people
> people in control of workplaces.

By definition, if something is practicable it is possible or capable of being done.

The definition of APS makes it clear that the decisions about what is to be done are to be taken ‘in the circumstances’. The HSE Act puts it this way: ‘In this Act, in relation to achieving any result in any circumstances, means all steps to achieve the result that it is reasonably practicable to take in the circumstances, having regard to the:
> severity of injury or harm
> probability of injury or harm
> hazard and ways to reduce, eliminate or control it
> availability, effectiveness and cost of the safeguards.’

**THE CONCEPT OF RISK IS AN INTEGRAL PART OF THE HSE ACT**

In this manner, the definition of APS introduces the concept of risk into the HSE Act. It is often said that the HSE Act is not risk based legislation because it does not use the term ‘risk’.

This is incorrect.

Although the word is not used, the concept is clearly there, given that risk is usually stated to be the product of likelihood and consequence.

\[ \text{Risk} = \text{likelihood} \times \text{consequence}. \]

In requiring employers to assess the significance of each hazard identified (s 7(c), the Act (as does case law) makes it clear that risk is a key element in decision-making about the steps that should be taken to control a hazard.

**BALANCING RISK AND PREVENTION**

In taking APS, what is known about the risk is balanced against the overall cost and feasibility of the safeguards necessary to avert the harm it may cause.

The cost has to do with the expense and inconvenience of putting safeguards in place measured against the consequences of failing to do so. It is not a measure of whether the employer can afford to put the necessary safeguards in place.

Employers would be expected to incur greater expense and inconvenience where risks could result in serious injuries from time-to-time, or against those which could result in frequent injuries even though they may be less serious.

Any judgment of what was ‘reasonably practicable’ would be made taking common practice and knowledge throughout the industry into account.

An employer could not claim that they did not know what to do if those hazards were widely known by others in their industry and safeguards were in place.

The concept of knowledge of the safeguards is objective and based on:

> industry standards and guidelines
> what a hypothetical reasonable employer would be expected to know in the circumstances.

It is not what any given employer might know.

The concept of ‘reasonableness’ is based on a hypothetical ‘reasonable person’ and the way that he or she might behave in a particular situation.

It is based on the values of the society of the day and, in the end, will involve a value judgment.

There is no legal definition of how a reasonable person would behave and the final decision would be determined on the particular facts of each situation.

The level of care considered reasonable by today’s standards could be considerably higher than in the past.

What is reasonable will change as new methods and new machines are developed and with changing ideas of justice and increasing concern with safety in the community.

The employers’ position can be summarised in the following way:

> The overall test is what a reasonable and prudent employer would do after thinking positively about the safety of his or her employees, in light of what he or she knows or ought to know.
> Where there is a recognised practice which has been followed for a long time in similar circumstances without mishap, the employer may follow that practice, unless in the light of common sense or newer knowledge it is clearly bad.

> Where there is developing knowledge, the employer must make an effort to keep up with it and not be too slow to apply it.

> Where the employer has greater than average knowledge of the risks, he or she may therefore be obliged to take more than the average or standard precautions.


### 1.6 EMPLOYEE PARTICIPATION

Employees and other people who face the hazards of a job often have valuable knowledge and experience about workplace health and safety, and the motivation to improve it.

In recognition, the HSE Act requires employee consultation and participation in managing health and safety. This involvement is consistent with the good faith provisions of the Employment Relations Act 2000.

Participation, whether through health and safety representatives, committees, or other mechanisms, provides an opportunity for employees to think constructively about health and safety, contribute ideas for improvement, engage in problem solving, and work as a team in implementing good work practices.

Participation enables people to take responsibility for their own health and safety. Creating motivation and commitment, and developing skills and capabilities can be valuable for the business.

By providing support for health and safety representatives and committees, an employer shows that their employees’ contributions are important in creating a productive, safe and healthy workplace.

With willing, motivated and educated employees who actively participate in health and safety, an employer can more easily fulfil their own responsibilities. (s19(a)–19(i) and Schedule 1(a)).


### 1.7 THE RIGHT TO REFUSE DANGEROUS WORK

Employees have the right to refuse dangerous work in certain circumstances.

The employee must believe that the work is likely to cause serious harm.

The employee must have reasonable grounds for the belief and must try to resolve the matter with the employer.

Reasonable grounds are deemed to exist if a health and safety representative advises the employee that the work may cause serious harm.

The employee can be directed to other work by the employer. s 28(a)
1.8 HEALTH AND SAFETY REPRESENTATIVES

WHEN IS A HEALTH AND SAFETY REPRESENTATIVE NEEDED?

A workplace needs to have a health and safety representative when:

> a representative has been agreed to as part of a system of employee participation

> if after six months, an employer of more than 30 employees has not agreed on and implemented a system of participation, then the default system requires employees to hold an election for representatives by secret ballot, or else requires their employer to hold the election on their behalf.

An agreed system may appoint health and safety representatives by a range of means, as long as there is agreement in good faith on the method and that those chosen represent the views of employees.

An agreed system may include other forms of employee involvement and does not necessarily have to include health and safety representatives.

THE DEFAULT SYSTEM

Employers, employees and unions should co-operate in good faith to agree to an employee participation system that best suits each workplace.

The HSE Act gives parties six months to agree on a system that starts:

> when the employer first employs 30 employees

> an employee requests an employee participation system.

A mediator from Worksafe NZ can help work through any issues of disagreement.

If parties can’t agree, the HSE Act sets out a system that will apply to the workplace. The system differs depending on the size of the workplace.

If there are fewer than 30 employees and a system is required, the employees, together with any union, must elect at least one health and safety representative.

If there are more than 30 employees, then there must be an election for:

> at least one health and safety representative to act independently; or

> up to five health and safety representatives to be members of a health and safety committee.

If there is a committee, health and safety representatives must make up at least half of the committee.

WHAT CAN A HEALTH AND SAFETY REPRESENTATIVE DO?

Employers must provide reasonable opportunities for employees to participate in health and safety.

Health and safety representatives may provide an employer with recommendations about health and safety. Employers must adopt these recommendations or provide a written response.

Employers must allow health and safety representatives leave to attend training.

Trained health and safety representatives may issue hazard notices (ss 19(a)–19(i) and s 46(a).

See:


1.9 PUBLIC SAFETY

There is no single agency responsible for, and no single law covering, public safety because of the variety of activity that people can be engaged in for work, recreation and living.
The purpose of the HSE Act is to promote the prevention of harm to people at work, and other people in places of work or in the vicinity of places of work. There are two main ways that the HSE Act ensures public safety:

- it requires employers to take all practicable steps to ensure that no action or inaction by an employee at work harms any person including a member of the public.
- it requires a person in charge of a workplace to take all practicable steps to ensure that no hazard harms people in that workplace, or in the vicinity, including members of the public who are there for recreation or pleasure.
- anyone can contact the Worksafe NZ to notify the possibility of harm from work activities, and Worksafe NZ can investigate.

1.10 VOLUNTEERS

Volunteers are at risk when carrying out their work and, like employees, they need hazards to be managed. When volunteers are doing work for an employer or self-employed person regularly, and the work is an integral part of the business of the employer, the employer/self-employed person must, for safety, treat the volunteer as if they were employees and protect them from harm.

Some voluntary activities not included:

- fundraising
- assisting with sport or recreation
- helping schools outside their own premises
- providing care in your home.

However, all voluntary work activity should be safe and those responsible for it are encouraged by the HSE Act to include hazard management in their planning. (s 3(c) and 3(d)

See:

1.11 WHEN AND HOW TO NOTIFY WORKSAFE NZ

Some things must be notified to Worksafe NZ. There is a form in each case. See:
www.business.govt.nz/worksafe/notifications-forms

1.11.1 AMUSEMENT DEVICES

An amusement device must be registered with Worksafe NZ and a permit must be obtained to operate it. An engineer is required to inspect the device as part of its registration. There are three relevant forms for this process.

1.11.2 ASBESTOS EXPOSURE

Any person who believes they have been exposed to asbestos can notify Worksafe NZ.

1.11.3 HAZARDOUS WORK

Certain types of work must be notified to the Worksafe NZ as defined in the Health and Safety in Employment Regulations 1995:

1. asbestos removal
2. any commercial logging operation or tree-felling operation
3. any construction work including:
   - work where workers could fall 5m or more, excluding work on a two-storeyed house, or work on a power or telephone line, or work carried out from a ladder only, or maintenance or repair work of a minor or routine nature
   - the erection or dismantling of scaffolds from which a person could fall 5m or more
   - every excavation which is more than 1.5m deep and which is deeper than it is wide at the top
   - any form of tunnel or drive where workers work underground, irrespective of timbering or support
> excavations where the face is steeper horizontal to vertical than 1:2
> construction work where explosives are used or stored
> work including diving, where construction workers breathe air or any other compressed gas or gas that is under pressure
> any construction work with asbestos
> lifts of 500 kg or more with a vertical distance of 5 m or more carried out by mechanical means other than a mobile crane, excavator or forklift.

When Worksafe NZ receives a NODS notification, it may assign a health and safety inspector. The inspector with a departmental medical practitioner will review the information and may interview the person who made the notification, and investigate the workplace.

Any link between the workplace and the health of the affected person can then be assessed by the department medical practitioner.

1.11.4 KNOWING ABOUT ENFORCEMENT ACTION

Any person wanting to know if enforcement action will be taken over an incident can ask Worksafe NZ (s 54).

1.11.5 SERIOUS HARM

If serious harm occurs to an employee, Worksafe NZ must be notified.

The details that should be provided when Worksafe NZ is notified can be found on a form (s 25).

1.11.6 OCCUPATIONAL DISEASES

The Notifiable Occupational Disease System (NODS) is a voluntary system used to notify Worksafe NZ of a health problem that may have been caused by work. Anyone can make a notification by completing a NODS form and returning it to their nearest office of Worksafe NZ.

A NODS notification helps protect the health of all persons in a workplace because it:
> highlights a workplace activity that may have caused harm
> assists an affected individual
> ensures other employees receive medical screening and treatment if necessary
> helps to prevent other employees being harmed.
1.13 LEGAL POWERS

The HSE Act gives certain people specific powers.

1.13.1 THE MINISTER FOR LABOUR

The Minister for Labour may:
> direct that an Approved Code of Practice (ACOP) be developed
> issue an ACOP
> direct that a Commission of Inquiry be held.

1.13.2 THE SECRETARY FOR LABOUR

The Secretary for Labour may:
> appoint health and safety inspectors
> appoint departmental medical practitioners
> issue Certificates of Competency
> recognise bodies to issue certificates of registration, competence, design verification and equipment inspection (See PECPR Regulations section)
> appoint HSNO enforcement officers.

1.13.3 HEALTH AND SAFETY INSPECTORS

Health and Safety Inspectors may:
> enter any workplace at a reasonable time
> take samples
> issue improvement notices
> issue prohibition notices
> issue infringement notices.

1.13.4 DEPARTMENTAL MEDICAL PRACTITIONERS

Departmental Medical Practitioners may:
> enter any workplace at a reasonable time
> require an employee to undergo a medical examination
> suspend an employee from work.

1.13.5 CORONERS

Coroners may require Worksafe NZ to provide a written report about a fatal accident.

1.14 CERTIFICATES OF COMPETENCY

A certificate of some sort is often required to operate tools, plant or equipment or carry out certain tasks as part of health and safety.

To use certain tools:
> powder operated fasteners.

To carry out certain tasks:
> occupational diving
> asbestos removal
> erecting scaffolding.

To operate certain equipment:
> cranes
> forklift driving.

1.15 CONTRACTORS

If people are contracted to do work, the person contracting them has a responsibility to take all practicable steps to prevent harm to them, their employees or to other people. The entity issuing the tender must take an interest in their ability to provide for health and safety on the job. This obligation cannot be contracted out.

For principals this duty can be summarised by making sure the contractor can and does do the work safely.
The practicable steps that might need to be taken by a principal can vary greatly.

- A demolition company – discovers the need for asbestos removal. A certified remover is retained and the principal checks the performance.
- A farmer contracting a shearing gang makes sure the shed, facilities and equipment they provide are safe, is satisfied that the shearing contractor is competent, that the crew is supervised properly and checks from time to time that the work is being done safely.

For large contracts, a Department Guideline suggests the following six steps:

- Scope the work: determine the work required, identify hazards, their likely risks and control options.
- Pre-qualify contractors: assess the health and safety capability of the contractors against the scale and significance of the hazards.
- Negotiation of terms: health and safety information is an integral part of the tender documentation (contract specification) and a draft plan to address risks is an integral requirement of a tender.
- Award the contract: before the contract is awarded the principal is satisfied that the hazards of the job have been communicated to the contractor, and the contractor’s plan to address the risks is adequate. This health and safety plan is a key part of the contract.
- Monitor the contract: monitor and check that the health and safety plan is being adhered to for the duration of the contract.
- Review: include health and safety in any review.

A good faith approach to these six activities requires that the principal and contractor communicate and cooperate appropriately.

Avoiding putting workers in unsafe conditions is key to safety.

Even if a principal operates through an agent or adviser, they have a duty to health and safety under the HSE Act.

Source:

1.16 THE HAZARDOUS SUBSTANCES AND NOXIOUS ORGANISMS ACT (HSNO) 1996

Administration and enforcement

The HSNO Act is administered by the Environmental Protection Agency (EPA).

This Act is concerned with the effects of chemicals and new organisms on human health, property and the environment, including damage to communities of plants and animals within ecosystems. There are also provisions for the protection of that which is of cultural significance to Maori.

The EPA website is a good source of up-to-date HSNO information www.epa.govt.nz

Enforcement of the HSNO Act is spread over a number of agencies including the Worksafe NZ.

Worksafe NZ is responsible for HSNO compliance in places of work. (Go to the HSNO section in this folder.)

See:
www.epa.govt.nz/Pages/default.aspx
IN THIS SECTION:
2.1 Managing health and safety
2.2 General safety
2.3 Utility safety
2.4 Machinery
2.5 Plant and equipment
2.6 Personal protective equipment
2.7 Youth at work
2.8 Sector summaries
2.9 Serial killers
2.1 MANAGING HEALTH AND SAFETY

2.1.1 HEALTH AND SAFETY SYSTEMS

Being systematic about workplace health and safety is a requirement of the HSE Act. The wording of the HSE Act suggests:

> health and safety responsibilities are part of the job for everyone
> senior management is committed to health and safety in the workplace – there is a written policy and it is followed
> health and safety is part of everyday thinking and practice in the workplace
> hazards are actively identified:
> as part of planned activities
> after an incident
> when any new information comes to light
> when anything new is planned
> seeking out information about workplace safety is an on-going activity
> hazard controls are reviewed regularly
> accidents are reported and there is an investigation and analysis after every incident to prevent future incidents
> information, training and supervision is provided
> visitors are registered and provision is made for their safety
> contractors’ health and safety performance is managed (See 1.14)
> emergency procedures are developed and regularly tested.

2.1.2 SAFETY CULTURE

Safety culture has been defined as:

‘the way we do things round here’.

It is the collective practice shared by everyone in the workplace, as a reflection of what’s important for workplace health and safety.

When taken at face value, this definition implies that the way things occur is fixed and cannot change.

Another definition says:

‘a culture of prevention is the acquisition of the habits and mechanisms necessary so that the personal response when confronting a risk (wherever it comes from) is largely automatic. The responses are not the product of scientific or technical discussions, but common responses belonging to the community and are coherent, essential behaviour.’

The ‘automatic response’ response referred to is valuable because it means everyone does things the same way. However, a community will always be in a state of flux. This means that adjustments and alterations are necessary to risk responses as experience accumulates and things change.

This definition of culture indicates that updating our culture will be required as a result of:

> experiences
> incidents
> near hits
> activities that get new information
> discussions with safety specialists, Unions and our trade organisations
> feedback from staff
> case law
> legislative changes
> journal articles and spontaneous inspirations.

This definition implies that safety responses are open to evaluation and change; perhaps, in part, as the result of scientific and technical discussions.

In practical terms, improving safety culture involves that a workplace understands:
> reporting practices – how well does a business know what's happening?
> risk awareness practices – how aware is the business of what can go wrong and how badly?
> learning practices – how does the business learn from mistakes and near misses?
> communication – how does the business ensure everyone is involved and engaged?
> practices for dealing with mistakes – is the business fair when dealing with people when something goes wrong?

Source: Worksafe NZ Safety Culture Page at:
safety-culture-snapshot

Google using: ‘Manual para el profesor de seguridad y salud en el trabajo’

2.1.3 HUMAN ERROR

There are only four kinds of human error:
> violations – witting
> mistakes – unwitting
> slips and – unwitting
> lapses – unwitting.

Of these, the last three should be considered the basic error types – as they indicate an absence of intent rather than its presence.

WITTING VIOLATIONS

All the violations described below bring perpetrators and their workmates into increased risk. They stem mainly from motivational factors and can only be understood in a social context.

Attitude or culture change is required to address them. The category includes:

> **Routine violations** – eg habitual deviations that have become a norm. Examples: assuming our work vehicle is safe instead of checking the operation of the tail and stop lights and indicators each morning.
> **Optimisation violations** – eg corner cutting and thrill seeking – getting the job done by available short cuts – driving as fast as possible.
> **Situational violations** – eg “we can’t do this any other way” – Lifting 250kg window frames into a building by hand.
> **Exceptional violations** – eg ‘There’s no rule for this’ – we’ll do it any way we like.
> **Sabotage** – eg cutting a hydraulic hose.

UNWITTING ERRORS

Knowing that there are only three types of unwitting error ought to make it more possible to prevent them.

However, we first need to realise that we have a choice on where we stand in regard to people who make errors.

**Errors at the personal level**

Traditional safety programs tend to focus on the person as the problem and respond with solutions such as threats, punishments, redeployment and retraining. This approach treats human errors as a moral issue and casts people who make errors as bad people.

**Errors as a net effect of fallible people working in an imperfect system**

Experience has shown that the personal approach can improve things only so far. Advanced approaches to health and safety acknowledge that human error is normal, but can be anticipated and prevented. Where such approaches have been applied, incident rates have decreased.

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1. A near hit. Something nearly happened. eg ‘The falling brick nearly hit me.’ A falling brick that ‘nearly missed me’ implies a hit! There is something odd with the language here!
These approaches view errors as a consequence, and that their genesis is the upstream factors that make errors possible as well as human failings.

When taking this approach, the work system can be designed with the aim of preventing human errors and minimizing consequences if they do occur. The interdisciplinary science of ergonomics (human factors) specializes in this type of design.

**Examples of upstream factors**

The well known ‘Swiss Cheese’ model shows one categorisation of the sorts of upstream factors that can affect people at the front line:

- fallible decisions and latent failures
- management defects
- precursors of unsafe acts
- an unsafe act
- inadequate defences.

The diagram below tries to make these labels concrete – by showing how the neglect of upstream factors permitted, in this case, an assault to a caregiver, to occur.

**2.1.4 HEALTH AND SAFETY AS PART OF NORMAL MANAGEMENT ACTIVITIES - LOOKING UPSTREAM**

Another categorization of upstream factors is based on research stemming from the use of the Tripod Beta approach to accident investigation in the oil industry. The research (sponsored by the Shell company) identified eleven common latent failures.

Note that only the last one is to do with traditional safety – the rest are the domain of normal management activities.
This commentary is not presented as a model to follow (though that might be appropriate in some settings). Rather it is an indication that a company tried hard to get it right, (in the way implied) and succeeded in improving safety.

DESIGN: Takes account of human factors so that operators are not placed in difficult situations. There is constant feedback from the workface to designers.

HARDWARE: To do with the materials used and the availability of tools and equipment.

PROCEDURES: Procedures that are really necessary are up to date, accurate, comprehensible and available. Good procedures will have been tested with frontline operators and revised until performance is error free. Procedures will require formal revision at set time intervals, when departures from them are noticed or when plant changes have consequential changes. The ultimate aim of a procedure is to cease to exist.

ORGANISATION: Do frontline staff know who to tell when they see a danger? Are managers aware of what goes on? Are they believed by the workforce?

TRAINING: See the entries at 1.5 and 1.6.

ERROR ENFORCING CONDITIONS: Are workers expected to work in conditions which are likely to increase the risk of error such as heat, cold, noise or time pressure? While these may be inevitable, people cannot perform heroically all the time.

HOUSEKEEPING: Poor housekeeping may reflect a wider malaise or a desire by management ‘not to know’.

MAINTENANCE MANAGEMENT: Firstly, the high level approach for the safe, whole of life operation of the equipment in question. Second, the performance of maintenance in a way that acknowledges that it is error prone and a source of new and unexpected mistakes and hazards.

INCOMPATIBLE GOALS: Front line realities are the starting point. For example:

> Lack of on-the-spot engineering support has means that the unexpected can no longer be catered for.
> The new schedule means I cannot re-stock these supermarket shelves unless I drive at 80kph between stores.

Information about this aspect flowing up to management makes it possible for management to devise and authorise necessary changes.

COMMUNICATIONS: If communications break down or are not used properly, people will act on incomplete, unrevised or outdated knowledge. Mistakes are more likely.

DEFENCES: The items above are all part of good management. ‘Defences’ is the only item devoted solely to ‘safety’.

2.1.5 TRAINING

Successful training for health and safety can be assessed against the following criteria:

Does the employee know how to:

> do the job or a particular task?
> identify the hazards in the job?
> control hazards?
> report any faults?
> use the safety equipment
> act in an emergency.

A good approach to training involves explaining and demonstrating, and then having the trainee explain and demonstrate against these criteria.

Instructions for a particular job and task and periodic follow-up are also helpful.

2.1.6 TRAINING FOR HEALTH AND SAFETY REPRESENTATIVES FAQ

A list of organisations that provide training programmes for health and safety representatives (HSR) under the HSE Act.

Some courses are only provided in the main centres, while for others training can be provided at any location.
The timing of courses depends on demand. Generally about 16 representatives are needed for each course.

Courses are offered at three levels. For details, contact the organisations concerned.

2.2 GENERAL SAFETY

2.2.1 ADVENTURE TOURISM G, R, W, F

All adventure activities operators subject to the Health and Safety in Employment (Adventure Activities) Regulations 2011 are required to pass a safety audit with a recognised auditor before they can be registered by WorkSafe NZ.

WHO IS AN OPERATOR?
The regulations say an operator is a person (whether an employer, a principal, or a self-employed person) who provides an adventure activity to a participant. ‘Provide’ is further defined as meaning where an adventure activity operator:

> directly provides the activity in person; or
> indirectly provides the activity through an employee or other person.

Booking agents are not considered to be people who indirectly provide adventure activities, so they are not covered by the regulations.

Examples of who may be considered as an operator:

Mount Arthur Cross Country Skiing contracts skiing guides (rather than employees) to take clients on cross country skiing trips. Mount Arthur Cross Country Skiing receives the payments from the clients and pays the skiing guides. Mount A Cross Country Skiing is therefore an operator.

Note: Using contractors does not absolve operators from obligations.

Angela’s Adventure Shop sells tickets to customers on behalf of adventure activity operators to do bungy jumps, guided canyoning trips and similar activities. Angela’s Adventure Shop is not the provider of an Adventure Activity and will not be required to be registered.

Bryan’s Bus Tours sells package tours that include transport and some adventure activities. Bryan’s Bus Tours pays the adventure activity providers and builds the cost into the tour price. Bryan’s Bus Tours is not the provider of an Adventure Activity and will not be required to be registered because it is acting as a booking agent and the activities are delivered by other businesses.

The deadline for achieving registration was 1 November 2014, beyond which date it is an offence to provide an adventure activity if not registered to do so.

Information on the Adventure Activities scheme is available, including guidance to help operators determine whether they are subject to the regulations at:

www.supportadventure.co.nz/

and through the WorkSafe NZ NZ Registrar (Adventure Activities).

Queries can be referred to aao@worksafe.govt.nz

Operators must use an audit provider recognised by WorkSafe NZ.

An information factsheet on the Adventure Activities scheme is available at:

www.business.govt.nz/worksafe/about/what-we-do/adventure-activities/for-operators/audit-and-registration-factsheet

2.2.2 AMUSEMENT DEVICES GL, F

Amusement devices are equipment with a means of propulsion primarily used for entertainment. Clearly, they can harm people if they are not designed and maintained properly.

Examples include fairground rides, some aspects of adventure tourism, indoor go karts and train rides.

Coin and slot rides are not included where they meet the exemption criteria.
Each amusement device must be certified by an engineer, who must also prescribe a maintenance schedule.

The operator must keep a log book of the times of operation and the number of people given a ride.

The operator should be able to produce a certificate, a maintenance schedule and an operations log book.

**Source:** Guidance and forms  

**Cross Reference:** Page 15

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**2.2.3 REST BREAKS**

Changes to the rest and meal break provisions in the Employment Relations Act (the ER Act) seek to balance the importance of rest and meal breaks with the need for breaks to be practical for each workplace. The changes came into effect on March 6, 2015. They replaced strict rules with a more general right for employees to have rest and meal breaks to give them a reasonable opportunity to rest, eat, drink and deal with personal matters. The new provisions encourage employers and employees to negotiate, in good faith, rest and meal breaks that meet the legislation, without compromising business continuity and flexibility.

The changes say:

> when employers can make reasonable restrictions on rest and meal breaks
> employers can specify when breaks are taken, if employees and employers cannot agree on when and how long breaks should be
> that an employer is exempt from giving breaks – when employees agree to reasonable compensation or where the employer cannot reasonably give the employee rest and meal breaks
> that reasonable compensatory measures are to be provided when an employer is exempt from the requirements to provide breaks
> rest breaks must be paid
> any other law that requires an employee to take rest and meal breaks takes priority over the rules in the Act.

Employees and employers can’t contract out of the right to rest and meal breaks – an employment agreement that required an employee to take no breaks, and did not provide compensatory measures, would exclude an employee’s entitlements and therefore have no effect. In other words, an employee either gets a break or a compensatory measure; the employer cannot fail to give either.

Further information about law changes to rest and meal break rules.

**FATIGUE AND PRODUCTIVITY**

There are also additional reasons for rest breaks including:

> preventing an accumulation of fatigue
> promoting morale and productivity.

For the optimum result, breaks need to be matched to the intensity of the work being undertaken, for example:

> A person in a call centre may need short frequent breaks to relieve the pressure of frequent, constant and demanding calls.
> Researchers may need a 10 minute break from looking down a microscope every 20 minutes to relieve the effects of keeping still. Doing exercises in the break could be advantageous.
Policy analysts may need a 20 minute break after 2 hours concentrated effort. Taking a break before then might mean a significant interruption – which could mean having to start from scratch again.

The specifications in the first part of this section are legal minimums that address comfort and meal needs everywhere.

Health and safety may be compromised in other specific situations because breaks are not provided.

For example:

> Where fatigue can lead to harm (such as in driving or the operation of dangerous machinery) employers have an obligation to take all practicable steps to ensure that fatigue is not likely to cause harm.

> If an employee signals fatigue, s/he may need to be given a break.

**NAPPING**

Providing for naps is a current strategy in some occupations.

**DETECTING IMPAIRMENT**

Employers are not responsible for factors outside of work that impact on an employee’s level of fatigue. But employers are required to take all the practicable steps to detect such factors when workplace safety may be affected. See section 2.12.

**Cross Reference:** 3.7.6 Page 151

**2.2.4 BRIDGES ON PRIVATE PROPERTY**

Bridges and culverts on private property are a risk if they are not inspected or maintained, or are used for purposes for which they are not suited. There have been multiple accidents causing death or serious harm.

Many bridges on private property have no specified live load carrying capacity or overweight ratings, and have few (or no) records of design and construction.

Because of the cost involved, they are usually never inspected by bridge inspectors, and landowners and users tend to have a ‘she’ll be right’ attitude.

Owners and users of bridges on private property place themselves and others at risk if there is insufficient evaluation of the strength and deficiencies of a bridge, the type of vehicles, loads and axle weight restrictions of vehicles using the bridge, as well as the speed of vehicles on the bridge.

A recent factsheet outlines the hazards and the measures that should be taken to prevent vehicles falling through them. Significant issues are to do with:

> **Design:** The design of the bridge (smaller vehicles accommodated only; no plans or inspection certificates; inadequate timbers, even when treated; a cantilever over the recommended 500mm.).

> **Use:** The use of the bridge (modern vehicles are larger and heavier and have wider wheel bases).

> **Maintenance and inspection** The weight-bearing capacity remains unknown, inability of farmers/landowners/users to determine if a bridge is appropriate for the purpose of use.

> **Inspection:** Inspection and certification has not been carried out; building permits not required for maintenance; costs of inspection and the lack of a formal compliance regime.

**Property owners can self – check as follows:**

1. Check deck condition for rotten boards, good drainage and grip
2. Check the cantilever as above
3. Check coatings on steel structures
4. Check for deterioration of concrete
5. Check for decay in timber piles
6. Check built-up debris in the river and bank erosion
7. Check for impact damage by vehicles, especially to guardrails and handrails
8. Check that the approach to the bridge is suitable
9. Consider whether the structure of the bridge is suitable for types of vehicles accessing the bridge
10. Check with any contractors using the bridge about the weight of the vehicle and load weights
11. Consider signage at the approach to the bridge if restrictions are necessary such as:
   > imposing a speed restriction
   > imposing vehicle gross weight and/or axle weight restrictions
   > limiting the number of heavy motor vehicles permitted on the bridge at the same time
   > closing the bridge to heavy motor vehicles and rerouting the heavy motor vehicles around a bypass eg via an adjacent bridge or through a stream.

Source: Refer to page 32 of the general guidance for farmers at:


2.2.5 COMPRESSED AIR

Compressed air (CA) is the fourth most important energy after electricity, oil and gas. The sudden release of compressed air can be equivalent to an explosion.

Unless it is handled properly compressed air may cause other types of harm:
> CA can cause dust to become airborne.
> A CA hose can whip around very forcefully if the end comes off, causing injury and damage.
> Noise.
> CA can blow particles into the skin and eyes.
> CA air can enter the body through a break in the skin. It can enter a blood vessel causing an embolism, which can be fatal.

Example: A worker received a small puncture in the palm of his hand from a metal spike. He used a compressed air gun to blow dirt and blood from his hand. The air enlarged the puncture and blew up his hand like a small balloon. He suffered severe pain and needed hospital treatment.

Safety with compressed air depends on:
> design
> installation
> maintenance
> operation.

No single New Zealand or Australian standard covers all this list but several standards cover the individual parts of a system such as:
> cylinders
> valves
> pressure regulators
> pressure gauges and
> hoses.

Installing a CA system is therefore a job for a specialist company with technical knowledge about all these aspects of safety.

Assuming a CA installation has been properly installed, what else needs to be done to ensure safety?

Training and Supervision to ensure correct use of the equipment, and regular maintenance checks.

EFFICIENCY CERTIFYING GROUP

The Energy Efficiency and Conservation Authority (EECA) provides auditors to assess the efficiency of CA installations. These auditors examine the design, installation and maintenance but do not cover health and safety.
Source: The EECA Business Page has a guideline about improving the energy efficiency of compressed air systems:


2.2.6 CONFINED SPACES

A confined space is an enclosed or partially enclosed space that is not usually a place of work. It may have a contaminated atmosphere or lack oxygen. It may have contents that could engulf workers or prevent their entry and exit. Examples:

> storage tanks
> tank cars
> process vessels
> boilers
> silos
> pits
> pipes
> sewers
> shafts
> ducts
> shipboard spaces and
> tunnels.

Hazards of confined spaces include:

> oxygen-deficient atmospheres
> toxic atmospheres
> flammable or explosive atmospheres
> engulfment — workers can be trapped or buried by dry bulk materials
> operation of moving parts such as augers or conveyor belts
> uncontrolled introduction of steam, water etc
> others including noise, extreme temperatures, manual handling and falls.

Controlling risks – A suitable person must take oversight.

An entry permit must be signed by someone who is knowledgeable about the hazards of the specific confined space. Hazards must be identified by this person and the permit should dictate how the work is to be performed and the safety measures required. These should include emergency evacuation techniques, communication with people on the inside and what to monitor in the air: CO, CO₂, H₂S, O₂.

In detail:

1. Eliminate: Can the needed work be done without entry to the confined space?

2. Isolate: contaminants and moving parts. Prevent accidental introduction of steam, water, through piping, ducts, vents. De-energise, lockout or tag-out machinery.

3. Clean and purge: the confined space if necessary. (Never use oxygen to purge a confined space. This can create a fire and explosion hazard.).
4. **Test:** the atmosphere for
   > lack of oxygen
   > toxic substances eg carbon monoxide, hydrogen sulphide
   > combustible gases eg methane, solvent vapours.

   If possible do this without entering the confined space.

5. **Ventilate:** Ventilate the confined space by using a fan, by blowing air in with a compressor, or by opening more manhole covers or other entry or exit points.

6. **Select:** appropriate breathing apparatus if necessary. If the space can’t be ventilated, or if the work will contaminate the atmosphere, a self-contained breathing apparatus or supplied-air respirator should be used.

7. **Select:** personal protective and safety equipment (PPE). A safety helmet, gloves, hearing protectors, safety harness and lifeline may be required.

8. **Issue:** a permit to work, as described in the reference below.

9. **Standby person:** Have a trained by person outside the confined space:
   > to monitor the safety of the person working inside the confined space
   > to take action if an emergency arises
   > to ensure there is reliable communication — by voice, radio, hand signals, hard-wired communication.

10. **Monitor atmospheres:** Monitor and maintain control measures put in place to ensure the atmosphere remains safe.

11. **Emergency evacuation:** Where necessary, have an evacuation plan and the necessary equipment to get a worker out of the space quickly if anything goes wrong.

   **Source:** Guidelines Safe Working in a Confined Space at:

   **Cross Reference:** 3.3.5 Page 112, 2.2.23 Page 41, Welding Page 104

**2.2.7 DRIVING AS PART OF WORK**

Employers must take all practicable steps to ensure that their employees are safe from harm while they are working.

When driving occurs as part of work, ‘all practicable steps’ would include ensuring that any vehicle used for work purposes is:
   > roadworthy and warranted
   > insured
   > loaded and used only within its specified capability
   > a safety banner, if appropriate
   > has a first aid kit.

A vehicle should not be inappropriately loaded so a driver’s vision is impaired, or so that the cargo could move and harm the driver.

Training and supervision to ensure employees who use a vehicle:
   > have the appropriate classes of driver’s licence
   > are not suffering from fatigue, vision impairment or any other factor
   > comply with driving hours restrictions for heavy vehicles
   > comply with the conditions of their driving licence
   > have adequate time in which to complete assignments
   > are physically capable of undertaking assignments.
Screening company drivers for sleep apnoea, while not required by law, must be regarded as a responsible step, given the severe effects of this condition on daytime alertness.

Employers could also consider developing a safe driving policy based on the New Zealand Transport Agency publication: Your Safe Driving Policy.

**Source:** [www.nzta.govt.nz/resources/your-safe-driving-policy/](http://www.nzta.govt.nz/resources/your-safe-driving-policy/)

### 2.2.8 DRUG TESTING

Testing if employees have been taking drugs is a highly sensitive matter.

The practice is covered in two guidelines:

- How to introduce a drug testing regime into a company is covered in International Labour Organisation (ILO) publication.

The first step in dealing with drug and alcohol problems in the workplace is to develop a drug and alcohol policy.

The ILO Code of Practice on managing alcohol and drug-related issues emphasises a preventive approach. It recommends a joint assessment by employers and workers of the effects of alcohol and drug use in the specific setting and co-operation in developing a written policy.

The aims of the policy should be towards

- Prevention
- Education
- Training
- Rehabilitation.

It is important to involve all employees. The policy must be consistent and fair.

There is no specific employment related New Zealand law that deals with drug-testing in the workplace.

Whether employees can be tested for drugs in the workplace will depend on a variety of factors:

- The industry and the type of work.
- Whether the employee’s work directly impacts the safety of others.
- The level of hazards.
- If an employee works in a safety sensitive area, shows signs of being affected by drugs, or has recently been involved in a workplace incident or near miss.

Privacy considerations.

- An employee’s right to privacy in relation to personal information under the Privacy Act 1993 and common law indicates conduct over sample collection procedures, the method of analysis, and the handling of test results.

The effect on individual rights.

- Laws to consider may include the Human Rights Act 1993 and the New Zealand Bill of Rights Act 1990. Even if those laws do not make it unlawful for an employer to require an employee to undergo drug testing they may influence whether the requirement is reasonable.

The details of the proposed testing policy.

- Random testing may be harder to justify than testing of specific employees for specific purposes, for example in safety critical operations.

The provisions of the employment agreement.

- If an employment agreement gives an employer the right to require employees to undergo drug testing then, provided the provision in the agreement is reasonable and does not contravene the protections contained in any relevant laws, it is more likely that the employer will be able to require drug testing. Similarly, it will be difficult for an employer to introduce drug testing if that right is not contained in the relevant employment agreement, unless the employee gives the employer informed consent.
If an employer suspects that an employee is using drugs, it is advisable for both parties to try and resolve the issue by talking about the problem. If this is not successful either party may choose to seek mediation assistance through the Worksafe NZ. The Privacy Commission provides guidance on the application of the Privacy Act 1993.

**Note: Dipstick tests.**

If a ‘dipstick’ test has the following characteristics:

- **Specificity** - 98% (ie 2% of identifications are false positives).
- **Sensitivity** - 95% (ie 5% of drug users are not registered as such by the test).
- And the drug use rate of the population being screened is, say, 5%.

The application of Bayes theorem indicates that the rate of false accusations is in the order of 30%!

This is unacceptably high, and means that, until a more accurate follow up test is done, no conclusions should be drawn.


**See also:** Plantation Forestry Code of Practice: Eliminating Drugs & Alcohol from the Workplace. 2008, New Zealand Forest Owners Association Incorporated at: [www.nzfoa.org.nz](http://www.nzfoa.org.nz)

**2.2.9 FIRST AID GL, AT, F**

There are three First Aid issues:

- Suitably stocked first aid kits and facilities.
- An appropriate number of trained first aiders.
- Information for employees about first aid arrangements.

**LEGISLATIVE APPLICATION**

The Factories and Commercial Premises (First Aid) Regulations 1985 were repealed in November 2008. Regulation 4(2)(d), read in conjunction with Regulation 7 of the Health and Safety in Employment Regulations 1995 apply to First Aid.

**GENERAL ASSESSMENT OF NEEDS**

Exactly what’s needed in a workplace will depend on its circumstances.

Some workplaces have greater risks of injury and illness because of the work being done. These risks help decide the first aid requirements, because different first aid may be needed for different activities.


It helps identify what’s needed at a workplace for First Aid.

The relevant circumstances include things like:

- the hazards in a workplace
- dangerous chemicals
- the machinery used
- dangerous activities
- the number of employees
- how far away the workplace is from medical help.
NUMBERS OF FIRST AIDERS REQUIRED
Given varying circumstances, a precise ratio of first aid personnel cannot be adopted in all workplaces. To determine the number needed, an assessment should be carried out of the risk factors in the workplace.

Small businesses can arrange to share qualified first aiders with neighbouring businesses.

The New Zealand Qualifications Authority has a list of training providers.

DO I NEED A FIRST AID ROOM?
First aid rooms aren’t required in every workplace. Employers in large workplaces should consider providing a first aid room given the higher likelihood of an accident.

If access to medical facilities is difficult, or where there are significant hazards in the workplace, a first aid room may be indicated.

FIRST AID KITS
Each employer must provide at least one full basic first aid kit in each place of work.

Where there are more than 50 employees, an additional kit should be provided; and for every 50 employees thereafter, an additional kit.

There should be at least one first aid kit on each floor of a multi-level workplace.

Work vehicles should carry a first aid kit.

First aid kits should be located:
> close to wash basins with hot and cold running water, soap, and clean towels. If running water is not available saline solution can be provided instead
> so that there is immediate access in areas of particular or special hazard.

First aid kits need to be easily seen, readily accessible to all employees and be unlocked wherever possible. They should be clearly identified as first aid containers: the marking used should be a white cross on a green background.

Source: First Aid for Workplaces – A Good Practice Guide at:

2.2.10 FLOORING – SLIP RESISTANCE
Injuries from slips, trips and falls are common. These injuries have slippery floors as a major cause. Six factors for flooring slip resistance are:
> floor material
> contamination
> environment
> use
> behaviour
> footwear.

RISK ASSESSMENT
Slip resistance is measured by mechanical devices. There are two main sorts:
> The pendulum type portable skid resistance tester. Expertise is always required for its use.
> Surface micro roughness testers – a hand held meter useable by most people.

Product specifications: The slip resistance of flooring surfaces should be specified in the flooring product data.

The slip resistance of certain flooring materials can be significantly reduced once it is in use. Data describing flooring material should report the results of accelerated wear tests.

The UK HSE Website caries a Slips Assessment Tool which can be downloaded from:
Source: www.hse.gov.uk/slips/
2.2.11 WORKING AT HEIGHTS

A new guideline for working at heights was published in May 2012 after extensive consultation with industry partners. Briefly describing each section:

SECTION 1: INTRODUCTION AND CONTEXT

The Guideline is an ‘umbrella’ document that provides generic, non-industry-specific information about the principles of working safely at heights.

Factors contributing to injuries sustained from working at height include:

> lack of or inadequate planning and hazard assessment
> inadequate supervision
> insufficient training for the task being carried out
> incorrect protection or equipment choices
> incorrect use or set-up of equipment including personal protective equipment
> unwillingness to change the way a task is carried out when a safer alternative is identified
> suitable equipment being unavailable.

More injuries happen on residential building sites than any other workplace in the construction sector. In 2012 Worksafe NZ initiated a targeted harm reduction programme to prevent falls from heights.
SECTION 2: PURPOSE
To help discharge HSE Act duties.

SECTION 3: SCOPE AND APPLICATION
Applies wherever people can fall from a height – and makes the point that the so-called 3 metre rule is – not a rule at all.

SECTION 4: WORK PLAN
Advice on identifying hazards, assessing and controlling them, monitoring the and documentation. There is a table about the selection of work equipment.

SECTION 5: ELIMINATION CONTROLS
Explores safer design (to eliminate work at heights), Using alternative construction methods and using tools and equipment that will reduce work at heights.

SECTION 6: ISOLATION AND MINIMISATION CONTROLS. THESE INCLUDE:
> Scaffolding
> Edge protection
> Mechanical access plant
> Safety mesh
> Harness systems
> Temporary work platforms
> Catch platforms
> Soft landing systems (SLSs)
> Safety nets
> Fixed roof ladders and crawl boards
> Ladders, stepladders, and means of access.

Many of these topics have been or are the subject of separate publications. Each topic requires careful attention to detail and most are subject to Standards and Industry publications.

SECTION 7: OTHER HAZARDS
That can impact on work at heights are also covered.

**Factsheets:** the following have been developed to help keep safe when working at heights. They are:
> Planning a safe approach to working at height.
> Selecting the right equipment for working safely at height.
> Short duration work at height.
> Edge protection.
> Temporary work platforms.
> Total restraint system.
> Safe working with ladders and stepladders.
> Be safe working on roofs.

**Sources:** Best practice guidelines for working at height in New Zealand at:
www.business.govt.nz/worksafe/information-guidance/all-guidance-items/preventing-falls-from-height

There is a Worksafe NZ National Programme 2014 – 5 in this area.


**2.2.12 HOME AS A WORKPLACE**
An employee working for an employer at home is covered by the HSE Act.

The principal or employer must take all practicable steps to ensure that workers in their own homes have a safe working environment.

For example, an employer should ensure that an appropriate computer workstation and equipment is provided and that the workstation is correctly adjusted.

The HSE Act excludes homeowners from responsibility when they employ a person – (cleaner, builder, plumber) – to work in or at their home.
A factsheet covers:

> working in another person’s home
> employing people that work in other people’s home.

**Source:** Search with ‘home’ at:
www.dol.govt.nz/workplace/knowledgebase/healthandsafety

**Cross References:** 3.6.3 Page 131

### 2.2.13 HOT WORK ON TANKS AND DRUMS

Many people have been injured or killed while doing hot work on drums or tanks.

These accidents follow a similar pattern and all could have been avoided if the proper precautions had been taken.

Advice from Worksafe NZ applies to hot work (welding, gas cutting, brazing or soldering) on any fuel tank, drum, container or pipe that has previously contained a combustible substance.

Examples are fuel tanks and the familiar 200 litre (44 gallon) drum.

The main problem is getting **all the stuff that was in the drum out of it.** Often, flammable substances dissolved in a solvent remain flammable (and ignite when heated) even though all the solvent has evaporated and the residue looks like a benign, solid tar.

Reliable methods must be followed to empty a drum or tank of combustible substances.

**Source:** Booklet at:

### 2.2.14 TEMPORARY IMPAIRMENT

If a person is impaired he or she may pose a workplace hazard.

**Example:** A scaffolder who has been up all night with a sick child is almost certainly unable to work safely.

Impairment may result from:

> fatigue (physical, mental or emotional)
> a family crisis
> alcohol or drugs
> reactions after a workplace accident
> unresolved conflict with an employer
> medical treatment or medication
> out of work events – examination, moving house etc
> poor shift work patterns
> harassment or bullying.

Employers must take all the practicable steps to detect hazards and this applies to any impairment in employees which may compromise safety.

Many employers are alert instinctively to this issue. In a short guide on impairment, Worksafe NZ suggested 13 questions might be asked by employers, as laid out in the checklist on the next page:

**Note:** Answering these questions may not be easy. There is no suggestion that the employer must ask all these questions in every situation. Clearly, some of them are private issues, and would need to be asked sensitively. It may not be appropriate to ask some of the questions.

<table>
<thead>
<tr>
<th>CRITERION</th>
<th>ASSESSMENT SCALE</th>
<th>WON’T USUALLY NEED ASSESSMENT</th>
<th>INCREASING NEED FOR ASSESSMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How many hours did the employee work in the past week?</td>
<td></td>
<td>Under 40 hours</td>
<td>Increasing numbers of hours</td>
</tr>
<tr>
<td>2. What is the pattern of the hours worked in the past week?</td>
<td></td>
<td>Regular 8-hour shifts</td>
<td>Extended irregular shifts</td>
</tr>
<tr>
<td>3. Is the employee suffering from acute sleep loss?</td>
<td></td>
<td>Regular sleep of usual day/night pattern and length</td>
<td>Disturbed or curtailed sleep</td>
</tr>
<tr>
<td>4. Does the employee have a sleep debt?</td>
<td></td>
<td>No reason for sleep debt</td>
<td>Hours worked and personal circumstances make sleep depth likely</td>
</tr>
<tr>
<td>5. Is the employee required to work at a time that is out of synchrony with the working cycle of the employee’s circadian rhythm?</td>
<td></td>
<td>No</td>
<td>Sleep patterns are out of synchrony with the employee’s personal circadian rhythm</td>
</tr>
<tr>
<td>6. What events are currently occurring away from work – is the employee experiencing life stressors?</td>
<td></td>
<td>None</td>
<td>Life events pose major problems</td>
</tr>
<tr>
<td>7. How well has the employee coped in the past?</td>
<td></td>
<td>Has coped well in the past</td>
<td>Has not coped well in the past</td>
</tr>
<tr>
<td>8. Does the employee get support at work – and at home?</td>
<td></td>
<td>Has had good support in the past</td>
<td>Support networks not evident</td>
</tr>
<tr>
<td>9. What is the physical intensity of the work?</td>
<td></td>
<td>Medium</td>
<td>Very low or very high</td>
</tr>
<tr>
<td>10. Does the employee’s physical fitness match the demands of the work?</td>
<td></td>
<td>Close fit between fitness and requirements</td>
<td>Obvious discrepancies</td>
</tr>
<tr>
<td>11. What are the mental and emotional demands of the work?</td>
<td></td>
<td>Medium</td>
<td>Very low or very high</td>
</tr>
<tr>
<td>12. Does the employee’s mental/ emotional state match the demands of the work?</td>
<td></td>
<td>Close fit</td>
<td>Obvious discrepancies</td>
</tr>
<tr>
<td>13. Do environmental factors pose an additional load?</td>
<td></td>
<td>No influences</td>
<td>Major influences</td>
</tr>
</tbody>
</table>
2.2.15 LOCKOUT PROCEDURES

Every year New Zealand workers are killed because machinery starts up unexpectedly. Lockout is a process used to render machinery inoperable. Lockout must be used when there is any risk of injury to an employee working on the machinery if it might start moving, or be energized in any way. Lockout applies to electrical, pneumatic, hydraulic and mechanical systems and to any form of stored energy.

There are five steps in a lockout:

> Identify the machinery or equipment to be locked out.
> Shut off the machinery or equipment and make sure all moving parts come to a complete stop. Also ensure that the act of shutting off equipment does not cause a hazard to other workers.
> Activate the main energy-isolating device for each energy source.
> Lock the energy-isolating device for each energy source, and ensure all parts and attachments are secured against inadvertent movement.
> Test the lockout for effectiveness.

Source: Lockout – Safe Practices for Isolation of all Sources of Energy in Sawmills at:

2.2.16 MAJOR HAZARD FACILITIES

In recent years, a number of very serious incidents have occurred at major hazard facilities overseas. There has been enormous damage to plant, people and communities and the environment has been put at risk. The Parnell fumes emergency in 1973, and the ICI fire in 1984 drew attention to the consequences of major incidents involving hazardous substances. Recent events include:

> an explosion and fire at a Tamahere coolstore in 2008
> an explosion in a gas system at a paper mill in 2008
> An explosion in a 100 tonne bitumen tank at Greymouth in 2009.

The Tamahere Incident in 2008 resulted in the death of a senior fire officer, and major injuries to six fire firefighters. The third incident resulted in the death of a worker who had been welding on top of the tank.

None of these events would be regarded as occurring at a major hazard facility.

Worksafe NZ published the Approved Code of Practice for Managing Hazards to Prevent Major Industrial Accidents (the Approved Code) in July 1994.

There has been no systematic assessment of sites that would meet the definition of a major hazard facility, and no assessment of the awareness of or adherence to the Approved Code.

There is no agreed New Zealand definition of a major hazard facility. In general terms it is an industrial site that receives, stores, processes, handles, forwards or disposes of significant volumes of hazardous substances.

Appendix 2 in the ACOP covers installations where it should be used:

> explosives or flammables
> petrol refineries
> pulp and paper mills
> steel making
> chemical processes
> tank farms
> bulk LPG terminals
> warehousing chemicals
> manufacturing where chemicals stored under temperature and pressure.
2.2.17 MAXIMUM AND MINIMUM TEMPERATURES

No particular temperature above or below which work should stop is specified in any Worksafe NZ publication. Many factors determine how hot we feel so it would be misleading to give maximum or minimum temperatures based on air temperature alone. The factors include:

- air temperature
- humidity
- sun or other radiant heat sources
- the speed of air movement
- the clothing being worn (i.e., PPE)
- how physically demanding the work is
- the degree of worker acclimatisation the frequency and length of rest breaks.

Exposure to excessive heat can lead to heat stress and heat exhaustion, fainting or rapidly fatal heat stroke. Cold stress can also occur and can be rapidly fatal.

Where work is being performed in extremes of temperature, first aiders will require special training.

**Source:** Guidelines for the Management of Work in Extremes of Temperature at:


**Cross Reference:** 3.8 Pages 158-161

2.2.18 MAXIMUM WEIGHTS

Maximum safe weights for safe lifting are not specified in any employment or health and safety law. This is because the load on a person handling an object depends on factors like the posture, the grip the person can get, the frequency of the handling, the time it goes on for and the starting and ending heights of the lift. Different people have different strengths and tolerances. The size and strength of the worker has a seeming relevance but providing tasks that any member of the workforce can do obviously gives employers more flexibility. Young workers under 15 are restricted from lifting loads that are likely to injure them. To assess the risks of lifting weights the employer and employee should consider four factors:

- Load – the muscle force applied by the worker – this may be the weight of the object handled.
- Posture and workplace layout – the postures adopted to lift the object and the amount of moving required.
- Environment – the workplace, the conditions slippery floors, walking up steps, restricted space to work in, lighting and the ability to get a good grip on the object.
- Time and repetition – the amount of time that is spent doing the lifting – or the number of repetitions of an action each day.

Worksafe NZ has a comprehensive Code of Practice about Manual Handling. It includes a risk assessment tool that combines the factors above into a single number. The control of manual handling risks should be by mechanical means rather than training, as illustrated above.

**Source:** The Manual Handling ACOP at:


See also:


**Cross Reference:** 3.5.3 Page 119
2.2.19 PERMIT TO WORK SYSTEMS

Permit to work (PTW) systems are:
- formal, critical, rigorous, precise and carefully constructed
- paper or computer based
- designed to communicate safety essentials to everyone involved
- for use in safety critical tasks and operations and
- in place over the whole time the task may affect safety.

Examples needing control by a PTW:
- most work on an oil platform/refinery
- confined space entry
- gas cutting near flammable liquid storage
- electrical maintenance
- maintenance on drilling rigs
- hot work on a pressure vessel
- pipeline repair.

Essential features of a PTW are:
- clear identification of who may authorise particular jobs (and any limits to their authority)
- who is responsible for specifying the precautions
- training and instruction including the use and closure of permits for all who are affected
- monitoring and auditing to ensure the system works as intended
- clear identification of the types of work considered hazardous
- clear and standardised identification of tasks, risk assessments, permitted task duration and supplemental or simultaneous activity and control measures.

Specialist advice is required to set up, operate and review the operation of a permit to work system.

See also: Lock out procedures.


2.2.20 QUAD BIKES

New guidelines were published in February 2011. They suggest:
- before you ride, ask yourself whether the quad is the right vehicle for the job
- ensure riders are trained and are experienced enough for the job
- always wear a helmet (special types are available)
- recognise dangerous areas by establishing ‘no-go zones’
- don’t carry passengers
- don’t let kids under 16 ride adult quad bikes
- check the operating condition of the quad bike before you ride
- maintained in a safe condition
- keep within the manufacturer’s towing or carrying limits
- only use attachments that are designed for and are compatible with the quad bike
- don’t do tasks that interfere with safe riding
- tell someone where you are going
- avoid use while fatigued/stressed
- restrict unauthorised access to the quad bike.

2.2.21 ROBBERY GL

RISK MANAGEMENT
A workplace should have clear policies for dealing with health and safety issues.

Where there is a threat of robbery, policies pertaining to security should address:

- risk assessment and mitigation
- security of cash, valuables, and/or drugs
- access, key control, opening and closing routines
- training and supervision of staff on safety measures
- use/maintenance of security equipment
- processes to be followed during and after a robbery, including staff support.

There should be regular auditing of the policies and procedures.

TRAINING AND EDUCATION
Safety and security procedures should be part of any training. Staff should be aware of the risk and trained to follow procedures in the event of a robbery.

A robbery can result in different reactions from different people. Employers, managers, supervisors and colleagues should be alert to the way their employees and colleagues react.

Appropriate support can greatly reduce negative emotional effects. Group debriefing after the event can play an important part in the recovery process, and individual counselling should be offered, but not forced.

OPERATIONAL PROCEDURE FOLLOWING A ROBBERY
The police must be notified as soon as it is safe to do so using the 111 service. The police will guide the caller through the information they need to provide.

First aid should be provided to anyone who needs it. The premises should be secured, and someone posted to admit emergency services when they arrive.

Nothing should be touched, to preserve the scene. Witnesses should be asked to stay, or their contact details taken. Those present should be discouraged from discussing the event until they can be interviewed by the police.

Staff could be called to provide evidence. Victim support services and the police will provide support and inform witnesses about risks and procedures.

PUBLIC RELATIONS
A spokesperson should be nominated, and deliver only basic facts to minimise the distress to victims. Victims should not be identified, and any release of information should be checked with the police first.


2.2.22 SIGNS FOR SAFETY

The safety signs needed in a workplace depend on the type of workplace and the hazards in it. They can draw attention to objects and situations affecting health and safety.

Signs are essentially passive and do not replace the need for systems or measures to control hazards. Safety signs do not replace health and safety training.

Safety signs should comply with NZS/AS 1319: 1994 Safety signs for the occupational environment. This Standard distinguishes categories of safety sign:
Regulatory signs: contain instructions, which if not complied with constitute an offence at law or a breach of standing safety procedures, eg fire, naked flame and smoking prohibited; head/hearing protection must be worn.

Hazard signs: warning of hazards such as fire risk, explosion risk, toxic hazard, forklift hazard, electrical shock.

Emergency information signs: location of facilities such as emergency exits, safety equipment, first aid facilities.

Fire signs: advising the location of fire alarms and fire-fighting facilities.

The standard provides detailed guidance about the design of different types of signs, and how and where they should be displayed.

It recommends that explanation of the functions and meanings of safety signs should be included in employee training and induction programmes.

When a new sign is displayed, or the location of an existing sign changed, employees should be informed and the reasons for the change explained.

Safety equipment suppliers provide a range of safety signs that comply with the Standard.


2.2.23 SILOS

Silos are large tanks used to store bulk materials like silage, grain, animal feed, milk powder, flour, coal, cement, wood chips, and sand. Many deaths and injuries have occurred in silos because of:

> Engulfment: Material cascades downwards and engulfs a person. Often, this occurs when material in the silo stops flowing and a person enters to try to free it. If a person enters at the top they may step on the material, find that there is a void underneath, break through and be engulfed. If entering at the bottom, they may find that material suddenly cascades onto them. Either way, this is often fatal.

> Suffocation: A person falls into the material and cannot get out. Some materials (grain, coal) have been likened to quicksand.

> Oxygen deprivation: The material in the silo (eg Silage) absorbs oxygen so that when a person enters there is none to breathe. Collapse is usually immediate and death is usually rapid.

> Toxic gases: The stored material emits toxic gases. (eg Silage may emit methane, or spoiling grain may emit carbon dioxide.) A person entering the silo is overcome. Death is usually rapid.

> Fire: Electrical faults, overheated bearings and slipping belts can cause fires in silos. Fires may also result from spontaneous ignition of the material in the silo and can be more difficult to deal with. These may occur, for example, in silage where the moisture content is low and/or air can get into the silo.

> Explosion: Flammable materials may create dust (eg grain, coal) which may become airborne. If there is enough in the atmosphere of the silo, a spark may ignite it and cause an explosion.

> Falls: are common given that every silo will have a ladder to its top.

> Machinery: Augers pose obvious hazards themselves. Workers entering silos to free jammed or blocked augers are often engulfed or asphyxiated. PTO from tractors are often used to power augers and pose obvious hazards.

> Others entering to rescue the person may also be overcome.
Dusts: Exposure to dusts in silos risks respiratory disease. Frequent low exposures risk an allergic reaction developing over time. A single massive exposure could also produce permanent symptoms.

Fumigants: Fumigants such as phosphine added to silos pose obvious hazards.

Overpressure: When a silo is filled by air blowing the substance in through a hose (for example cement) overpressure can develop. Explosions have occurred.


Cross References: 2.2.11 Page 33, 3.3.4 Page 107, 3.3.5 Page 112

2.24 SLIPS, TRIPS AND FALLS

Slips, trips and falls are a leading cause of injuries. A large number of accidents occur while handling goods or materials, and by people falling, being hit by falling objects or striking objects.

Good housekeeping is probably the first and most important prevention factor.

Some good housekeeping practices:
> cleaning up spills immediately
> mark wet/hazardous areas
> keep walkways and aisles clear and free from clutter
> secure mats, rugs and carpets that don't lie flat
> keep working areas and walkways well lit.

Slips, trips and falls may be prevented by changing or modifying surfaces that people walk on (floors, steps, ramps) and/or by selecting proper footwear.

Cross Reference: 2.2.10 Page 32

2.2.25 SPACE REQUIREMENTS TO WORK IN

The floor space per person is one factor that may affect an employee’s safety and sense of well-being. Productivity can be compromised if people are too close together.

The costs of running a building (rent, power, cleaning, maintenance etc) are usually very much less than the cost of paying the people who work in it. (Typically they are 10 times less.)

If each person in an office building such as Unisys House in Wellington (with about 1200 employees):
> works five minutes longer each day
> makes fewer errors (five minutes worth)
> works quicker (five minutes worth).

due to congenial facilities, the added value is in the order of $2.25 million each year.

Given these observations, employers should ensure that:
> employees are not grouped together so closely that they cannot work in a safe and healthy manner
> privacy is available for those badly affected by having lots of people around – eg the introverts among us who thrive on opportunities for quiet reflection – people with autism
> employees do not bump into each other, slip or trip, knock themselves on the edges of desks or do not have safe emergency exits.

For most office work space requirements are given in terms of two factors: (a) the ‘footprint’ and (b) the average floor area per occupant.

> The ‘footprint’ is the rectangle described by the person’s desk and floor space to work in. A value of between five and seven square metres is normally specified.
> For the average floor area per occupant a value of nine square metres per person is regarded as an absolute minimum – and this is for clerical work without computers.
> For work with computers, a value of 12 square metres per person is regarded as an absolute minimum.

> A target of 12 - 16 square metre per person is suggested for Government Head Offices in New Zealand.

> Values for particular situations depend on the nature of the work, hardware, storage, requirements for meetings and the extent to which facilities are shared. What is ‘in’ and ‘out’ in the determination of the overall floor space should be spelled out clearly.

Comment: Based on very extensive research and as confirmed by a consensus of experienced office designers, there is a clear, important tension in every office space design between two factors:

> having people close enough together so that good communication can occur and

> providing spaces for high quality solo work.

People who try to short circuit this tension do so at their peril. The calculation stated earlier shows the consequences of failure.

Cross Reference: 3.5.6 Page 125, 3.6.3 Page 131, 3.6.5 Page 134

2.2.26 TYRE FITTING

Tyre fitting poses four main hazards:

> compressed air (CA)

> heavy handling

> exploding rims

> noise.

In 2001, Worksafe NZ and the Tyre Sector published a detailed guideline on tyre safety. The guideline describes hazard management for tyre fitters and their employers.

The most common work related injury in the sector is to backs.

However, the Guideline is illustrated with many instances of severe injuries and fatalities due to exploding tyres and the effects of compressed air.

Tyre fitters require extensive training and supervision until they are able to work safely.

Source: Health and Safety Guidelines for Tyre Fitters at:


2.2.27 WORKING ALONE

Working alone means the normal contact with other staff is not available. This may include working in isolated areas on-site or off-site, either during or outside normal working hours.

Specific instances are:

> people working in kiosks, petrol stations, workshops etc

> people who work from home

> working outside normal hours

> home based health care workers, social workers, rent and debt collectors

> bus and taxi drivers

> agriculture and forestry workers

> trades and maintenance people.

Working alone can pose special risks:

> entering and exiting the workplace

> manual handling of portable equipment, machinery, tools

> chemical exposure

> operating controls safely may require more than one person

> violence

> for the young, disabled or pregnant or people with a medical condition

> communication in an emergency.

Employers of lone workers should:

> involve staff in risk assessments

> review risk assessments as often as needed

> check control measures are in place and review their effectiveness from time to time

> provide backup or help if a risk assessment shows it is required.
Risk controls for lone workers may need to be more comprehensive:
> controls may need to be upgraded for lone workers
> supervisors periodically visiting and observing lone workers
> regular, planned contact between the lone worker and the supervisor
> special security measures
> provision of emergency alarms.

Some lone working is not acceptable:
> working in a high risk confined space
> in some situations when working with electricity.

Emergency responses may need to be more fully developed if people working alone are to be kept safe.

More thorough training may be indicated by the risk assessment and lone workers in some situations may need first aid training.

Source: www.hse.gov.uk/pubns/indg73.pdf

2.3 UTILITY SAFETY

2.3.1 ELECTRICAL SAFETY

Electrical safety hazards exist in most workplaces. The severity of these hazards varies widely, depending on the kind of workplace and environment, on electrical factors such as the voltage, the circumstances and the physiological make-up of the people involved.

The information presented here will need to be supplemented with expert advice from time to time because of the wide range of workplaces.

OVERVIEW

People can be electrocuted, and suffer severe burn, blast and flash injuries, and be killed or seriously disabled by electrical accidents.

In order of hazard priority:
> Electrical shock hazards can exist in most places of work.
> Electrical arc blast and flash hazards are relevant to those working with large switchboards, motor control centres, large battery banks and high voltage equipment.
> Electrical faults causing excessive heating leading to explosions and fires can be present in many places of work.
> Electricity as an ignition source in potentially explosive atmospheres for example: cool store facilities, paint spray booths and mines.

Electric shock can also cause injuries of an indirect or secondary nature, where involuntary muscle reactions can cause bruises, bone fractures, and even death resulting from collisions or falls. In some cases, injuries caused by electric shock can be a contributory cause of delayed fatalities.

Direct contact is the most common cause of electrical fatalities. This involves people making direct contact with live metal through the equipment, tools and machinery they are using. These types of hazards can be transferred to others some distance away if there is a metallic path to the same live metal conductor.

When electrical equipment is damaged or defective or electrically over-loaded, a serious hazard may exist. Internal failures inside electrical equipment often cause heating as electrical insulation breaks down. Overloaded electrical equipment can carry an increased current causing an increase in resistive losses and appearing as heat.
This can lead to fires and explosions from the resulting arcs.

- Sustained internal arcs in large oil filled transformers can lead to massive explosions and fire.
- Extremely high-energy arcs in high voltage switchyards can generate massive blast forces and heat waves, and damage to equipment, causing fragmented metal to fly in all directions.
- Low-energy arcs can cause explosions in atmospheres that contain flammable gases, vapours, or combustible dusts.

The following lists present electrical hazards sorted by type.

**CONTACT WITH LIVE CONDUCTORS**
1. Drilling through walls where there are power cables.
2. Trenching or excavation near buried power cables.
4. Working near live power lines.
5. In a high voltage switchyard, the slew control of a crane left unlocked during levelling using outriggers.
6. No earthing of metal enclosure.
7. Safety earth applied to a live circuit.
8. Climbing into a live high voltage equipment bay.
   (Both 7 and 8 usually result from an operator’s disorientation).
9. Untested or poorly maintained electrical equipment.
10. Incorrectly wired electric cords and appliances.
11. Electric cords connected in series.
12. Electric cords used to drag equipment or appliances.
13. Surface run power cords and cables across vehicle or access ways.
14. Extension cord used to supply an outdoor area.
15. Power cord or cable near a source of heat.
16. Worn, or damaged, or repaired power cords or cables.
17. Working near electrical conductors assumed but not proven to be disconnected.
18. Absence of control over electrical isolation.

**STORED ENERGY**
20. Generators: motor isolated but rotor spinning.

**EARTH POTENTIAL RISE HAZARDS – UNSAFE CONTACT VOLTAGES**
21. Incorrect positioning of earth points during high voltage maintenance.
22. Insufficient earthing applied during maintenance at high fault level sites.
23. Inadequately rated earthing equipment used for maintenance.
24. Absence of safety plan and procedures for high voltage maintenance work.
25. Wet conditions and/or damp location.

**EXCESSIVE HEAT**
27. Incorrect over-sized fuse used.
28. Gradual breakdown of insulation.
29. Poor connections.
30. Blocked or ineffective cooling systems.
SOURCES OF IGNITION IN EXPLOSIVE ATMOSPHERES
31. Electrical sparking.
32. Hot surfaces.

INDUCTION
33. Induction from parallel circuits.
34. Transformer neutral not earthed.
35. Cable sheath tail not earthed.

ARC FLASH
36. High voltage installations.

HAZARD TYPE: ARC BLAST
37. High voltage installations.

STATIC ELECTRICITY
38. Build up of charge on surfaces as a result of contact and friction with another surface.
39. Wind and dust on isolated objects.
40. High voltage bus bars, line conductors.
41. Build up on hoses and equipment handling oils, flammable and combustible liquids.

EARTH POTENTIAL RISE (EPR)
This refers to the voltage rise on exposed metal structures and equipment when current from an electrical fault flows through it to the ground on its return path to the power source.

If a person makes contact between different parts of the return path then a voltage across the parts of the body making contact occurs, and this is referred to as a ‘contact voltage’.

If the magnitude of contact voltages are not controlled by the use of safety earths and equipotential bonding, then electrocution can occur.

Equipotential bonding is defined in the Safety Manual – Electricity Industry as:

‘A zone at a worksite within which the voltage differences between conductive parts, which can be contacted by an employee, remain below hazardous levels in the event of any inadvertent livening of any part of the equipment.’

Source: An electrical safety study guide developed by the Los Alamos Laboratories is at: www.lanl.gov/safety/electrical/docs/elec_hazard_awareness_study_guide.pdf

2.3.2 OVERHEAD POWER LINES
Overhead power lines carry high voltage electricity. Contact is often fatal. Anyone who operates mobile mechanical plant including a crane, a loader, an excavator, drilling or pile driving equipment needs to take time to focus on what is above them by planning and using one or more of the following safety measures:
> safety observers
> height restrictions on vehicles and plant
> ground level barriers
> ground level barriers plus rigid goal posts
> diversion or de-energisation of power lines.

SITE SPECIFIC SAFETY PLAN
Before any planning for a new site starts, a visit should assess any hazard posed by power lines. The higher the voltage in the power line, the greater the safe approach distance required. Electricity can flash over to an object or person without actual contact.
The minimum safe approach distance for mobile plant near overhead lines is specified in NZECP 34: 2001 New Zealand Electrical Code of Practice for Electrical Safety Distances.

This Code requires that the distance between any live overhead electric line and any part of mobile plant or its load shall be at least four metres, unless the operator has received written consent from the overhead electric line owner allowing a reduced distance.

Where mobile plant is likely to be used near power lines, a warning notice (pictured) must be displayed in a conspicuous place as near as practicable to the operator’s position.

**CRITICAL SAFETY FACTORS**

Check every time for the location of power lines before moving equipment, loading or unloading vehicles, stacking tall or long loads and scaffolding.

Take particular care:
- with all cranes and excavators
- when dumping material using lift tray trucks and
- fastening loads while standing on the top of the load.

Do not work on top of a vehicle near power lines.

The safe distances increase significantly with increases in voltage and span length.

For voltages higher than those in the table in the column opposite, consult NZECP 34 or contact the line owner to ascertain the relevant safe working distances.

Always consult the line owner if you are in any doubt in regard to achieving compliance with NZECP 34.

**Safe working distances.**

<table>
<thead>
<tr>
<th>CIRCUIT VOLTAGE (KV)</th>
<th>MAX SPAN LENGTH (M)</th>
<th>MIN. DISTANCE BENEATH, NORMAL CONDITIONS (M)</th>
<th>MIN. DISTANCE TO THE SIDE, NORMAL CONDITIONS (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1</td>
<td>50</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>1 - 11</td>
<td>80</td>
<td>5.5</td>
<td>5</td>
</tr>
<tr>
<td>11 - 33</td>
<td>125</td>
<td>7</td>
<td>8.5</td>
</tr>
<tr>
<td>33 – 110</td>
<td>125</td>
<td>7.5</td>
<td>9.5</td>
</tr>
<tr>
<td>110 – 220</td>
<td>125</td>
<td>8.5</td>
<td>11</td>
</tr>
<tr>
<td>&lt; 33</td>
<td>250</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>33 – 110</td>
<td>250</td>
<td>8.5</td>
<td>12.5</td>
</tr>
<tr>
<td>110 – 220</td>
<td>250</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>275 &amp; 350 kV d.c.</td>
<td>250</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>&lt;33</td>
<td>375</td>
<td>9.5</td>
<td>20.5</td>
</tr>
<tr>
<td>33 – 110</td>
<td>375</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>110 – 220</td>
<td>375</td>
<td>11</td>
<td>22.5</td>
</tr>
<tr>
<td>275 &amp; 350 kV d.c.</td>
<td>375</td>
<td>10.5</td>
<td>18</td>
</tr>
</tbody>
</table>

See also: the Worksafe Publication Electrical Safety on Construction and Demolition sites.


Where you need to work at a distance closer than specified, the power line owner should be approached to have:
EXCAVATION AND CONSTRUCTION NEAR POWER SUPPORTS
Except with the prior written consent of the pole or stay wire owner, no building or similar structure shall be erected closer to power supports than:

<table>
<thead>
<tr>
<th>CIRCUIT VOLTAGE</th>
<th>POLE</th>
<th>TOWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>11kV to 33kV</td>
<td>2m</td>
<td>6m</td>
</tr>
<tr>
<td>33kV to 66kV</td>
<td>6m</td>
<td>9m</td>
</tr>
<tr>
<td>&gt; 66kV</td>
<td>8m</td>
<td>12m</td>
</tr>
</tbody>
</table>

Except with the prior written consent of the pole or stay wire owner, no person shall interfere with any land where the work:

> Is at a greater depth than 300mm within 2.2m.
> Is at a greater depth than 750mm within 2.2m and 5m.
> Creates an unstable batter (sloping sided hole).

Spoil or other material is not to be deposited under or near power lines, as this will reduce the safe distance to the conductor.

CONTACT WITH POWER LINES
When a vehicle comes into contact with a power line, there is a high risk of serious injury or even fatal shock.

If the vehicle being driven contacts power lines, it is best for the driver to remain where they are until the power has been switched off. Most rural power lines have an automatic reset (auto-reclose) which turns the power back on after a trip. This can fail so lines should be assumed to be live.

The exceptions are:
> if there is a danger of direct contact with the power line
> a fire starts
> it is unlikely that anyone else will knows what has happened
> in these circumstances it may be necessary to leave the vehicle.

When leaving the vehicle:
> do not touch the vehicle and the ground at the same time
> jump off the vehicle so that no part of the body is touching the vehicle and the ground at the same time
> do not return to the vehicle.

Bulletins at: the Worksafe NZ Home page.

2.3.3 TESTING AND TAGGING POWER CORDS AND APPLIANCES
The standard that applies in New Zealand is AS/NZS 3760 In-service inspection and testing of electrical equipment.

The Standard indicates:
> the frequency of testing given the type of environment the power cord or appliance is being used in
> the tests that need to be completed.

The standard AS/NZS 3012 Electrical Installations – Construction and Demolition Sites gives the requirements for testing and tagging appliances at construction and demolition sites.

2.3.4 INSTALLING UNDER-FLOOR INSTALLATION HZA
Workers installing insulation under floors are at risk of electric shock – for example if they use a stapler and hit a power cable.
2.3.5 GAS SAFETY

Compressed gases are subject to the Hazardous Substances and New Organisms Act 1996 and the Hazardous Substances (Compressed Gases) Regulations 2004, that are administered by the Environment Protection Authority (EPA) at:

www.epa.govt.nz

Refer to the HSNO section of this booklet for further information.

2.3.6 RADIATION SAFETY

‘Radiation’ is defined as ‘a process in which energetic particles or waves travel through a medium or space’. The field is split broadly into two types:

> **Ionizing radiation:** So called because the energy of the radiation is enough to ‘ionise’ materials which means removing electrons from atoms.

> **Non ionising radiation:** This form of radiation is mostly called electromagnetic radiation (EMR) and refers to microwave radiation, visible light, lasers and infrared radiation. The term is also applied to the low frequency electric and magnetic fields found around cables and equipment carrying mains electricity, although strictly these are not a form of radiation.

In both cases the energy radiates outwards in straight lines from the source.

IONISING RADIATION

Ionising radiation is generated by radioactive materials, X-ray tubes, and particle accelerators. It is not detected by human senses. Geiger counters are required to detect radiation.

Ionising radiation has many practical uses in medicine, research, construction, and other areas.

Exposure to ionising radiation causes damage to living tissue, resulting in skin burns and radiation sickness. In low doses it can cause cancer, tumours and genetic damage. In high doses it can be fatal.

OCCUPATIONAL EXPOSURE

Radiation sources are used to measure density and moisture content and, in some cases, to analyse the components of various materials found in industry.

Ionising radiation is used in the following settings:

> **Pulp and paper and timber industry:** for measuring the **density** of various liquids in pipelines, the **levels** of materials in digester columns, the **basis weight** of paper, the **density** of manufactured board and the **density** of green lumber.

> **Steel industry:** measuring the **level** of molten steel in billet moulds, the **control** of the zinc coating on steel plate, the **density** and **mass** of iron sand in pipelines and inline analysis of iron ore slurries.

> **Civil Engineering:** measuring the **density** and **moisture** content of base course in roading construction, and the **density** of asphalt.

> **Mining:** measuring **density** and **ash content** of coal.
> **Oil and gas industry:** gamma and neutron sources are used to determine the density (porosity) and hydrogen content of the geological formations penetrated by the well. Measurement of the hydrogen content can differentiate between oil, gas and water in the geological formations.

> **Food and drink industry:** the detection of foreign bodies in food, for example the presence of stones amongst nuts for chocolate manufacture; the detection of under filled cans in the brewing industry.

> **Customs:** x-ray sources are used to check imported and exported goods for prohibited items and substances.

> **MAF:** x-rays check for illegal material in incoming passenger baggage and incoming mail.

> **Agricultural sector:** ionising radiation helps irrigation scheduling in orchards and vineyards.

> **Electronics industry:** x-rays check circuit boards for faulty soldered joints.

> **Industrial radiography:** checking the integrity of welds and structures.

### NON IONISING RADIATION

Non-ionising radiation (NIR) refers to any type of electromagnetic radiation or electromagnetic fields that do not carry enough energy to ionise atoms or molecules. Ultra-violet, visible light, and radiowaves are all NIR. Effects on the body vary widely, depending on exactly what type of NIR a person is exposed to.

Ultraviolet radiation can cause photochemical reactions which term can produce sunburn and over many years may lead to skin cancer.

High exposures to Infra-red, microwaves and radiowaves can cause heating. Lower frequencies of radiowaves, and low frequency electric and magnetic fields, induce electrical currents in the body.

There is a range of standards and guidelines which recommend exposure limits for non-ionising radiations in order to ensure occupational health and safety. These include:

> International Commission on Non-Ionizing Radiation Protection (ICNIRP) recommendations for ultra-violet radiation and low frequency electric and magnetic fields (www.icnirp.org)

> NZS 2211.1 2004 Laser Safety

> NZS 2772.1 1999 Radio-frequency Fields Part 1: Maximum exposure levels 3 kHz – 300 GHz.

Occupational exposures could occur in the following settings:

> Radiofrequency (RF) plastic welders – the operator normally sits close to a powerful source of RF fields.

> UV lamps for sterilising and in some printing processes are very powerful.

> Welding arcs – UV radiation.

> Industrial lasers used for cutting; any laser in Class 3B or Class 4 should be carefully controlled to avoid injury.
The National Radiation Laboratory (NRL) can provide advice on protection measures.

Source: The National Radiation Laboratory.

2.4 MACHINERY

2.4.1 STATIONARY COMPACTORS

Stationary compactors compress any kind of waste material to make better use of landfill and reduce transport costs. Several people have died from using stationary compactors. An Worksafe NZ guideline was published in 1999. It covers the crushing and shearing hazards that result from using the compactor and the bin lifter.

The guidelines require:
> design and installation
> guarding
> operation and location of controls
> fail to safety (if there is a failure the machine reverts to a safe state)
> appropriate operating and maintenance including lockout procedures
> training for operators
> regular inspections
> limiting access safety signage.

Source: Stationary Compactors: Safety Requirements – New Zealand Guidelines for Refuse Collection, Processing and Disposal Equipment at:

2.4.2 MACHINE GUARDING

Moving machinery poses obvious hazards of injury. Worksafe NZ published a guideline in 1995 that lists nearly 40 types of hazard associated with moving machinery.

The guide covers:
> types of machinery hazard
> types of guard
> training and responsibilities
> isolation and lock out.

SAFETY OF MACHINERY

This standard AS 4024.1–2006 provides comprehensive information for best practice and is the principal design reference for complying with the law. Designers, manufacturers, suppliers and employers who use this standard are likely to be able to demonstrate that they have taken all practicable steps.

The standard describes the basic principles of conducting risk assessments including:

a. Risk analysis:
> determining the limits of the machinery
> hazard identification
> risk estimation.

b. Risk assessment:
Relies on judgmental decisions using systematic, qualitative and quantitative methods. These include a variety of ways of identifying hazards and assessing risks:
> preliminary hazard analysis
> what-if method
> failure mode and effects analysis
> fault simulation for control systems
> method for a systematic analysis of risks
fault tree analysis
> DELPHI technique
> hazard and operability study.

Safeguards selected must be appropriate for the application in terms of:
> probability of defeat or circumvention
> severity of harm
> hindrance to the execution of the required task.

Operating procedures for the machinery must match the ability of personnel who use it, and the user must be sufficiently informed about risks.

If PPE is recommended the need for it and the training requirements for its use must be adequately described.

Documentation about risk assessment must demonstrate the procedure that has been followed, and the results that have been achieved.

DESIGN PRINCIPLES
This part of the standard covers the elimination of hazards and reduction of risks through design. Firstly, the design of the controls, interlocks and guarding must ensure a system that fails to a safe state.

The management of the safety-related parts of the control systems includes design validation, the design of controls, interlocks and guarding, emergency stop design, and the prevention of unexpected start-up.

The standard specifies categories and describes the characteristics of their safety functions, including programmable systems for all machinery and for related protective devices. ‘Safety’ here refers to:
> intended use
> foreseeable misuse
> when faults occur

> when foreseeable human mistakes are made during the intended use of the machine as a whole.

The risk assessment might lead to different risk levels, so it is necessary to establish the safety level to be adopted in proportion to the risk.

The standard defines the classes of safety related parts according to the following parameters:
> severity of injury (reversible, irreversible, fatal)
> frequency and duration of exposure to the danger
> possibility of avoiding danger.

The standard also defines the behaviour of the safety related parts of the control system in the event of a failure. The category is the classification of the safety related parts of the machinery (SRPCS) in respect to their resistance to faults and behaviour in fault condition. Fault is the inability to perform a required function.

The categories range from Category B and Category 1–4, where Category 4 has the highest standard of safety requirements.

Safety-related parts shall be designed so:
> A single fault in any of these parts does not lead to loss of the safety function.
> The single fault is detected at or before the next demand upon the safety function.

If this is not possible, then an accumulation of faults shall not lead to loss of the safety function.

The designer must declare all the safety relevant faults that were considered during the design, those not considered and the measures employed to allow exclusion, the parameters relevant to reliability (and technology used. The design of the SRPCS shall be validated. Performance of the SRPCS should be assessable by a third party.
ERGONOMICS PRINCIPLES
The revision of the standard in 2006 includes a new section on ergonomics. It provides information about how to use human body measurements and anthropometric data to calculate correct safety distances, sizes of guards and permissible openings. The positioning of displays, control actuators and signals, indication marking and actuation are also explained.

See:

MACHINERY LOCKOUT, ISOLATION AND ENERGY DISSIPATION
During maintenance, a safeguard may have to be removed.

Where there is large machinery or plant, maintenance personnel may have to enter the machine or plant out of sight of other persons. A serious accident could occur if someone turns on the machine. Therefore formal, written lockout procedures must be developed. (See section 3.13)

These formal written lockout procedures must include machine specific procedures for shutdown and re-energising equipment plus training for affected employees. They must be followed during servicing or maintenance, to avoid the unexpected start up of the machinery or the release of stored energy.

Opening or removing guards. The standard sets out the steps to be taken when it is essential to open or remove the guard whilst still retaining some movement of the dangerous parts of the machinery. This may be required during setting, teaching, process changeover, fault-finding, cleaning or maintenance.

For some special machinery other protective measures, such as automatic safety restraint to prevent gravity fall or anti-free fall device, may be necessary.

Source: Guidelines for guarding principles and general safety for machinery at:

See also the webpage for the Worksafe NZ National Programme in this area for 2014–5:

Refer also to AS4024.1202–2006, Clause 4.11.10

2.4.3 GUARDING TRANSMISSIONS

A transmission includes:
> shafts
> wheels
> drums
> pulleys
> gearing
> chains, couplings and clutches
> ropes, or other device which transfers power from a prime mover to a driven machine.

Transmission machinery must be securely fenced. If it is in a position that makes it ‘safe’ it does not need to be fenced. ‘Safe by position’ might mean that the transmission is high overhead, for example.

This is only maintained while nobody approaches the transmission for maintenance, cleaning or lubrication.

Secure fencing means that there is no longer a reasonable risk of injury, even when a worker is careless or inattentive.
Guards must be substantial and fixed securely in position. Openings in guards are permissible so long as a person cannot reach the transmission. Inspection panels should not be removable.

Guards may allow lubrication points to be accessed. If it is not possible to do this and prevent access to the transmission, then lubrication must be carried out with the machine at rest.

**Source:** Guidelines about guarding farm machinery and transmissions at:


**2.4.4 ELECTRICAL INTERLOCKING**

When a machine that can harm people is operating it will need to be guarded. This includes:

- power presses, moulding machines, bottle filling stations, and stamping machines.
- The guards that prevent access will need to be opened or moved aside to unload the work pieces and products.
- When this happens the dangerous motion of the machine needs to automatically stop moving.

Electrical interlocking can achieve this.

The guideline outlines the basic principles of electrical interlocking. It includes how the electrical components used must still produce a safe state if and when they fail.

The types of interlock covered in the guideline:

- normally closed switch operated by a cam
- snap action switches
- switch position monitoring
- emergency stop controls
- micro-switches
- magnetic switches
- proximity switches
- optical detection systems
- trapped key interlocks.

Further details and requirements are in the standards series AS4024.1–2006.

**Source:** Guidance notes for Electrical Interlocking for Safety in Industrial Processes at:


**2.4.5 WOODWORKING MACHINERY**

This 1995 guideline has detailed information about the safety of a variety of woodworking equipment:

1. **Saws:**
   - log breakdown saws
   - breast benches
   - frame saws
   - band saws
   - edgers
   - circular saws
   - narrow blade band saws.

2. **Planers, shapers and sanders:**
   - planing machines
   - vertical spindle moulding machines
   - mortising machines
   - routing machines
   - sanding machines.

A general section covers power tools, long hair, loose clothing, cleaning and maintenance, training and supervision, responsibilities and machinery integrity, isolation and lockout.

**Source:** Guidelines for the safe use of woodworking machinery at:


See also the Worksafe NZ general guideline about machinery Safety:

2.5 PLANT AND EQUIPMENT

2.5.1 THE PECPR REGULATIONS 1999

The PECPR regulations (“peckper”) apply to:
- pressure equipment (timber treatment pressure vessels, boilers)
- cranes
- passenger ropeways

The PECPR regulations outline the way in which safety is provided for and a series of Codes apply the framework to:
- boilers
- pressure equipment other than boilers
- cranes
- passenger ropeways.

The regulations have seven preliminary sections, six parts and two schedules.
Definitions are covered in Schedule I and reading the entire Schedule is recommended. To see what is covered and what is not covered, look at Schedule 2. Car engines and animal powered machinery are exempt.

What the design verifiers and inspectors have to do must be specified by the designer.

PRELIMINARY SECTIONS

Regulations 1–4 of the PECPR regulations describe the title, interpretation and define the meaning of ‘controller’ and ‘equipment’.

KEY PROCESS OF THE PECPR REGULATIONS:
- **design** for safety
- **designs** are **checked** by a design verifier
- **manufacture** to be safe
- **inspection** to ensure that it has been manufactured to be safe
- supported by **documents**
- **operated** safely and there is adequate **information** to allow that.

Regulations 5–6 refer to the ability of the Secretary for Labour to grant exemptions to controllers, designers, manufacturers and suppliers and to equipment. The Secretary may impose conditions on the exemption. For example, irrigation systems, that carry water under pressure, have been exempted.

Regulation 7 makes it clear that the HSE Act 1992 also applies and may impose additional duties.

PART 1 CONTROLLERS’ DUTIES

The term ‘controller’ means a person who is the owner, lessee, sublessee, or bailee of equipment in a place of work (not being a home occupied by the person).

The controller’s duties are explained in detail in the regulations:
- Information (Regulation 8) needs to be supplied (a) information about operating the equipment safely and (b) information establishing compliance with the requirements relating to design, design verification, manufacture, and fabrication inspection. The information must be kept at the workplace where the equipment is located and must be readily available.
- Accident notification (Regulation 9) Notify the Secretary of accidents and provide a written report within seven days.
- Operation (Regulation 10) The equipment must be operated safely, within its limits and maintained in a safe condition. It must have a current certificate of inspection.
- Repairs and alterations (Regulation 11) repairs and alterations are done according to the PECPR Regulations.

PART 2 UNSAFE EQUIPMENT

 Certain requirements pertain to equipment that is or becomes unsafe:
- Employees must look out for equipment and if it becomes unsafe, notify the controller (Regulation 12).
> Investigate (Regulation 13). If the controller becomes aware that the equipment may be unsafe, they must investigate the nature of the problem, the level of expertise required to deal with it and the degree of harm likely to arise. If the equipment is deemed unsafe it must be withdrawn from service, marked as unsafe, recorded, retuned to service only when the controller is satisfied it is safe, repairs alterations and adjustments are done in accordance with the regulations, and a record is kept of the testing required.

> Notify a fault to the designer and manufacturer if the controller believes a type fault has occurred (Regulation 14).

> The manufacturer determines if there is a type fault and if so to withdraw the equipment. (Regulation 15).

PART 3 DESIGNERS, MANUFACTURERS AND SUPPLIERS

Regulations 16–17 indicate that the HSE Regulations 1995 apply and that the Secretary of Labour can designate certain documents as relevant standards.

Designers must (Regulation 18):

> Design equipment so it is safe – and specify its hazard level, its design life, its design verification requirements, its manufacturing requirements and its fabrication inspection requirements, taking into account the New Zealand seismic environment.

Manufacturers must ensure that (Regulation 19):

> If the equipment was designed in New Zealand, the designer complied with the regulations; the equipment is manufactured according to the verified design any material alterations are checked with the designer first and if necessary, verified by a design verifier.

> If fabrication inspection requirements are specified in the design, that the inspection is carried out by an equipment inspector holding an appropriate qualification and at the inspection points specified by the designer.

> An equipment inspector who carries out an inspection prepares and hands over a report.

> If designed overseas, the design was in accordance with the equivalent of the New Zealand Regulations.

Suppliers must take all practicable steps to ensure that (Regulation 20):

> the manufacturer complied with Regulation 19.

When importing equipment manufactured overseas ensure:

- it has been designed, design verified, manufactured, and inspected to standards that are equivalent to those imposed by regulations 18 and 19 and
- it has not already exceeded its designated design life.

Regulation 21 covers the provision of information about the safe use of the equipment and the certifications required.

PART 4 ADMINISTRATIVE PROVISIONS:

> The Secretary for Labour can acknowledge documents as standards (Regulation 22).

> The Secretary can grant recognition to inspection bodies and qualification issuing bodies (Regulation 23).

> Functions and recognition of Inspection bodies (Regulations 24–25).

> The functions of design verifiers and equipment inspectors (Regulations 26–27).

> When a Controller is deemed to have an acceptable quality management system (Regulation 28).
> The functions and recognition of qualification issuing agencies (Regulation 29).


### 2.5.2 BOILERS **ACOP**

Raising steam has been part of the industrial and commercial scene since the early 1800's. It is a highly developed, mature technology.

Of all Worksafe NZ's ACOPs, this is probably the most complex because of the complexity of the equipment used, its safety critical nature and the technical safeguards required to prevent boilers malfunctioning.

The use of 'private' language is extensive – mastering the vocabulary is difficult. No glossary could cover it all.

Most users of this COP will be people whose working life revolves around boilers.

Boiler malfunctions are uncommon. However, as the Code states:

Overheating as a result of low water is the most common cause of boiler damage or explosions, usually a result of the malfunction of the automatic controls.

The main reasons for these incidents has been shown to be:

> build-up of scale
> inadequate supervision
> isolation of float control chambers and safety controls
> lack of maintenance of controls and alarms
> lack of testing of controls and alarms.

Refer to a specialist for further advice.

**Source:** Approved Code of Practice for the Design, Safe Operation, Maintenance and Servicing of Boilers at:
www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-boilers

### 2.5.3 PRESSURE EQUIPMENT (OTHER THAN BOILERS) **ACOP**

The Pressure Equipment (Excluding Boilers) - Approved Code of Practice applies the framework of the PECPR Regulations 1999 to compressors, fired heaters, gas turbines, piping components, pressure fittings, pressure piping, pressure vessels, pumps, steam engines and steam turbines.

Pressure fittings are:

> fittings which are to contain gases or liquids at pressures above 50kPa or steam
> fittings like pressure gauges, safety devices, valves and other items require to ensure the safety of the overall installation.

Pressure piping is:

> an assembly of piping components which conveys fluid or transmits a fluid pressure for gases or liquids at pressures over 50kPa or steam
> pressure relief valves
> supports for pressure piping required to maintain safety.

**Source:** The Approved Code of Practice for Pressure Equipment (excluding boilers) is undergoing revision. It is at:
2.5.4 CRANES ACOP

The Approved Code of Practice for Cranes is now in its third edition.

It covers the design, manufacture, supply, inspection, certification, operation, maintenance, alteration and repair of a variety of cranes.

The ACOP supports the requirements of the PECPR Regulations 1999 and the HSE Regulations 1995.

The ACOP covers all types of crane, including monorails and equipment used as a crane, and crane-lifted platforms.

It also covers the following equipment when being used as a crane:

- forklift trucks
- material handlers
- tele-handlers
- earthmoving and forestry equipment.

There is an eight page glossary that is a helpful starting place for this topic.

The Regulations cover:

- the duties of controllers regarding information about the equipment, accident notification and its safe operation and repair
- what should happen if equipment becomes unsafe
- duties of designers, manufacturers and suppliers
- the inspection and certification regime
- certification requirements.

Section three of the ACOP covers the day-to-day operation of the crane:

- routine checking
- inspection and certification
- alterations and repairs
- maintenance
- accident notification
- designated design life

- Sections 4–9 cover requirements for:
- people operating or working with cranes
- designers
- design Verifiers
- manufacturers
- suppliers and importers
- functions of equipment inspectors and inspection bodies
- sections 10–18 provide detailed safety information about the various types of crane.

Source: Approved Code of Practice for Cranes at:
www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-cranes

2.5.5 PASSENGER ROPEWAYS ACOP

This 1998 Code, in 122 pages, covers several sorts of aerial and surface ropeways. These are almost entirely to do with skiing operations:

Aerial Ropeways:
- fixed grip chairlifts
- detachable chair lifts
- gondola lifts
- jig back tramways.

Surface ropeways:
- t-bar lifts
- platter lifts
- rope tows.

Three stages are covered by the Code:

- design and construction (design, design approval, manufacturing, erection, commissioning)
- maintenance and inspection
- day to day operation.

The Code reflects the PECPR Regulations, in its Section 2.

The Code is in eight sections:

- Section 3: General technical requirements.
> Section 4: Chair Lifts/Gondolas.
> Section 5: T-Bar/Platter lifts.
> Section 6: Surface ropeways with intermediate supports.
> Section 7: Surface ropeways without intermediate supports.
> Section 8: Reversible aerial passenger ropeways.

To elaborate further would reproduce the long lists of topics covered in the Code.

**Source:** Approved Code of Practice for Passenger Ropeways in New Zealand at: www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-passenger-ropeways

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### 2.5.6 FORKLIFT SAFETY ACOP

The Approved Code of Practice for Training Operators and Instructors of Powered Industrial Lift Trucks covers forklift operator training.

It is also suitable for training the operators of:

> order pickers
> side loaders
> reach trucks
> pallet trucks
> platform trucks
> straddle trucks and carriers
> lateral stacking trucks
> tele-handlers (when used with forklift like attachments).

Forklift operators must have a certificate from attending an instruction course.

The course instructors must also meet certain criteria that is described in the ACOP.

A standard syllabus for the training course is prescribed in the ACOP, and employers must provide additional training if needed (for example, if the forklift has any attachments).

Trainers may be registered, but this is not mandatory.

Maintenance of forklifts and any attached equipment must be carried out.

After an operator has a certificate from a training course, their employer is required to issue a certificate from the company authorising the operator to operate a forklift.

**Source:** The Approved Code of Practice for Training Operators and Instructors of Powered Industrial Lift Trucks at: www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-forklifts

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### 2.5.7 PIPELINES R, GL

A pipeline generally carries a hazardous substance (gas or liquid) over long distances, generally under pressure. The potential for harm is obvious.

The guidelines for the safe operation of pipelines follow the outline of the HSE (Pipelines) Regulations 1999. They require a Certificate of Fitness for a pipeline to be issued by a certifying authority recognised by the Secretary for Labour.

**BASIC DUTIES:**

The owner of the pipeline is required to have a certificate before the pipeline can be operated. The Certifying Authority must:

> inspect the pipeline and the associated equipment
> issue a Certificate of Fitness
> impose limitations when the pipeline no longer complies with the certificate
> ensure the certification is in accordance with an acceptable Code or Standard.
> specify the expiry date which is a maximum of five years.

If the pipeline goes beyond its expiry date, sustains damage, shows signs of deterioration, is modified or replaced, the Certifying Authority can impose conditions and limitations on its operation.
GUIDELINES FOR A CERTIFICATE OF FITNESS FOR HIGH-PRESSURE GAS AND LIQUIDS TRANSMISSION PIPELINES

These guidelines cover existing and new pipelines.

For existing pipelines the certification requirements are:

> what a pipeline is (based on what it is carrying and where it is) and what it is not. The latter includes domestic gas supply, offshore pipelines and water pipes

> suggests a range of standards the Pipeline could conform to

> design review

> construction verification

> pressure testing

> operation review

> maintenance review

> pump stations

> safety systems review.

For new pipelines:

> Design – threat assessment; design process; the route; security from interference; control and management; materials to be used; stations.

> Construction – Safety plan for the construction phase; survey; Component handling; Inspection; Making bends; Weld quality; other joints; System controls; location; Trench Construction; Installation in the trench; etc.

> Inspection, testing, commissioning – Inspection and test plan procedures; Pressure testing; Records; Commissioning.

> Operation – Normal operating procedures; Safety and Operating plan; Emergency Plans; Venting and purging procedures; Changes in operating conditions; Operations reviews.

> Maintenance – Pipeline integrity; Inspection and assessment; Coatings maintenance; Pipewall defect assessment; Cathodic protection system Inspection; Pressure control and protective equipment; Pig Trap maintenance; Casing maintenance; Pipeline repairs.

> Mitigation of corrosion – Rate of degradation; Internal and external corrosion prevention; External anti-corrosion Coatings.


2.6 PERSONAL PROTECTIVE EQUIPMENT

2.6.1 GENERAL INTRODUCTION

Personal protective equipment (PPE) is generally an expensive, undesirable option, to be used only when essential.

Controlling hazards at the source through elimination and isolation must, by law, be explored first.

Wearing PPE is often unpleasant (this applies particularly to respiratory protection) and expensive due to the cleaning, maintenance and replacement required to maintain PPE in a functional and effective condition.

To be effective most PPE must be:

> selected to fit properly

> fitted correctly

> supported by training

> regularly cleaned, maintained and replaced.
2.6.2 HARD HATS

Hard hats are designed to protect against shock and penetration (things dropping), but also electricity and a degree of heat.

They work by holding the outer shell of the hat away from the head by at least 25–32mm which provides a zone into which the shell can move and decelerate before the head is struck.

Hard hats should be replaced when:
> they show any signs of damage (crack, hole, melting)
> after a severe enough knock
> after prolonged exposure to sunlight for example being stored on the rear shelf in a car
> after contact with certain chemicals – paint thinners, some paints, solvent marker pens
> when the surface begins to fade, chalk or craze
> if the harness can’t be replaced.

The integrity of the harness is crucial to safety. Therefore, the harness should be replaced if it frays, cracks or breaks.

Training is needed to make sure employees understand this and can adjust the strap for a secure fit.

Wear may be accelerated if the hard hat is treated casually. For example throwing it into a car boot may cause damage if it contacts sharp points.

Chin straps are required when an employee works at a height. A hard hat falling and hitting someone would be an irony!


2.6.3 GOGGLES AND FACE SHIELDS

Eye protection comes in many varieties (goggles, glasses and face shields) and should be selected for the task and context.

Goggles, glasses and face shields are designed to protect against:
> ultraviolet radiation (glasses, welding shields)
> glare to prevent ocular fatigue
> glare from artificial light to improve vision in low light
> glare from water and shiny surfaces (polarising sunglasses)
> infrared radiation when working with hot metals
> enhance contrast in low light
> splashes
> chemicals
> wind.

Three categories of impact resistance are prescribed:
> low intensity (hammering and chipping)
> medium intensity (when using a grinder)
> high intensity (grinding wheel flies apart).

Face shields prevent the most common eye injury that occurs when a grinding wheel disintegrates. Goggles are not suitable.

If there is any doubt about the level of protection required, or what equipment to select, a specialist should be consulted.

Source: Refer to the AS/NZS 1337 and 1336 series.
2.6.4 REFLECTIVE VESTS

There are numerous anecdotes about loose fitting reflective vests being caught on things. While the majority of these incidents are probably benign, they signal the potential for a major problem.

If a vest was caught on a critical control while an operator was getting into the seat in a backhoe, for example, the operator's reaction time might not be quick enough to prevent the control being actuated and the resulting uncontrolled action causing damage.


2.6.5 GLOVES

Gloves can give good protection or can make things worse for hand health. The latter will occur when chemicals, water or grit get inside the glove.

Floppy gloves are dangerous near machinery, for obvious reasons.

The AS/NZ Standard 2161.3:2005 provides for gloves to protect against:

> abrasions
> blade cuts
> tears and
> punctures.
The table helps inform how to select gloves before consulting a manufacturer’s catalogue.

<table>
<thead>
<tr>
<th>PROTECTION AGAINST ...</th>
<th>STATUS</th>
<th>SELECTION</th>
<th>CORRECT USE</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical abrasion and cuts.</td>
<td>Useful</td>
<td>Should be selected to fit well.</td>
<td>Few gloves protect against mechanical abrasion and chemicals.</td>
<td>Loose fitting or frayed gloves may be dangerous near machinery.</td>
</tr>
<tr>
<td>Chemicals – Solid, liquid, solvents, toxic chemicals.</td>
<td>Gloves should be used only as a last resort¹.</td>
<td>The need to select a glove material that will resist the penetration of the chemical is clear. Specialist advice will be needed.</td>
<td>Correct donning and doffing is required to prevent contamination of the glove interior.</td>
<td>Few gloves will resist a mixture of chemicals. Replacement frequency may make the cost prohibitive².</td>
</tr>
<tr>
<td>Heat and cold</td>
<td>Insulation can often be applied to the items that are to be handled. The handling time and the temperature of the handled objects will determine the insulation properties required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>Wet hands inside gloves (without any additional chemical exposure) can lead to serious skin effects.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>Efficacy questionable</td>
<td>Padding may make them suitable only for gripping vibrating tools</td>
<td>Extra muscle forces needed when using gloves (up to 30% increase) may make them more tiring to use.</td>
<td></td>
</tr>
<tr>
<td>Infection control</td>
<td>A standard hygiene practice.</td>
<td>A variety may be required to protect against latex sensitivity – Which is a serious issue.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed reasons</td>
<td>Very few gloves will protect against mechanical abrasion and chemicals. Double gloving may be the only solution.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COMMENTS
1. Gloves can worsen skin effects when chemicals penetrate them.
2. The frequency of replacement required for effective protection can be very high.
3. Check the glove’s performance as it is being worn. If the wearer is allergic to the glove material or to any substances that get trapped in it, the choice will need to be re-thought.

ALL DAY USE OF GLOVES
Expecting users to wear gloves all day may be unrealistic as trapped sweat may lead to problems. While many gloves are permeable to moisture, the capacity to transfer water may be exceeded if the duration of wearing, the work rate, or the handling of hot objects are excessive.

Source: AS/NZ Standard 2161.3:2005
2.6.6 SAFETY BOOTS AND SHOES

Safety footwear should be chosen after an analysis of the protection required.

The standard indicates that safety boots and shoes can provide protection against:

- falling, cutting and rolling objects
- penetration of sole or uppers
- friction or pressure blistering
- explosions and electricity
- chemicals, heat and molten metals and cold
- water
- fuel oil
- slipping.

The manufacturer’s data sheet should indicate the protection an item offers and the item should carry this information in the form of a letter, as designated in AS/NZS 2210.1 – 2010.

Source: Refer to the AS/NZS 2210 standard series. For protection against cuts from chainsaws, see ISO 17249:2004 : Safety footwear with resistance to chain saw cutting.

2.6.7 RESPIRATORY PROTECTION

Respiratory protection is to either protect the lungs against toxic contaminants or provide clean air and/or oxygen where there is none. Although they are all called ‘respirators’, these two purposes require different types of device. There are three basic types: air purifying respirators (APR), supplied air respirators (SAR) and self contained breathing apparatus (SCBA).

Respiratory Protection Table

<table>
<thead>
<tr>
<th>TYPE</th>
<th>TO PROTECT AGAINST</th>
<th>DUSTS, FUMES, MISTS AND FIBRES</th>
<th>GASES AND SOLVENT VAPOURS</th>
<th>LACK OF OXYGEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air purifying filter type respirators APR</td>
<td>Particulate Respirator</td>
<td>Three levels of protection are available: P1, P2 and P3. See below, Note 1</td>
<td>Not suitable, though some models are designed to protect against both.</td>
<td>Not Suitable</td>
</tr>
<tr>
<td></td>
<td>Gas Respirator</td>
<td>Not suitable, though some models are designed to protect against both</td>
<td>Cartridges are available for different gases. See below Note 2.</td>
<td></td>
</tr>
<tr>
<td>SAR</td>
<td>Supplied Air Respirator</td>
<td>High level of protection – may be overkill</td>
<td>High level of protection – may be overkill</td>
<td>Suitable</td>
</tr>
<tr>
<td>SCBA</td>
<td>Self Contained Breathing Apparatus</td>
<td>High level of protection – may be overkill</td>
<td>High level of protection – may be overkill</td>
<td>Suitable</td>
</tr>
</tbody>
</table>

NOTE 1:

P1 filters: for mechanically generated dusts from sanding, grinding, mining, etc

P2 filters: for thermally generated contaminants in smelting or welding, where metallic fumes produced.

P3 filters: high-efficiency filters used with a full face piece, which permits a very effective seal on the face to prevent highly toxic or irritant contaminants leaking into the respirator. This type of device is used when handling highly toxic dusts or powders, like organophosphate insecticides and radionuclides.
NOTE 2:
Cartridges are available for P2 and P3 respirators for:
1. organic vapours
2. acid gases – chlorine, hydrogen sulphide, hydrogen cyanide and sulphur dioxide
3. combinations of 1 and 2
4. ammonia
5. nitrous oxide
6. highly volatile pesticides
7. mercury
8. volatile solvents.

1. Air Purifying Respirators (APR)
These are filtering devices that remove one of the following:
> dusts
> gases
> organic vapours
> solvents.

An APR may consist of:
> papier-mâché type mask
> half face-piece mask
> full face-piece mask
> head covering.
The order of these masks as listed is how they differ in their ability to provide a tight seal to the face and as a result the protection provided.

2. Supplied Air Respirators (SAR)
An air line delivers clean air from outside the contaminated area to a respirator worn on the face.

3. Self Contained Breathing Apparatus (SCBA)
Compressed air bottles are worn on the user’s back and a hose feeds the air to a mask held on the face.

SELECTING, FIT TESTING AND TRAINING
Using respirators properly requires discipline in:
> selecting the right one for the task
> selecting the right size for the person’s face
> fit testing – to see that a proper seal can be obtained between the face of the wearer
> training – including the wearer knowing how to put on and remove the respirator
> cleaning, maintaining and storing the respirator.

CAUTION – NEED FOR MEDICAL ASSESSMENTS
For the reasons below, people who must use a respirator routinely must be given the opportunity for a full medical assessment, particularly if the work being performed requires any effort:
> impaired lung function
> susceptible to asthma
> heart disease or anaemia  
> epilepsy  
> glasses or contact lenses can restrict the types of respirator that can be worn  
> claustrophobia.

Face structure or facial hair may prevent a good seal. If this is the case, carefully taken decisions about whether or not the employee can continue in the work will be required.

**Sources:** Guideline: A Guide to Respiratory Protection at:  

### 2.6.8 HEARING PROTECTION

Reduction of noise at its source is preferred. In all situations hearing protection (HP) should be regarded as a last resort and may be ineffective in many situations. Only where noise cannot be eliminated or isolated should HP be used.

**SELECTION**

HP will be required whenever a person is exposed to:

> an average noise level of over 85 decibels (dB) for eight hours or
> a peak noise level of 140 dB.

Different classes of HP are available, and the class selected must protect against the level of noise, as follows:

<table>
<thead>
<tr>
<th>CLASS</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest noise level</td>
<td>90</td>
<td>95</td>
<td>100</td>
<td>105</td>
<td>110</td>
</tr>
</tbody>
</table>

**NOTES:**

Either earmuffs or earplugs are acceptable, as long as they are chosen from the right class. Employees using HP must be informed about:

> how to adjust and fit the HP  
> how to clean and disinfect the HP and any maintenance requirements  
> the consequences of not wearing the HP even for a few minutes each day.

Employees should wear HP before entering noisy areas. Break time in quiet areas will be needed when HP must be taken off.

**SAFE USE OF HEARING PROTECTION**

**Damaged or worn** ear protectors are ineffective. Earmuff cushions should be replaced when they are worn out (6 monthly). When the clamping force diminishes it is time to replace the whole protector (Usually 12 months).

HP needs to be cleaned, and stored properly to retain its effectiveness. It may also need to be disinfected between uses or users.

**Additional Note:**

Not wearing HP for part of the day reduces its effectiveness markedly.

> Removing a 30db protector for five minutes in six hours is the same as if the hearing protector was only able to give 18 dB protection.  
> If the seal against the skin is poor, for example if the worker is wearing glasses, the protection provided may drop by several dB.  
> Earplugs have to be fitted properly or they don't work.  
> Overprotection (using the next class up) may result in unacceptable interference with regular communication.  
> Stereo headphones only increase noise exposure.


Refer to the AS/NZS 1269/1270 series refer.
SECTION 2.0 // SAFETY TOOLS

2.6.9 PPE AND THE LABOUR HIRE SECTOR

THE LABOUR HIRE AGENCY

The Labour Hire agency is responsible for providing, making accessible to and ensuring that temporary workers use personal protective clothing and equipment.

This is required when it is not practicable to eliminate or isolate a significant hazard to which the temp. continues to be exposed [s 10(2)].

The hiring agency should obtain information from the client about the hazards and control mechanisms in the client’s workplace to confirm:

> that it is not practicable to eliminate or isolate one or more significant hazards
> that the temporary worker may be exposed to this significant hazard(s)
> the likelihood that harm to the temporary worker can be minimised by providing protective clothing and equipment
> the type of protective clothing and equipment required.

The Act imposes a duty on employers to provide, make accessible to and ensure the use by the employees of suitable clothing and equipment to protect them from harm. (s10(2)(b)

Under section 10(3), an employer does not comply with that duty by simply paying an allowance or extra salary or by requiring the employees to provide their own protective clothing as a precondition of employment.

The agency is responsible for determining the need to provide or make accessible protective clothing and equipment.

THE TEMPORARY WORKER:

The HSE Act acknowledges that the temporary worker may genuinely prefer their own protective clothing for reasons of comfort or convenience.

If this option is taken the hiring agency needs to ensure that the equipment is appropriate, fits properly, that the temporary worker knows how to use it, it is clean and maintained.

It is unlawful for the hiring agency to discriminate on the grounds that a temporary worker has chosen or not chosen to provide their own protective clothing.

It is also unlawful to create an impression that providing their own protective clothing is a precondition of employment. Temporary workers who choose to provide their own protective clothing relieve the hiring agency of the responsibility to supply that protective clothing. The hiring agency continues to have other obligations in this situation:

> Demonstrate that the temporary worker chose to provide their own protective clothing without any coercion or inducement from the agency.
> Be satisfied that the protective clothing provided by the temporary worker is suitable for the purpose.
> The temporary worker can change their mind, after giving the agency reasonable notice, and choose that the agency provides the protective clothing.
> The Agency remains responsible for providing PPE. This dispensation applies only to protective clothing.
> The agency remains responsible for ensuring the temporary worker uses the protective clothing.

2.7 YOUTH AT WORK

2.7.1 CHILDREN IN THE WORKPLACE

Family members may visit businesses and staff may ask if it’s possible for their children to come into work during school holidays or on work experience.

Children visiting workplaces must be safe. Consider restricting them to a safe area where there are no hazards. Any hazards should be clearly explained to your staff and the children.

WORK EXPERIENCE

Many schools and training facilities value opportunities for students to gain hands-on experience. In such cases students must be treated as if they were employees.

That includes explaining what hazards exist, how they are controlled, actively managing the work experience to avoid any exposure to significant hazards, and providing any necessary PPE.

Schools and training facilities may provide some PPE or meet all or part of the cost. The PPE need not be new, but must be effective. Disposable items such as earplugs and dust masks must not be reused.

The protective gear supplied must be appropriate to the hazard and must fit correctly.

Students must also be instructed in its correct use.

If PPE is provided it must be appropriately sanitised after use so that it doesn’t become a health hazard.

CHILDREN ON FARMS

Farms are unique environments where families work, live and play. This is not found on such a large scale in any other industry or workplace.

It raises unique challenges that other business operators don’t have.

Farm owners and operators should already have identified existing hazards.

The hazards for children are different in view of a child’s size, strength, perspective and judgement.

Devising hazard controls must therefore include how this could affect children.

Apart from listing the hazards on a farm and telling children about them, the way in which children are engaged with the issue should be considered.

Options:

> Have no go areas because some areas on farms are simply too dangerous for children to be regardless of what instruction may have been given.
> Get the kids involved in safety ‘eye spy’.
> Discuss things with them.
> Get kids to make safety posters.
> Spend time training them by showing and then getting them to show you how to do tasks safely.
> Listen to children.
> Instead of a ‘treasure hunt’, have a ‘hazard hunt’.
2.8 SECTOR SUMMARIES

2.8.1 OCCUPATIONAL DIVING

Occupational diving can occur in a variety of categories:

- construction
- aquaculture
- scientific
- film/photography
- recreational
- tourism.

Diving is a physically demanding activity, often conducted in remote locations and under difficult conditions.

Occupational divers must, therefore, be physically and mentally strong and healthy.

Occupational diving involves breathing gas under increased pressures and there are specific medical requirements.

Providers of training for divers must advise prospective students of the need for diving professionals in New Zealand to hold a Certificate of Competence. Before starting entry level training, prospective students intending on a career as a diver must obtain an occupational diver medical clearance from the Diving Hyperbaric Medicine Services in Auckland.

Details of the requirements for a medical certificate and how to apply are in a Guideline. Medical certificates must be renewed every 12 months. A Certificate of Competence is issued by Worksafe NZ. It is valid for five years provided the diver is medically fit to dive. It can only be issued if there is a medical certificate that is less than six months old. An application form is provided in the Guideline.

Each category of occupational diving requires a Certificate of Competence. The certificate is issued only with evidence of adequate training to standards given in a series of Australian Standards or NZQA Unit Standards.

Some types of occupational diving have a range of certification. For example, construction divers may be certificated to perform work only to 30 metres and any deeper requires further training.

As well as describing certification and medical clearance, the Guideline for Occupational Diving describes:

- the safe conduct of diving
- requirements for the provision of a recompression chamber
- diving at increased altitude
- travel to altitude following diving
- skin diving
- highly technical diving
- tourism diving.

Source: Guidelines for Occupational Diving, 2004 at:


2.8.2 PETROLEUM

Health and Safety regarding petroleum can be divided into the two sections of exploration (drilling) and extraction (production).

These activities are carried out in both onshore and offshore environments throughout New Zealand.

High Risk activities include:

- Drilling Installations, drill ships or semi-submersible drilling rigs.
- Offshore floating installations (FPSOs) some 40 kilometres from land.
- Fixed installations attached to the sea bed.
- Onshore production stations for gas and liquid processing.
PETROLEUM HAZARDS:
> highly flammable
> usually released in vapour (gas) or liquid at high pressure
> vapours are often vented or flared
> heat radiation
> usually produced in large quantities
> uncontrolled release will allow contact with sources of ignition
> can be explosive
> gas can form large clouds before ignition prior to explosion.

OFFSHORE INSTALLATIONS
Offshore installations are required to prepare an installation safety case in which the operation is described, hazards are identified and control measures are documented. For more information refer to the HSNO booklet in this folder.

ONSHORE INSTALLATIONS
These installations can vary from a drilling installation or rig to a highly complex gas treatment plant refining petroleum into other petrochemicals. Refer to the HSNO booklet in this folder.

2.9 SERIAL KILLERS
A number of topics in this section must be seen as serial killers. This means that a death or serious injury occurs from time to time. The frequency of the fatalities is not usually very high (perhaps about one every 2 to 5 years, with the exception of Quad bikes) but the point is that they occur regularly and for the same set of causes.

1. Confined spaces
A person enters a confined space which lacks oxygen or where the air is contaminated or toxic. The person collapses. Other people may rush in to rescue the person and collapse. As many as six people have died in this way in single instances. The prior identification of confined spaces, checking they are safe and and a safe system of work are required.

2. Working at heights
A person falls due to lack of appropriate fall protection. Worksafe has a Guideline.

3. Hot work on tanks and drums
A person welds or heats a metal tank or drum. It explodes and the person is killed or maimed. Usually this happens because it is thought that all the flammable substances have been removed from the tank/drum when they have not. Often a waxy solid has remained and emitted explosive substances when heated. A Worksafe guideline refers.

4. Lockouts
People die when machinery starts up unexpectedly because it has not been locked out (isolated) correctly. Correct procedures properly supervised are required, as described in a Worksafe Guideline.
5. **Quad bikes**

Quad bikes are responsible for more than a few deaths every 5 years.

6. **Silos**

Silos are dangerous for the reasons set out earlier. Typically, a person enters the silo to be engulfed or to collapse from lack of oxygen.

7. **Tyre fitting.**

A person fitting a tyre onto a truck rim omits to put the tyre/rim assembly into a safety cage. The tyre ring is flung off the rim as the tyre inflates – perhaps due to incorrect fitting, and a person is killed.

These deaths and serious injuries may occur for a variety of reasons:

> **Information:** It seems that, as new people move into the workforce (a school leaver begins work as a tyre fitter for example), there is a failure to inform, educate and warn.

> **Vigilance:** Eg A confined space is not identified as such.

> **Short cuts:** Eg A person thinks that they do not need to take the precautions or that they do not have enough time to take them.

> **Diligence:** Procedures are not adhered to carefully enough. (A short cut is taken, but in ignorance.)

> **Ignorance:** The hazards are not appreciated.

> **Pricing:** A contract for work has been offered and accepted. It has not included enough to cover the time and equipment needed to provide for safety and health.

More serial killers are listed in the next section on Occupational Health.
IN THIS SECTION:

3.1 Occupational health in general
3.2 Monitoring
3.3 Clean air - respiratory health
3.4 Chemical safety
3.5 Work related musculoskeletal disorders
3.6 Ergonomics
3.7 Psychosocial factors
3.8 Physical environmental hazards
3.9 Occupational Diseases
3.10 Skin diseases and skin cancers
3.11 Other occupational health publications
3.12 Delayed killers, serial killers and cumulative harm
### 3.1 OCCUPATIONAL HEALTH IN GENERAL

#### 3.1.1 PROMOTING OCCUPATIONAL HEALTH PRACTICE

<table>
<thead>
<tr>
<th>TYPE OF PROBLEM</th>
<th>EXAMPLES</th>
<th>CAUSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>An acute physical injury</td>
<td>A person loses a finger in an unguarded machine</td>
<td>Maintenance not done</td>
</tr>
<tr>
<td></td>
<td>A person slips on a wet floor.</td>
<td>Cleaning omissions</td>
</tr>
<tr>
<td>An occupational disease which is attributable to a workplace exposure</td>
<td>Solvent neuro-toxicity.</td>
<td>Lack of control of solvent vapour at source</td>
</tr>
<tr>
<td></td>
<td>Lepto-spirosis.</td>
<td>Lack of engineering controls and use of PPE</td>
</tr>
<tr>
<td>A common disease, a fraction of which is attributable to workplace experiences</td>
<td>The percentage of heart disease, depression or musculo-skeletal disorders attributable to workplace experiences</td>
<td>Work pressures, No sense of personal control, Low support at work, Relationships etc</td>
</tr>
</tbody>
</table>

Occupational health poses a slightly different set of challenges compared to safety. To appreciate why, realize that there are three broad sorts of work related health and safety problems:

**OCCUPATIONAL HEALTH DEALS WITH THE SECOND AND THIRD CATEGORIES**

The term ‘psychosocial’ (a definition is just below, but see also section 6 of this booklet), is used for the third category.

**COMPARING INJURY AND OCCUPATIONAL DISEASE**

Occupational **injury** is often very dramatic – something happens suddenly, there is blood and noise and a clear cause such as a spinning circular saw or an electric arc flash. The affected person usually gets lots of sympathy, even if they made a mistake.

Occupational illness is not usually dramatic. There are frequently no visible signs and even an occupational physician may miss evidence. An example is solvent induced neurotoxicity where signs resulting from solvent absorption may be interpreted as a personality disorder.

The causative agent is frequently invisible and may not be considered as a factor in the person’s demise or condition.

Worst of all there is often little empathy in co-workers and possibly the opposite. An example is the isolation of a person that may result from workplace bullying.

Harassment may occur when fellow employees can’t ‘see’ any reason for lost productivity. They may get a cold shoulder from the employer and an ACC claim is often denied.

**LONG TERM AND LATENCY**

Occupational health poses the issue of latency – where a disease develops some time after exposure. Examples are asbestosis and mesothelioma (two lung diseases related to asbestos exposure which have a long latency), and occupational asthma and allergic reactions – which have a shorter latency.
PERSONAL FACTORS
Personal factors can play a role in disease development. Examples:
> in a timber treatment plant a person will be more at risk if they are in the habit of touching their mouth with their hands
> a welder keeping his/her head in the welding plume
> a loader out at a sawmill does not use the roller stand provided.

PSYCHOSOCIAL FACTORS
What does this term mean? If ‘Psycho’ means Mind and ‘Social’ refers to Society we have ‘mind in society’. This reflects the idea that how we behave towards each other can be important in determining outcomes. This idea is, of course, as old as history. Clear demonstrations of the importance of psychosocial factors are found in Sections 5 and 7 in this booklet. Eg:
> Managing acute low back pain – where psychosocial factors are the most important barriers to recovery. How managers behave towards affected people can speed the return to work.
> Stress – where congenial relationships can moderate the effects of work pressure.
> Bullying – all about the quality of workplace relationships.

Being alert to these issues will help with occupational health practice.

3.1.2 GENERAL OCCUPATIONAL HEALTH AIDE-MEMOIR
Hazards to health can be categorised:
> Chemical – Clean air.
> Ergonomics.
> Physical.
> Noise, Vibration, Heat and Cold.
> Biological.
> Contagious and Infectious Diseases, Skin Diseases.
> Psychosocial.

The aide-memoir on pages 72 and 73 sets out this classification. It is one way of systematizing thought about occupational health. An A3 version of this tool is posted along with this booklet.

3.1.3 RISK ASSESSMENT
The Aide-Memoir makes no mention of risk assessment. That is the employer’s business.

RISK ASSESSMENT – CLEAN AIR (SECTION 3)
Toxic effects will depend on:
> the nature of the air contaminant
> its concentration in the air
> routes of entry (skin, mouth, breathing)
> the frequency and length of exposure
> the organs it may target
> its half life in the body and
> individual susceptibility.

For these reasons, assessing risk can be very complicated.

Reference to an industrial hygiene consultant will often be required early on. Air monitoring, a carefully taken history, observation of the process and toxicological input may all be required.

RISK ASSESSMENT – ERGONOMICS (SECTIONS 5 & 6)
For manual handling tasks, see the Manual Handling Hazard Assessment record in the ACOP for Manual Handling at:

When repetitive actions need to be assessed, seek advice from an Ergonomist, Occupational Therapist or Occupational Health Physiotherapist. There is a list of certified Ergonomists on the New Zealand Ergonomics Society Website: www.ergonomics.org.nz
<table>
<thead>
<tr>
<th>TOPIC</th>
<th>KEY OBSERVABLE</th>
<th>POSSIBLE HARSMS</th>
<th>CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Clean air Chemical exposures to the lungs, eyes and skin.</td>
<td>• Smells • Unsealed Containers • Dusts • Spills Explosives Flammables Toxics Corrosives Oxidisers Ecotoxics</td>
<td>• Lung/throat – diseases • Eye – irritation • Skin – problems • Head or body – dizziness, headache, nausea. Which apply? Rapidly fatal Slow acting Allergic response</td>
<td>Eliminate the substance and/or isolate the process. Control contaminants as close as possible to the source with local exhaust ventilation. Minimise exposure by use of ventilation, enclosed booths, personal protective equipment (PPE), damping with water, work practices and techniques. Provide information and training. Spill control Labelling – Storage – Disposal.</td>
</tr>
<tr>
<td>2. Ergonomics actions and postures</td>
<td>High force actions, Awkward postures. Repeated actions. No task rotation. No breaks, low task variety, fixed postures</td>
<td>Discomfort, pain and injury from: Acute low back pain (ALBP); Specific back injuries (SBI); Gradual process injuries (GPI)</td>
<td>Adopt the twofold approach of prevent serious back injuries (SBI) AND manage acute low back pain (ALBP). For Gradual Process Injuries (GPI), Consider the 7 contributory factors. A prime cause is muscles held tight for long periods without a break. Reduce muscle tension as described in Section 5.3</td>
</tr>
<tr>
<td>3. Noise</td>
<td>Can’t hear a normal conversation at one metre.</td>
<td>• Noise-induced hearing loss • Safety concerns through poor communication</td>
<td>• Control noise at source. • Isolate noise sources. • Provide information and training • Use PPE as a last resort.</td>
</tr>
<tr>
<td>4. Vibration</td>
<td>Felt in hands, feet or body. Goes with noise.</td>
<td>• Hand-arm vibration syndrome. • Whole-body vibration syndrome</td>
<td>• Eliminate through selection of equipment, maintenance. • Isolate with vibration isolators or • Minimise with damping and working techniques.</td>
</tr>
</tbody>
</table>
### TOPIC KEY OBSERVABLE POSSIBLE HAZARDS CONTROLS

#### 5. Heat and Cold
Facial appearance, sweating, irritation, shivering
See 8.2 and 8.3
- Heat stroke
- Cold stress
- Be aware of the 6 factors that affect feelings of warmth and cold.
- Have specially trained First Aiders for hot work and make sure rapid access to treatment is pre-planned.
- Be alert to locations and settings where these can occur.
- Seek specialist advice from a hygienist if, after reading the information in section 8, a solution can’t be found.

#### 6. Infectious and Contagious Diseases
Signs appropriate to the disease
- Leptospirosis*
- Hepatitis#
- Tuberculosis*
- Scabies*
- Campylobacter*
- HIV/AIDS*
- Legionella*
- Orf*
- Continual attention to strict hygiene; Obtain specialist advice from DMP
- For the topics marked # Worksafe NZ has advice.

#### 7. Skin Diseases
Skin lesions, redness.
- Irritant or allergic contact dermatitis, urticaria, skin cancer.
- Remove from work
- Prevent contact
- Reduce frequency and duration of exposure
- Use gloves – (choose carefully, they can make things worse)
- Avoid skin trauma, excessive heat/humidity, cold and chapping
- Use safe work habits
- Clean hands with the mildest possible cleansers
- Use a different chemical.

#### 8. Psycho-social
- Stress
- Violence
- Bullying
Fatigue and consequences, eg: increased errors, irritability, poor concentration, emotional distress. ‘Stress’ visible on faces. Isolation and withdrawal.
- Depression, Anxiety, Cardiovascular disease, Raised blood pressure, Stroke
**Stress:** People tend to respond to positive stress (challenges) with engagement, persistence, reserving judgement and humour. Negative stress (a threat) is characterised by tendencies towards delay, avoidance and thoughts about leaving.
**Bullying:** Cannot flourish in environments of openness, dialogue, treating people as people.
**Violence:** Many guidelines exist.
RISK ASSESSMENT – PSYCHOSOCIAL
(SECTION 7)
1. **Stress**: Questionnaires are available to assess experiences and risks.
2. **Bullying**: When people are asked if:
   > they have been bullied
   > if they have seen bullying in their workplace or
   > if they have been the target of negative acts (say 2 or more each week for 6 months).

The responses show a pattern of:
- Direct question: 4%
- Others bullied: 8%
- Negative acts: 20%

In other words, how a question is asked will affect the result. However, it is possible to question staff about Stress and Bullying using questionnaires and obtain useful results, as long as their interpretation and use is appropriate. For both topics, questionnaires should be administered by people who have had experience so that reliable interpretations are made.

RISK ASSESSMENT – NOISE (SECTION 8)
A Preliminary Noise Survey (as set out in the Noise Code) may indicate the need for a Detailed Noise Survey (DNS). Reference to an Industrial Hygiene consultant or noise specialist will be required for a DNS. See Section 8.6.

RISK ASSESSMENT – VIBRATION (SECTION 8)
Assessing risks of vibration by measurement is increasing in New Zealand but Worksafe NZ does not have advice on this topic. An alternative approach to physical measurements for both hand arm and whole body vibration is set out in the publications of the Off Highway Plant and Equipment Research Centre (OPEROC) in the UK:
1. **Traffic Light Scheme for Managing the Risks from Hand-arm Vibration and**
2. A guide to hand-arm vibration.


RISK ASSESSMENT – HEAT AND COLD (SECTION 8)
**Heat and Cold stress**: The WBGT and ECT methods as outlined and referenced at 8.2 and 8.3 respectively should be used.

RISK ASSESSMENT – INFECTIOUS AND SKIN DISEASES (SECTION 9)
Seek the advice of the appropriate specialist doctors or occupational physician.

3.1.4 THE OCCUPATIONAL HEALTH PANELS
Worksafe NZ has five Occupational Health Panels, typically comprised of 3 – 4 people with special expertise. They exist to advise Worksafe NZ and to review cases of disease investigated by Inspectors using the Notification of Occupational Disease (NODS) system.

The Panels are:
- Asbestos and Occupational Respiratory Panel.
- Chemical and Solvent Panel.
- Musculoskeletal Panel.
- Psychosocial Panel.
- Physical Hazards Panel.

3.1.5 KEY PRINCIPLES FOR CONTROLLING HAZARDS
Here are some brief summaries about prevention principles:

**AIR CONTAMINATION**
- Eliminate the contaminant.
- Substitute it with something less toxic.
- Isolate the process.
- Use administrative controls.
- Control emissions at source (using local exhaust ventilation).
Monitor environmental exposures to significant hazards.
Monitor personal health.
Provide information and training.

**MUSCULOSKELETAL**

Distinguish between acute low back pain and serious back injuries.

Make sure employees know how to self treat for acute low back pain – and what to expect from their GP.

**Specific Aims for preventing back problems:**

**Low back pain:**

Aim to prevent acute low back pain getting worse, using the ACC material on psychosocial flags.

**Serious Back Injuries:**

Aim to prevent serious back injuries happening, using the ACOP for Manual Handling.

Consider all 7 of the contributory factors set out in Section 5.2

When preventing gradual process injuries happening (overuse disorders) also focus on preventing prolonged muscle tension. See Section 5.3.

**PSYCHOSOCIAL HAZARDS**

Think as much about adding good things to work as removing bad things.

Take reports of stress at face value and investigate in good faith.

Find out what category of work the person is doing. Tailor prevention to the category.

There are 3 ways to control stress:

> Make work healthy.
> Improve the fit between the person and the job & vice versa
> Stress management – the least preferred option.

Embarrass bullying out of an organisation by (a) creating an environment where it cannot flourish and (b) improving relationships between people.

The Worksafe NZ Stress page:


The 2014 Bullying Guideline is at:


### 3.2 MONITORING

#### 3.2.1 EXPOSURE MONITORING

Clean air is necessary for a healthy life.

A difficulty arises when the extent to which workplace air is contaminated is not known. For example, in a motor garage – can engines be run safely inside or should exhausts be fitted to the tailpipes of the cars being worked on?

In these sorts of situations, air monitoring can supply answers as part of a risk assessment. Monitoring is carried out for different contaminants with different equipment:

> **Inhalable and respirable dusts:** A variety of pumps and collecting heads and filters are used.
> **Chemical exposures:** Absorbent tubes and badge samplers are used as well as direct reading instruments (PID, Gas meters).
> **Biological exposures** – bacteria and fungi – both viable and non-viable (dead or alive).
> **Specific contaminants:** Many types of dedicated monitor exist.

**DUSTS**

**Inhalable dust:** Definition: Particulate that is hazardous when deposited anywhere in the respiratory tract. The sampling definition of the inhalable fraction is a sampling device
that has 50% efficiency at capturing particles of 100\textmu M aerodynamic diameter.

Inhalable dust is normally eliminated via the mucociliary escalator\(^2\).

**Respirable dust:** Definition: Particulate that is hazardous when deposited in the gas-exchange region of the lungs. The sampling definition of the respirable fraction is a sampling device that has 50% efficiency at capturing particles of 4.25\textmu M aerodynamic diameter.

These particles will penetrate to the deepest parts of the lungs and can have toxic effects over a long time. Silica dust is an example. Respirable dust must be measured using a cyclone sampling head with the air flowing at a set rate and the dust collected on a suitable filter.

**CYCLONE FILTER HEAD**

Dust can be collected on a variety of filters, depending on what is being sampled, other contaminants in the air and the analytical method.

For example, if the level of lead in air is being measured, the dust is collected on a filter that is soluble in acid

**Sample applications:**
- The air in a foundry is sampled for silica
- The air in a leadlight window manufacturers’ workshop is sampled for lead.

**CHEMICALS**

Chemicals in the workplace air can be sampled by drawing air through glass tubes 2 – 10 mm in diameter containing an absorbent material such as activated carbon or silica gel. Sometimes the gel is impregnated with a chemical to increase the efficiency of the absorption.

Chemical sampling can also be done using direct reading instruments.

Reference to the NIOSH/OSHA/HSE/EPA compendium of analytical methods needs to be made owing to the variety of methods available and the specificity required for different substances. [www.cdc.gov/niosh/docs/2003-154/](http://www.cdc.gov/niosh/docs/2003-154/)

**Sample applications:**
- Ammonia can be sampled using a glass tube containing silica gel treated with sulphuric acid – or by using a direct reading meter.
- For methyl bromide, (the fumigant) two petroleum charcoal tubes, of 400 mg and 200 mg are used, (preceded by a drying tube containing sodium sulphate in humid environments).
- A direct reading meter can often be used.

**BIOLOGICAL CONTAMINANTS**

A particulate filter treated with agar (and a normal pump) or an agar plate attached to a specialised sampling pump is used. Standard culture methods can then be used to measure the concentration.

**Sample applications:** The air in an office building is sampled for moulds and bacteria.

**SPECIFIC CONTAMINANTS**

A large variety of purpose built meters exist to measure specific air contaminants. Examples are: hydrogen sulphide, carbon monoxide, oxygen, carbon dioxide, ammonia and ozone.

**Sample applications:**
- To signal low oxygen levels in a confined space
- To signal an explosive atmosphere.

---

\(^2\) This term refers to fine hairs (cilia) that line the respiratory tract and which beat in concert in such a way as to move the mucus that is secreted in the lungs upwards – for it to be spat out or swallowed. It serves two functions: to keep the lower respiratory tract sterile, and to prevent mucus accumulation in the lungs.
3.2.2 WARNING

All but the simplest sampling is beyond the capacity of most Health and Safety Advisors.

Employers should refer to specialist consultants with appropriate laboratory backup.

Exposure monitoring results can be compared with workplace exposure standards, but specialist advice should be consulted to ensure the interpretation is correct.

3.2.3 WORKPLACE EXPOSURE STANDARDS GL

Workplace exposure standards (WES) refer to concentrations of airborne substances and represent levels to which it is believed nearly all workers may be exposed to repeatedly day-after-day without adverse effect.

WES are guidelines for those involved in occupational health practice. Their use by untrained persons for determining ‘compliance’ is not recommended.

Compliance with the WES does not guarantee protection from discomfort or ill-health outcomes for all workers. The range of individual susceptibility is wide and it is possible that workers will experience problems from exposure to substances at levels below the WES.

It is inevitable that some WES will be lowered in the future.

WES should not be used to differentiate between exposure levels that are safe or unsafe. The relationship between two exposure standards cannot be used as a measure of relative toxicity.

Some WES are designed to prevent the development of ill health after long-term exposure; others to reduce the possibility of acute effects.

Chemicals may enter the body by inhalation, ingestion or skin absorption. Inhalation is the most important route.

The feasibility of limiting exposure varies from substance to substance and in practice this may restrict the safety factor that can be realised.

Note: Regardless of the WES, it is important to take all reasonable steps to reduce the concentration of airborne substances to the lowest practicable level.

Source: Guideline: Workplace Exposure Standards at:


3.2.4 BIOLOGICAL MONITORING AND BIOLOGICAL EXPOSURE INDICES (BEI) GL

Biological monitoring — the measurement of a substance (or its metabolites) in body fluids such as urine or blood — provides a complementary approach to air monitoring for the estimation of exposure to workplace contaminants.

A Biological Exposure Index (BEI) is defined as follows:

- If a worker’s inhalation exposure is equal to the WES, and he/she is engaged in moderate work, then the BEI represents the expected level of the biological determinant.

In most cases, the BEI has been derived from the observed relationship between the measured exposure and the biological level, but in some instances the relationship between the biological level and the potential health effects has been approached more directly.

Results from biological determination may reflect:

- very recent acute exposure
- the average exposure over the last few day(s), or
- long-term cumulative exposure
- the half-life of the substance in the body.
The BEIs assume that the exposure has been reasonably steady and that an 8-hour day, 5-day week has been worked. Extrapolation to other exposures can be made but only with a clear understanding of the relationship between the absorption, metabolism, and elimination of the substance in question.

Biological monitoring has been widely used to monitor the uptake of cumulative toxins (eg lead, mercury, organophosphate insecticides). It also may be employed effectively where there is a significant potential for increased uptake as a result of skin absorption, increased respiratory rate, or exposure outside of the workplace.

Generally a BEI associated with only one assay is given for exposure to each substance, even though there may be several possible ways of estimating exposure. Preference has been given to urinary assays over more invasive blood tests but factors such as the stability of the sample and the possibility of interferences have also been considered.

**BEIs exist for:**

<table>
<thead>
<tr>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>acetone</td>
</tr>
<tr>
<td>arsenic</td>
</tr>
<tr>
<td>cadmium</td>
</tr>
<tr>
<td>carbon monoxide</td>
</tr>
<tr>
<td>chromium</td>
</tr>
<tr>
<td>cobalt</td>
</tr>
<tr>
<td>2-ethoxy-ethanol</td>
</tr>
<tr>
<td>fluorides</td>
</tr>
<tr>
<td>hexane</td>
</tr>
<tr>
<td>lead</td>
</tr>
<tr>
<td>mercury</td>
</tr>
<tr>
<td>pentachlorophenol</td>
</tr>
<tr>
<td>phenol</td>
</tr>
<tr>
<td>styrene</td>
</tr>
<tr>
<td>trichloroethylene</td>
</tr>
<tr>
<td>methyl alcohol</td>
</tr>
<tr>
<td>methyl ethyl ketone (mek)</td>
</tr>
<tr>
<td>methyl isobutyl ketone (mibk)</td>
</tr>
<tr>
<td>Organo-phosphates</td>
</tr>
<tr>
<td>sodium fluoroacetate (1080)</td>
</tr>
<tr>
<td>xylene</td>
</tr>
</tbody>
</table>

For routine surveillance of exposure to some substances, biological monitoring may be preferred over air sampling. Eg: if the substance has a long half-life in the body, the monitoring will give a result that reflects an integrated exposure.

Quantitative interpretation of biological monitoring results is often difficult. The quality of the information may be improved if measurements are obtained from several workers with similar exposure, or from serial determinations the same worker. Before doing biological monitoring, it is essential to get background information, including data on the pharmacokinetics of the substance and interferences.


(Take care in interpreting the lab reports from CDHB. They are not well set out.)

### 3.2.5 PERSONAL HEALTH MONITORING

In this section **Audiology** and **Lung Function Testing** are discussed in some detail. For these two topics a lot of knowledge and precedent exists.

Monitoring for these will normally take place in a clinic and be performed by health staff.

**Vibration** monitoring will be different for hand arm vibration syndrome (HAVS) and whole body vibration (WBV).

**Visual status** monitoring will need to be performed by an Optometrist, preferably one with expertise in Occupational Optometry.

Monitoring for **Skin Status, Sleep and Impairment** can be performed onsite, with follow up by a GP, dermatologist or specialist sleep clinic. Skin status, Visual Status, Sleep and Impairment are new inclusions, for the following reasons:
> **Skin**: Checking for skin diseases can prevent small problems becoming large. The discussion explores what to look for and the industries in which skin problems are most common.

> **Visual status**: If a person can’t see properly how can they do the job properly? Ageing workers pose special problems.

> **Sleep**: If a person has not slept well the night before, or has accumulated a sleep debt, their ability to work safely may be impaired.

> **Impairment**: This is the generalised case of impairment leading to a person being less able to work safely.

### LUNG FUNCTION MONITORING

Monitoring lung function can be done with the following methods:

> **Questionnaire**.

> **Peak flow meter**.

> **Spirometry**.

> **Chest x-ray**.

1. **A questionnaire** is cheap and easy and can be given as an initial screening tool by a health and safety representative. They will not be able to interpret the results which will need referral to an Occupational Health Nurse or Occupational Physician.

2. **Peak flow meters** measure the maximum rate of expired air. They are cheap, simple and easily carried, and can give useful though limited information. They can provide an indication of both the amount of airway obstruction and any variability of the obstruction over time. They can be used by an Occupational Health Nurse.

3. **Spirometry** measures airflow and lung volumes, and is the preferred lung function test. A spirometer is more complicated than a peak flow meter and requires moderate skill to operate.

4. **Chest x-ray and other radiology**.

   Chest x-rays are performed occasionally when clinically indicated. Eg Pneumonia, Asbestosis. They are ordered by a GP or Occupational medicine doctor.

   Historically, chest x-rays were sometimes performed as a screening test to detect early development of lung disease eg Asbestosis. This is not generally done now as it had a very low pick-up rate and can cause lung damage.

   For more details consult your DMP.

### AUDIOLOGY

**Hearing surveillance has 3 aims**:

1. To identify people with hearing impairment or tinnitus and to prevent further hearing loss.

2. To monitor the effectiveness of noise control measures.

3. To detect the need for an education programme.

As with all types of biological monitoring, the person being tested must understand the reasons for the monitoring, give their agreement and be informed of the results. It is useful if the employee agrees to allow their manager to be informed of these results as they need to be able to identify people at risk when planning to control the risks in the workplace.

**The Audiogram**

As with most biological monitoring, it is important to obtain a ‘baseline’ by performing an initial audiogram. This identifies any hearing loss present before the current employment and allows a more accurate assessment of the effects of noise in the current workplace.

**After the initial audiogram**:

1. Audiograms should be performed regularly for all people working in an environment which has an established or suspected noise hazard.
2. The baseline audiograms should be performed within 3 months of initial employment, after a period of at least 16 hours quiet. This could follow a period of absence from work or the wearing of high-grade hearing protectors to ensure that the exposure is no higher than 75dB(A). The beginning of a shift is often used to perform hearing surveillance.

3. Audiograms should be repeated no further apart than 2-yearly. They should be done more frequently where:
   a. There is evidence of hearing loss.
   b. New processes have been introduced which pose a greater noise hazard.
   c. When requested by a specialist.

4. Ideally, audiograms should be performed in specially designed booths to allow everyone to detect the faintest sounds at the threshold of hearing.
   Audiograms should be carried out in an environment where background noise is less than the levels specified in AS/NZS 1269.4, 2005. Where ambient noise is greater than this, noise-excluding head sets or a testing booth should be used.

5. Technical equipment should meet standards and be calibrated regularly.

The Diagnosis of NIHL

Worksafe NZ [in common with international practice] has adopted pure tone measurements to diagnose NIHL. This may not reflect a person’s ability to communicate in a workplace – which is often the most serious effect of NIHL. The following criteria have been chosen to make the diagnosis as straight-forward and reproducible as possible.

Occupational History

There should be a clear history of sustained exposure to loud noise at work. The practitioner should ask the person what industries they have worked in and for how long in each. An attempt to identify the noise levels at each task (eg was speech possible without shouting? were the ears ringing at the end of the day or week?) should be made and the control measures employed (PPE, engineering control, hearing surveillance) should be assessed. Comment should be made concerning the degree and type of recreational noise exposure.

Results of the screening audiogram

Audiometry should not be a stand-alone function but be part of an industry-based hearing conservation programme. In order to make the diagnosis of NIHL, the following are necessary:

1. The shape of the hearing threshold curve should show a characteristic notch at 4–6 kHz, with a recovery at high frequencies usually required.

2. A symmetrical loss is expected in each ear, or there should be an explanation for asymmetry. Asymmetry could result from a hobby involving rifle shooting. If there is no convincing explanation for asymmetrical loss, referral to an otolaryngologist should be considered.

3. To notify Worksafe NZ, the audiogram must measure the magnitude of the hearing loss by noting the depth of the notch from an established baseline.

The criteria adopted for notification is that the threshold at 4KHz is at least 30dB Hearing Loss (HL) and is at least 15dB worse than the 2KHz threshold.

Loss of Recovery above 6kHz

It is usual for the audiogram to show a recovery in both ears for frequencies above 6 kHz. If this recovery is not present, the diagnosis of NIHL should be reconsidered. Many severe cases of NIHL do not show this recovery (sometimes this recovery is absent
because of tinnitus) and NODS will accept a case without high-frequency recovery, accompanied by an explanatory note by a referring or reviewing specialist.

**Notification**

Worksafe NZ will accept notification without further validation from otolaryngologists, occupational physicians or other health professionals who have undertaken and passed the National Audiology Centre’s 2-day hearing conservation introductory course.

**HEALTH MONITORING FOR VIBRATION DISEASE**

1. **Hand Arm Vibration Syndrome (HAVS)**

Information and training for at-risk employees should emphasise that this problem can be career limiting. The symptoms and signs need to be explained along with comprehensive prevention measures so that employees may self report to the employer.

The employer needs to be proactive in personal health monitoring where there is vibration exposure - which by definition won’t have been eliminated or isolated. An Occupational Health Nurse could perform this monitoring on site. If signs of vibration disease are found, referral to a specialist physician is required.

2. **Whole Body Vibration (WBV)**

Monitoring should comprise asking workers about back problems and their possible relation to driving vehicles such as forklifts or in mining operations. Using a questionnaire every 6 months is a good idea – such as the one on page 49 of the ACOP for Manual Handling at: www.business.govt.nz/worksafe/information-guidance/all-guidance-items/manual-handling-code-of-practice-for

**HEALTH MONITORING FOR VISUAL STATUS**

**Introduction**

Poor vision performance affects safety and productivity and can accelerate fatigue at the workplace.

Visual performance can be assessed in many ways. Reading letters on a chart to measure Visual Acuity (VA) is the most familiar test. However, stereoscopic [three dimensional] VA is very important for precision tasks such as crane operation, hairdressing, driving a forklift and flying.

To see a task clearly, the eyes must be kept still. This means that the muscles in the upper trunk and neck, the face, the forehead and around the eyes are involved in the visual task. Tension can occur in all of these and result in fatigue. This ‘straining’ to see can lead to headaches, sore, tired eyes and distraction from the task.

A full assessment of visual performance therefore needs to take into account all the needs of the visual task, including loads placed on the muscles of the face, head, neck and upper body. This task is best done by an optometrist specialising in eye safety and visual ergonomics.

Colour coding in signage, cabling and signaling requires a high level of colour perception. This performance factor is more likely to be deficient in males and will be of relevance to electricians (cable coding) and people doing spraycoating (colour matching).

**Visual Standards & Performance**

A distinction must be made between the ‘Visual Standards’ required for functional vision in the workplace and the ‘Visual Performance’ of the workforce to be achieved to meet the standards. For example, NZ Police requires Police Officers to achieve high visual standards under conditions of low luminance to ensure safe driving at night in adverse
weather. Similar standards can be developed for any industry (e.g., road transport, aviation, microscopy), using tests of visual acuity, stereoscopic visual acuity. Note that many other tests of vision are available for specific purposes.

**Workstations**

At workstations (e.g., computer workstations, reception areas, cabinet making, laboratory work), near vision requirements are the most important. Few people will reach the age of 45yrs before requiring a visual correction (glasses or contacts) for close work. The demographic of an aging population is important when considering visual health schemes for the workplace.

The visual demands of screen-based tasks are well documented. However, there is no evidence of harm to vision caused by computer use. Investigation of computer workplaces and assessment of employee complaints shows that symptoms can be attributed to:

- uncorrected vision
- postural compromise
- ventilation and air conditioning
- poor illumination.

**Cross Reference:** 3.8.5 Page 162

**HEALTH MONITORING FOR SKIN INTEGRITY**

Contact dermatitis accounts for at least 60% of occupational dermatoses, which, in turn, is responsible for 40–70% of all occupationally acquired illness.

The majority is irritant dermatitis but a significant portion is allergic contact dermatitis. This is more difficult to control once developed and the focus should be on the prevention of contact with strong allergens.

The appearance of the dermatitis may provide few clues as to its cause, and whether or not it is a contact dermatitis or another condition may be difficult to ascertain, so a careful assessment is important.

**Dermatitis** (eczema) is usually described as being erythematous (rose-coloured patches) and scaly (which may be well or poorly circumscribed) looking like eczema. Vesicles (tiny sacs containing fluid) are common on the hands although the dermatitis may sometimes be ‘weepy’ rather than vesicular. There may be superficial or deep fissures.

**Fungal infections** show powdery scaling on the palm.

**Psoriasis** often involves pustules or silvery scale but not generally vesicles. It can affect the scalp, extensor surfaces of the elbows and knees and nails which would be unusual for atopic eczema which affects the flexor surfaces of the elbows and knees.

**Photoallergy and Contact Urticaria** are also possible reactions. Their location and appearance can be more specific, but it is not always possible to distinguish them from these factors alone.

Referral to a GP or specialist is required in all cases.

**Note:** A culture of respect for the skin and a high index of suspicion for work relatedness when problems appear will be part of a sensible safety culture.

**Cross Reference:** 3.10 Page 176

**HEALTH MONITORING FOR SLEEP QUALITY**

If a person has not slept well the night before or has a sleep debt (several nights with inadequate sleep) the person may be impaired
and thus not able to perform a task safely or properly.

Therefore it is in the interests of everyone to promote good sleep. Sleep, along with nutrition and exercise, is one of the three foundations of health – and generally requires more promotion.

This is not trivial. A 2004 Australian project put the cost of poor sleep and sleep disorders to the Australian economy at 1.4% of GDP.

This was mainly due to the costs of workplace accidents and road crashes. Another study of 2003 concluded that 120 Australian lives lost through road crashes could have been prevented if fatigue from poor sleep had been addressed.

Advice about sleeping well is mature and validated. Googling with a search term such as ‘sleep hygiene’ will produce relevant information.

At an individual level, it may be difficult for an employer to detect sleep problems.

Given the emergencies and exigencies of life, it may be inappropriate to try to find out.

On the other hand, where an employee is performing safety critical tasks, an employer should take all the practicable steps open to him/her to find out if an employee is impaired. (See the full discussion on ‘Impairment’ at 2.5.7.)

On a population scale, having people well rested is a likely economic benefit.

Source: See, for example, the advice at the University of Maryland Sleep Disorders Centre: www.umm.edu/sleep/sleep_hyg.htm

Cross Reference: 3.7.6 Page 151

MONITORING FOR GENERAL IMPAIRMENT

If a person is impaired he or she may pose a workplace hazard.

Example: A scaffolder who has been up all night with a sick child at a hospital is probably unsafe to work safely.

Impairment may result from:
> Fatigue (physical, mental or emotional).
> Reactions after an accident.
> Unresolved conflict.
> Medical treatment or medication.
> Harassment or bullying.
> A family crisis.
> Alcohol or drugs.
> Out of work events – examination, moving house etc.
> Poor shiftwork patterns.

Employers are required to take all the practicable steps open to them to detect hazards and this applies to impairment in employees which may compromise safety.

Many employers are alert instinctively to this issue.

In a short guide on impairment, Worksafe NZ made the suggestion that 13 questions might be asked by employers (see page 35):
> How many hours have been worked in the past week?
> What is the pattern of the hours worked?
> Is there acute sleep loss?
> Is there a sleep debt?
> Are nights being worked?
> Are there life stresses away from work for the employee?
> What coping ability has the employee shown in the past?
> What support at home is there for this employee?
> What is the physical, mental and emotional intensity of the work?
> What is the employees’ physical, mental and emotional fitness?
> What environmental factors may impinge on fatigue?

Putting the answers to the questions together in a specific situation to get a conclusion won’t always be easy.
Note specifically that there is no suggestion that the employer must ask all these questions in every situation. Clearly, some of them are private issues, and would need to be asked sensitively. Further, it may simply not be appropriate to ask some of them.

The guide discusses aspects of this situation – that many factors are outside the employer’s control and the employee’s control – what to do if the employee does not recognise the hazard s/he is causing and – if there is ongoing impairment.

Source: Pamphlet. Search with ‘Impairment’ at the Worksafe NZ Health and Safety Publications page:


3.3 CLEAN AIR – RESPIRATORY HEALTH

GENERAL

This section is about workplace air contamination. The safety of employees relies, in part, on being informed about these hazards and alertness, intuition and experience in identifying their presence to an employer.

Key points are:

> alertness to the possibility of air contamination
> recognition of possible types of contamination in different employment settings
> knowing basic risk assessment and control measures and
> knowing what to do when knowledge runs out.

Points 1 and 2 rely on being informed and personal abilities. Point 3 is covered (in part) in this aide mémoire. Point 4 requires referral to a specialist.

Workplace safety and health is the responsibility of the employer. All that’s been said so far applies equally to employers and their advisors.

Clean air is included to raise awareness and to emphasise that exposure to hazardous substances – including those that cause allergic reactions – is an ongoing important problem.

The topics are presented without prioritisation due to the scant information on which to assign priorities:

> some are potentially rapidly fatal but occur infrequently
> some are slow acting but have more frequent exposures and some
> some create an allergic response with time.

A. CONTROLLING AIR CONTAMINANTS

1. Eliminate the substance or process producing the contaminant.

Substituting hazardous materials with non- or less-hazardous ones, by automation with enclosure or outsourcing can mean:

> good relations with regional councils
> complaints from neighbours are eliminated
> the need for monitoring is eliminated (see point 4 below)
> on-going costs for personal monitoring and assessment are eliminated
> the need for protective equipment and training is eliminated
> clean-up is easier
> fire hazard and, maybe, insurance costs are reduced
> HSNO commitments are reduced.

2. Isolate the process

This can be achieved by automation and enclosed ventilation, using a booth, or isolating the person (eg in an airtight cab or control room).
3. Minimise exposure

Exposure to hazardous processes or substances which are not eliminated or isolated must be minimised by the use of ventilation, booths, PPE, damping with water, work practices and techniques.

4. General air ventilation

Eg: fan in the roof/open doors. This is adequate for some situations (eg piggeries) but is wasteful and totally ineffective for airborne exposures from most industrial processes (eg spray-coating and welding).

5. Control at source

Contaminant control at source means ensuring the escape of contaminant to the atmosphere is minimised. This can be achieved with eg:

- local exhaust ventilation (see following section)
- keeping lids on containers
- automatic dispensing methods.

Controlling at source results in:

- better control over airborne contaminants – reduced employee exposure
- energy efficiency – local extraction ventilation saves on power costs (as less air needs to be moved)
- loss control – by evaporation of costly thinners and solvents,
- lower ACC and sick leave liabilities.

6. Monitor exposure to significant hazards

If the employer judges that serious harm may result from exposure to any chemical and the exposure cannot be eliminated or isolated, then:

- the employer must monitor employees’ exposure and
- if there is a method for doing so employers must (after getting their informed consent) monitor employees’ health in relation to the chemical exposure (See section 2.4).

Types of air contaminants

<table>
<thead>
<tr>
<th>TYPE</th>
<th>WHAT IT IS</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>Tiny bits of solid material suspended in the air.</td>
<td>Wood dust in cabinet making or a craft woodworker using rimu; flour in a bakery; mould dust from bird droppings or compost.</td>
</tr>
<tr>
<td>Mist</td>
<td>Tiny droplets of liquid suspended in the air.</td>
<td>Acid mist at an electroplating shop; water spray near an air-conditioning unit.</td>
</tr>
<tr>
<td>Fume</td>
<td>Extremely fine metallic particles originating from a hot process.</td>
<td>Metal fume in a foundry or from welding process.</td>
</tr>
<tr>
<td>Vapour</td>
<td>Gas from an evaporating liquid.</td>
<td>Paint thinners during spray-coating; solvents from recently LOSP-treated timber; fibreglassing.</td>
</tr>
<tr>
<td>Gas</td>
<td>Carbon monoxide from the use of petrol-powered forklift used in a confined space. Methane from anaerobic decay of organic matter in a silo.</td>
<td></td>
</tr>
</tbody>
</table>
7. Personal protective equipment

Is not a cheap option:

> it is usually uncomfortable to wear
> compliance is poor
> training about when to use it will be needed
> PPE needs to be selected and fitted correctly (using a fit test)
> it must be maintained and replaced as it wears out
> it must also be worn, which is frequently uncomfortable!

8. Information to employees

Provide clear information to employees about the hazards of what they are using and doing with it, what is happening to control clean air hazards and what their responsibilities are.

B. INDUSTRIAL VENTILATION

Industrial ventilation means the use of supply and exhaust ventilation to control emissions, exposures, and chemical hazards in the workplace. Traditionally, air-conditioning has been used to control temperature, humidity and odours. This more of a Building Certification matter.

Industrial ventilation is in 2 main types:

1. Dilution ventilation

Where air is blown into a space to dilute contaminants and force them outside. This might be visible as a large fan on the ceiling of a factory. This approach used by itself is quite inadequate in many situations.

This type of ventilation is not energy efficient for controlling specific industrial processes being carried out in a factory. This is because the amount of air required to dilute the contaminants, compared to the size of the room, is so great that it uses a lot of power.

Dilution ventilation must never be used to control toxic substances eg some solvents, welding fume, spray-coating vapour. Control at source is required.

2. Local exhaust ventilation (LEV)

LEV systems capture contaminants as close as possible to their source (with a hood) and convey the contaminant through ducting with the contaminated air being discharged through a stack [chimney] via a scrubbing system (eg dust bag, bag house or electrostatic precipitator).

LEV is the preferred option, as it reduces the release of contaminants into the workplace and the potential for exposure. LEV systems require specialist engineering knowledge in design, fabrication, installation, evaluation and maintenance.

LEV systems should capture the contaminant. This is a matter of hood design and placement. It must be positioned so that it draws contaminant away from the worker. (Smoke tubes are very good for showing how well a hood captures a contaminant.)

The velocity of air needed at the hood face will depend on the type of contaminant and how it is produced, eg metal particles produced from grinding are thrown out at high speed therefore require a high velocity to be dragged into the exhaust hood.

Deciding on the right air velocity and the type of hood to use should be done by a specialist eg a hygienist or ventilation engineer. It is usually cheaper and easier to design the ventilation right in the first place than it is to try and fix an ineffective ventilation system (that in the mean time may be providing little or no protection for workers).

Refer to a specialist when:

> the capture is inadequate - ie flow rates or hood position do not appear to capture contaminants
> the hood appears to be badly designed
> the LEV system leaks (dust or contaminant deposition on or around the ductwork)
> filters ‘appear’ to be overloaded.
C. COMMON MISCONCEPTIONS

MYTH 1:
‘They have ventilation so it’s all under control’
Ask yourself/your client:
> Is it working, is it used, can it do the job?
> When is it used, does it have sufficient capture velocity?
> Is it controlling at source?
> Is it maintained (records)?
> Are filters changed?
> Is any contaminant escaping though leaks in ducting/hood?
> Is the contaminant being taken away from the operator rather than towards their breathing zone (e.g. for hot processes, such as welding, the rising plume will invade the breathing zone if the hood is above the welder)?

MYTH 2:
‘There’s a filter so it’s all OK!’
A good example of futility is the ventilation system used in nail bars.
Typically, a slot or grid in the table where clients rest their hands is exhausted through a tube and charcoal filter. Given the amount of solvent in the air (which can’t all be completely captured by this arrangement) the charcoal filters will need changing so frequently as to make the cost prohibitive.

MYTH 3:
‘The vapour/gas is heavier than air so therefore the ventilation should be placed near the ground’
The biggest myth in the book!
The only time a vapour/gas collects in a pool at floor level is when there are completely still conditions and very high concentrations (higher than a person could work in) i.e. no drafts, no doors/windows open, no thermal gradients, no machines moving to create air currents or people moving around and no LEV. This situation is very rare in most industrial settings. It may occur in tanks, silos or unused rooms. In all cases vapours/gases are best controlled at the source i.e. ventilation at the machine/task and since people generally don’t work at floor level this means it should be placed at working height.

www.acgih.org

3.3.1 DUSTS
ASBESTOS

What is the problem?
Asbestos can cause serious lung diseases (asbestosis, lung cancer, mesothelioma) and cancers in other parts of the body.
Asbestos is found in brake and clutch linings and in building products formerly used in New Zealand, including asbestos cement cladding, textured ceiling coatings, thermal insulation around pipes and boilers, and fire-protective linings on structural steel (limpet asbestos).
Asbestos exposure can occur during building demolition, floor sanding and work on brake linings in car repair.

Problem assessment
Laboratory analysis will be required to confirm asbestos in suspicious materials.
Environmental monitoring is required during removal.
**The Asbestos Regulations**

Work with asbestos is regulated under the Health and Safety in Employment (Asbestos) Regulations 1998. These Regulations specify particular tasks that must be notified to WorkSafe NZ before work begins.

The tasks must be carried out by a person holding a certificate of competence, or by someone under the direct supervision of a person holding a certificate.

**Control measures**

The Regulations also specify controls that apply to anyone working with asbestos.

Where contact with asbestos-containing products cannot be avoided, then all practicable steps must be taken to minimise exposure.

This may be achieved by:

- Ensuring that effective steps are taken to stop or limit the release of asbestos fibres into the air.
- Ensuring that sound work practices are used to avoid the spread of asbestos contamination on clothing and footwear (wearing disposable outer clothing is recommended).
- Using dust extraction where the generation of fibres from a process cannot be avoided.
- Appropriate protective clothing including respiratory protection.

**Health surveillance**

It is essential to monitor employees who carry out restricted work with asbestos.

A Departmental Medical Practitioner may require any person undertaking work with asbestos to have a medical examination.

Employees who may have been exposed to asbestos are also invited to enter their names and appropriate exposure details in the Asbestos Exposure Register administered by WorkSafe NZ.

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**The Christchurch earthquakes**

The Christchurch earthquakes have led to new interest because of the presence of fibres in so many of the demolition sites.

As a result, new material has been presented on the WorkSafe NZ Asbestos page at:  

1. A new removal guideline has been published.

2. Fact sheets have been developed about:
   - where asbestos is likely to be found
   - personal protective equipment
   - work exposure standards and monitoring.

3. The scheme for certifying asbestos removalists has been strengthened.

**Source:** A revision of the Asbestos Removal Guideline was published by the New Zealand Demolition and Asbestos Association in March 2011. See:  
www.demolition-asbestos.co.nz/

Asbestos exposure and disease: Notes for Medical Practitioners at:  

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**LEAD**

GL, MOH GL

The main exposures are in foundries, paint stripping, leadlight fabrication and sundry casting (fishing sinkers).

**What is the problem?**

Airborne lead dust can cause lead poisoning. Ingestion is also significant.

**Problem assessment**

Exposure measurements can indicate the concentration of lead in the breathing zone.  
WES = 0.1 mg/m³.
Biological monitoring indicates the level of lead absorption and is required when people are exposed to lead routinely. Lead in blood – 1.5 μmol/l in red blood cells. Lead in urine – 0.72 μmol/l action level.

**Control measures**

Generic control measures include:

**Foundries:** Lead paint can contaminate ferrous metals. Brass scrap contains lead. Gas cutting/gouging and furnace heat may produce lead fume. For control, use enclosed processes and local exhaust ventilation where possible. PPE should consist of the items below plus the appropriate lead fume respirator.

**Paint stripping:** Sanding or removal of paint from old houses with a blowtorch can produce lead dust and fume. Identify lead in paint with a test kit from a paint shop (Google: ‘lead test kit’).

Use a wet process where possible but prevent lead leaching into garden soil as it could cause sickness in children or pets.

Use PPE as below. Take care to prevent secondary exposure when taking clothing off and laundering.

**Sundry casting:** (eg boat keels, fishing sinkers): Avoid exposure to fume and dust with ventilation and PPE.

**Leadlight windows:** Avoid exposure to fume and dust with ventilation and PPE.

**Loading ammunition:** Avoid exposure to dust with good ventilation and PPE.

**Personal protective equipment:** Appropriate dust or fume respiratory protection; overalls; apron; gloves; hair covering. Do not expose anyone to dust when taking off or laundering PPE.

**Hygiene:** Strict attention to hand hygiene and other hygiene practices is required to prevent ingestion.


**Ministry of Health** Repainting Lead-Based Paint:


**SILICA**

Foundries, abrasive blasting, quarries mines, road making, concrete cutting.

**What is the problem?**

Silica dust can be present in the settings listed due to the use of sand or when rock is crushed. Continued exposure can produce serious lung disease.

**Problem assessment**

Employers should carry out air sampling to assess the level of risk. Analysis of solid samples of parent rock or sand can show its silica content and may help to predict if air concentrations are likely to be hazardous. New Zealand sands are usually high in silica, but most sandblasting appears to be with silica-low or silica-free sand or glass beads.

The WES for Silica is different for its different forms. The values are 0.1mg/m$^3$ or 0.2mg/m$^3$ for respirable or inhalable dust for cristobalite, quartz, tridymite and tripoli. Consult Technical for details.

**Control measures**

**Foundries**

Substitution of silica-free sand may not be possible. Instead, local exhaust ventilation, enclosure of processes and the informed use of personal protective equipment (PPE) should be undertaken.
Abrasive blasting
Substitution by silica-free alternatives is widely practised. Properly designed booths and PPE should be used.

Quarries, mines, road making
- positively pressurise vehicle cabs and process control rooms
- water damping where possible
- use of PPE when outside
- adequate dilution ventilation.

Concrete cutting
Use of wet processes. In confined spaces – damp dust before sweeping up.

WOOD DUST
What is the problem?
The most serious concern relates to the risk of cancers of the nose (adenocarcinoma) and sinuses (ethmoid), which have been observed historically with exposures to hardwoods (beech, walnut, oak, mahogany, maple). The risk from soft woods is considered much less, but should not be entirely discounted.

Some wood dusts can cause allergic respiratory disease (eg asthma, sinusitis, alveolitis), and/or or allergic dermatitis. Implicated components include resin acids (plicatic, abietic and pimaric acids) rosins (colophony) and terpenes (pinenes and carenes).

Wood can be contaminated by microorganisms including fungi or microbial products (eg endotoxins) which may cause other lung reactions. There is a potential for dust explosions.

Note: WES for Softwood Dust:
The WES-TWA for eight hour shifts for softwood dust has been reduced from 5mg/m³ to 2mg/m³. The WES-TWA for 12 hour shifts is also 2mg/m³. The 12 hour WES-TWA will be reviewed as data supporting the development of a 12 hour WES becomes available.

Problem assessment
Furniture manufacturing and joinery have high dust exposures. Assess by air sampling and comparison with the WES. Use a Tyndal Lamp to indicate the efficiency of controls.

Control measures
Recent investigations show that dust exposures follow certain operations.

- Avoid the indiscriminate use of compressed air to remove dust.
- Isolate fine dust producing processes.
- General housekeeping.
- Appropriately designed hoods and extraction devices mounted directly onto individual powered equipment.
- Capture of dust as close as possible to the source of emission.
- Adequate PPE for high-risk tasks.
- Remove dust from flat surfaces.
- Regular maintenance of ventilation systems.

3.3.2 GASES & VAPOURS
CARBON MONOXIDE
What is the problem?
Carbon monoxide (CO) is a deadly poison. It is colourless, non-irritating and odourless. Over 10% of survivors are left with a brain injury.
The traditional view of carbon monoxide poisoning is the production of carboxy-haemoglobin preventing access of oxygen to cells. This gives an incomplete picture of the toxicology. Evidence as to best treatment is still unclear, so prevention is of great importance.

Carbon monoxide poisoning is the most common industrial poisoning and occurs from the use of things like forklifts and concrete cutting saws and compressors in buildings or semi-enclosed spaces such as garages or construction spaces. It can be deadly even when ventilation appears adequate.

**Problem assessment**
Carbon monoxide can only be detected by instruments. CO monitors – both ‘personal’ and ‘general air’ – are available but should only be used to signal the need to immediately exit a confined area.

**Control measures**
- elimination of fuel-powered motors in confined spaces
- placement of fuel-powered motors outside buildings (and away from air intakes)
- using alternatives to fuel combustion to heat water
- using electric rather than petrol powered tools
- ventilation
- learn the symptoms of carbon monoxide poisoning: headache, nausea, weakness, dizziness, visual disturbance and loss of consciousness
- where fuel powered vehicles and tools are used – tuning the engine to minimise exhaust emissions of CO
- looking out for workmates.

**Carbon Monoxide and Forklifts**
An electric-powered forklift should be used instead. If this isn’t possible, or if carts and trolleys can’t be used:
- develop a policy on the use of forklifts and associated hazards
- inform, train and supervise staff and monitor their health
- restrict use in poorly ventilated or confined areas – turn them off when not working
- tune engines regularly and test for carbon monoxide emissions
- install carbon monoxide alarms on forklifts or in buildings. Inform supervisors or managers immediately if they sound.

**Catalytic Converters:** These can reduce carbon monoxide by 70 to 90 percent, but they do not eliminate the danger. They’re not effective until the forklifts’ engine has been running for about 10 minutes so short term running can void the alarm.

**Carbon Monoxide and Hirers and Sellers of equipment**
Companies hiring or selling forklifts have a responsibility to make sure that customers have the information they need to choose the right forklift for their environment. They are legally required to advise on the hazards of carbon monoxide.

**Legal obligations**
Section 18A of the Health and Safety in Employment Act 1992 requires hirers and sellers of forklifts to find out:
- what the forklift will be used for
- where it will be used.

Hirers and sellers must take all practicable steps to make sure that the forklift is safe for its intended purpose or other reasonable use – either by design, manufacture or maintenance.

Customers should be advised about the hazards of carbon monoxide if the intended use of the forklift suggests a hazard exists.
What should forklift hirers or sellers do to advise customers?

A short notice, either given directly to the customer or placed inside the forklift can help achieve legal obligations to inform customers about CO hazards.

Source: Fact sheets at:

FORMALDEHYDE

Background

Formaldehyde is a colourless, flammable gas with a strong, pungent odour. It is sold mainly as an aqueous solution called formalin, which is 37% to 50% formaldehyde by weight. Formaldehyde is used to produce synthetic resins such as urea- and phenol-formaldehyde resins - used primarily as adhesives when making particle-board, fibreboard, and plywood. Embalming fluids contain formaldehyde and its use is common in pathology labs.

Health effects

The International Agency for Research on Cancer (IARC) has recently declared formaldehyde a human carcinogen.

The first signs or symptoms (concentrations 0.1–5 ppm) are burning eyes, tearing and irritation to the upper respiratory tract. Higher exposures (10–20 ppm) may produce coughing, tightening in the chest, a sense of pressure in the head, and heart palpitations. Exposures at 50–100 ppm or more can cause serious injury such as collection of fluid in the lungs, inflammation of the lungs or death. Dermatitis due to formaldehyde solutions or formaldehyde resins is well recognised. After a few days' exposure, a worker may develop a sudden inflammation of the skin of the eyelids, face, neck, scrotum, and flexor surfaces of the arms. The reaction may also appear on the fingers, back of the hands, wrists, forearms and parts of the body that are in contact with clothes. This may occur after years of exposure.

WES: The WES-Ceiling remains at 1ppm. WES-TWA for eight hour and 12-hour shifts have been introduced. They are 0.5ppm and 0.33 ppm respectively.

Minimising employee exposure

Formaldehyde should be handled in the workplace as an occupational carcinogen. Exposure should be limited to as few employees as possible, and workplace exposure levels minimised.

Exposure monitoring

Initial and routine exposure monitoring should be carried out determine the extent of employee exposure and to ensure that controls are effective.

Controlling employee exposure

There are four basic methods of limiting employee exposure to formaldehyde.

1. Product substitution

The substitution of an alternative (safe) material with a lower potential risk is an important method for reducing exposure.

2. Contaminant controls

The most effective control is at the source of contamination by enclosure of the operation and local exhaust ventilation.

3. Employee isolation

If feasible, employees may be isolated from direct contact with the work environment by the use of automated equipment operated by personnel in a closed control booth or room.

4. Personal protective equipment

The use of PPE is permissible. However, this is only during the period necessary to install engineering controls where which work
practice controls have proven ineffective:
> for maintenance
> for operations which require entry into tanks or closed vessels
> in emergencies.
Proper maintenance procedures, good housekeeping in the work area, and employee education are all vital. Employees should be informed as to the nature of the hazard, its control, and appropriate personal hygiene procedures.

**Medical surveillance**
Health effects such as upper respiratory irritation or dermatitis should alert management that unacceptable exposure to formaldehyde is occurring. A medical surveillance programme should be made available. In addition, skin protection should be stressed in the workplace to keep the number of new cases of dermatitis to a minimum.


**ISOCYANATES**
Isocyanates are chemicals used in:
> the production of polyurethane foams eg foam mattresses and rigid foams in chairs etc
> paint and lacquers in motor vehicle repair – in 2-pack paints in which isocyanate hardener or activator is added to a pigmented or clear base
> some adhesives.

**What is the problem?**
A single, high exposure to isocyanate vapour, aerosol or dust may cause immediate effects such as irritation to the eyes, nose and throat, resulting in coughing and a dry throat.

More severe effects can include chemical pneumonitis. Such a high exposure can cause immediate sensitisation, resulting in occupational asthma.

A series of smaller exposures over weeks, months and years may lead to wheezing, coughing, shortness of breath or a tight chest, which are symptoms of asthma.

Contact dermatitis may occur from skin contact with un-reacted isocyanates.

Exposure to isocyanates may occur via:
> Inhalation of the vapour – especially from the very volatile toluene diisocyanate (TDI) class.
> Inhalation of airborne droplets from spraying or spray painting.
> Inhalation of dust while handling pure methylene bisphenyl isocyanate (MDI).

Isocyanates can react violently with alkalis and acids: eg sodium hydroxide and ammonia. They also react slowly with water and this can result in a dangerous build-up of pressure in closed containers.

**Problem assessment**
Employers should carry out air sampling to assess the risk. An exception is in spray booths where operators are wearing a full face airline respirator (as exposure outside the mask would be expected to be above the exposure standards).

Where a ventilated spray booth is used, the airflow in the booth can be measured and compared to the New Zealand Standard 4114 (see reference). Pre-employment lung function testing is recommended and annual lung function testing and medical exam is required.

**Controls**
As always, the first steps in control should be substitution and elimination, isolation then minimization including:
> LEV for spray painting
> ventilated booths
> not removing the visor or hood before ventilation clears the spray booth or mist
> not removing the respirator before leaving the booth
> safe cleaning practices eg of spray guns good housekeeping
> appropriate PPE and training.

The Isocyanate Code of Practice requires air testing where TDI and MDI are used.


Isocyanates – Guidelines for the Health surveillance of workers at:
www.business.govt.nz/worksafe/information-guidance/all-guidance-items/isocyanates-guidelines-for-the-health-surveillance-of

SOLVENTS

Organic solvents (eg toluene, acetone and white spirits) and products containing solvents are used in many workplaces.

Solvents can enter the body through the lungs, the skin or by being swallowed.

People react differently to solvents. Not all have the same effects. These may disappear once solvent work stops, but long-term or high exposure increases the risk of permanent neurotoxic damage.

Common effects:

<table>
<thead>
<tr>
<th>Headaches</th>
<th>Weakness</th>
<th>Forgetfulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>Irritability/mood changes</td>
<td>Giddiness</td>
</tr>
<tr>
<td>Abnormal tiredness</td>
<td>Damage to skin and eyes</td>
<td>Drowsiness</td>
</tr>
<tr>
<td>Balance disturbance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Long-term exposure can damage the nervous system resulting in:
> lack of concentration
> memory loss
> blunting of mental skills
> depression.

Skin: Solvent contact with skin often causes drying, cracking, reddening and soreness. It increases the absorption of solvents and skin infection. Dermatitis caused by solvent use may last a long time, even when solvent use ceases.

Lungs: Many solvent vapours irritate the lining of the respiratory tract, affecting the nose, throat and lungs. Some solvents in some settings may cause an asthma-like attack.

Eyes: Solvent vapours or liquids may cause eye irritation. This is usually reversible and permanent damage is rare. Solvent splashes to the eyes are dangerous – treat immediately.

Reducing solvent exposure

Employers must provide adequate ventilation.

Other ways to reduce exposure are:
> using other products
> using a less volatile solvent
> using a less toxic solvent
> using less solvent
> keeping containers sealed
> cleaning up spills immediately
> placing solvent-contaminated rags in a sealed bin.

PPE: If exposure to solvents cannot be avoided a correctly fitted and selected respirator and cartridge must be used.

Source: Practical Guidelines for the Safe Use of Organic Solvents at:
Diagnostic Criteria for Chronic Organic Solvent Neurotoxicity at:

3.3.3 PROCESSES

ELECTROPLATING

Electroplating poses well known risks of toxic chemical exposure. Lungs, eyes and skin are at special risk. Exposures can be direct, for example to the chemicals used in the various different processes while mixing solutions, or indirect, for example to chromic acid mist that may be generated during chrome plating.

The full range of HSNO controls will apply. Approved handlers will be required.

In view of the possible consequences, discipline is required throughout all stages of the electroplating process to ensure that chemicals are handled properly. Special attention will be needed for:

> dispensing/mixing of plating solutions
> control of mists
> drip control for plated items when removed from the bath
> control of chemicals to waste.

Properly designed local exhaust ventilation will be required to control emissions of mists from plating tanks. Owing to the corrosive nature of chromic acid mist, the ventilation system will need constructing from appropriate materials and will require periodic inspection.

PPE will be required, with all the implications for selection, care, maintenance and replacement. Facilities for hygiene, including changing and showering facilities, will be required plus strict personal hygiene.

Personal health monitoring will be needed if exposure monitoring shows that air contaminants are present.

The preparation of items for plating can pose hazards. Vapour degreasing or acid pickling will require their own controls.

Source: Safe use of chemicals in electroplating at:

FIBREGLASSING

What is the problem?

Exposure to airborne solvents (styrene and methyl ethyl ketone (MEK)).

The potential for exposure to a wide variety of other chemicals: resins and hardeners; catalysts and initiators; fibres and reinforcing; mould release agents; fillers and pigments; inhibitors; and promoters and accelerators.

All may enter the body via the respiratory tract or the skin.

Dust exposure may also be a problem.

Problem assessment

Exposure to solvent vapours in this industry causes a lot of ill health. The problem should be treated as potentially serious.

Air monitoring is appropriate only where processes are constant. Biological monitoring is possible.

Control measures

Control air contaminants at source:

> local exhaust ventilation
> ventilated booths
> low-emission guns
> work behaviours
> housekeeping practices + PPE.

FIBREGLASS INSULATION

**What is the problem?**

Fibreglass insulation may irritate the eyes and skin. Some people are more sensitive than others. High concentrations of fibres in the air may cause irritation of the upper respiratory tract.

Synthetic mineral fibres (SMF) do not appear to cause cancer as does asbestos.

The publication referenced below has more information. It covers the manufacturing, handling and use of SMF in sections about:

> appropriate work methods
> PPE and protective clothing
> hygiene measures.

**Source:** Synthetic Mineral Fibres – Health and Safety Guidelines for the Selection and Safe Handling of at:


FUMIGATION

**What is the problem?**

Very toxic gases, solids and liquids can be used. Processes are generally well regulated, but even short-term low exposures may cause symptoms and considerable concern.

**Methyl Bromide:**

Methyl bromide effects include nausea, vomiting, headache, dizziness, slurred speech, unsteadiness (which can persist for days) and neurological effects.

Decisions have been made to make it compulsory to recapture the gaseous fumigant methyl bromide rather than release it to atmosphere (in 10 years time). Recommended alternatives include metam sodium, dazomet, and chloropicrin. Sulfuryl fluoride has also been used in the USA.

Handling of imported goods fumigated offshore has concerned port authorities and private consumers. Methyl bromide can react with sulphur-containing materials (eg wool, furs, feathers and leather where sulphur is added during tanning) to produce volatile smelly sulphur compounds.

Another problem is the gas being absorbed by cargo and then rereleased when the cargo is taken out of a container, particularly immediately upon opening. Such brief relatively low exposures may cause mild to moderately acute symptoms, but more severe respiratory or neurological effects are possible with high acute and/or regular long-term exposures.

Transport and stacking of fumigated containers may be hazardous.

Soil injection techniques (eg in fruit farming) are reputed to be safe, but studies suggest that levels under tarpaulins can take longer than the recommended minimum waiting period of 48 hours to fall below 5 ppm.

Outside export/import fumigation, methyl bromide is only allowed to be used to eradicate potato wort at residential properties. It is not allowed on fruit farms.
Magtoxin:
Magnesium phosphide. It and similar substances (e.g., aluminium and zinc phosphides) react with water and acids to form phosphine, a toxic gas with a garlic, fish-like odour. These are used in the preservation of stored grain (e.g., in grain elevators and ships). These often involve confined environments. On contact with moisture in grains, phosphine is generated along with metal hydroxides.

Phosphine:
This has an auto-ignition temperature of about 40°C, and when dry can ignite at room temperature due to impurities. Aluminium and magnesium phosphide containers may flash on opening. Many formulations contain ammonium carbamate or similar, which liberates ammonia and carbon dioxide, reducing the explosive hazard substantially.

Chloropicrin
Now prohibited in methyl bromide. However, chloropicrin can be used on its own as a fumigant or in other formulations.

Exposure monitoring
Do not rely on odour as a warning. Levels should be assessed using direct reading instruments that read down to 0.05 ppm. Results should be compared with the WES-TWA (5 ppm) and the tolerable exposure limits (TEL) under HSNO which are:
> 1 hour TEL of 1 ppm
> 24 hour TEL of 0.333 ppm
> annual TEL of 0.0013 ppm.

There is limited correlation between blood (inorganic) bromine levels and symptoms, and no BEI, but blood and/or urine levels are being investigated as biological monitoring tools.

Control measures
> Use the EPA approved code of practice for fumigations.
> Appropriate signage for fumigated areas.
> Precautionary monitoring if air levels unknown but potentially significant.
> Methyl bromide application requires air monitoring. The method used to calculate TELs must be in accordance with the EPA document ‘Guide to methyl bromide fumigations’.
> Wear adequate respiratory protective equipment, especially when opening or entering containers.
> Ensure containers are sealed as well as possible check for leaks if suspected.
> Suitable protective clothing (methyl bromide can permeate many materials).
> Education on phosphine explosion risk; especially if mixed with water or in confined spaces.
> Know poisoning symptoms.

Reference: The Pest Management Association of New Zealand has a Code of Practice that is available to members only. It has been approved by the NZ New Zealand EPA (the former ERMA). See www.pmanz.co.nz

PESTICIDE APPLICATION FACT SHEET

What is the problem?
Rodenticides (designed to kill mammals) are generally the most hazardous group of pesticides. Careful handling is required with concentrated formulations (e.g., cyanide pastes). Repetitive exposures to some insecticides (e.g., organo-phosphates) can cause initially silent but gradually developing poisoning.

Initial preparation (e.g., mixing of concentrates) and subsequent cleanup can involve high exposures, and protective equipment must always be worn. For some, skin can be a significant source of absorption, and clothing worn in hot weather is often insufficiently protective. Dermatitis may occur even with relatively low toxicity products.
Problem assessment
Air levels of mists and vapours during spraying are seldom measured. However, the spray methods employed, the amount of pesticide used, the quality of personal protective equipment and work practices can provide circumstantial evidence.

Monitoring
Some blood or urine tests exist. Most often blood acetylcholine-esterase monitoring is done for regular users of organophosphates but is less useful for carbamates. Tests are also available for 1080; paraquat; 2,4-D and some others. Inadvertent ingestion is also a risk, and safe, child proof storage practices are required.

Control measures
> Education, including availability of MSDS and training in safe use. These should include the importance of reading labels as different precautions are needed for different products, depending on the indicated level of hazard.
> Extra precautions with specific hazardous activities (e.g., mixing concentrate, fine droplet spraying of volatile constituents) or conditions (excessive heat, wind, dust generation).
> Adequate respirator selection, fit testing, cleaning, storage, maintenance and replacement.
> Adequate protective clothing, impervious where necessary.
> Biological monitoring programme where required (e.g., blood cholinesterase for those organophosphate users who work with sprays more than 30 hours per month).
> Secure storage of concentrates (lockable area).
> Adequate cleaning and segregation of boots and clothes (leave at work).


Spraycoating
What is the problem?
Spray painting results in exposure to hazardous substances including:

<table>
<thead>
<tr>
<th>paints</th>
<th>polyisocyanates</th>
<th>powder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resins</td>
<td>solvents</td>
<td>degreasers</td>
</tr>
<tr>
<td>dusts</td>
<td>glues</td>
<td>lacquers</td>
</tr>
<tr>
<td>surface preparation products</td>
<td>paint removers</td>
<td>rust converters and removers</td>
</tr>
</tbody>
</table>

Other hazards include:
> plant
> electricity
> paint injection into skin (S 8.8)
> noise
> airless spray guns
> manual handling
> fire and explosion.

Health effects can include:
> occupational asthma
> allergic dermatitis
> lung cancer
> painter’s syndrome or solvent neurotoxicity (from long-term exposure to organic solvents)
> damage to the reproductive systems, kidney and liver.

Short-term effects can include:
> irritant contact dermatitis
> burns to the skin and eyes
> vomiting and diarrhoea
> irritation to nose, throat, lungs
> headache, dizziness, nausea and fatigue.

Problem assessment
Risk assessment involves working out the level of risk from each hazard in the spray-painting process. Questions such as the following should be asked: How long is the person exposed? How great is the exposure? What harm might occur and how severe could it be?

Control measures
Spray Booths
Spray-painting must be carried out in a spray booth unless, because of its shape, size or weight, it is impractical to do so, for infrequent spraying of heavy or bulky equipment, or minor operations such as spotting or touching up. The spray-booth must be designed, constructed, installed and maintained in accordance with AS/NZS 4114.1:2003 – Design, construction and testing of spray-booths; and AS/NZS 4114.2:2003 Selection, installation and maintenance of spray-booths.

Exclusion zone/confined space
A spray-painting exclusion zone should be established according to AS/NZS 2430.3.9 1997: Classification of hazardous area: Part 1. Spray-painting in a confined space must be carried out as per AS 2865: 2001 Safe working in a confined space.

Spray booth/mixing room ventilation
The ventilation system should provide an optimum, continuous, uniform and evenly distributed supply of airflow throughout the spray-painting area and mixing room to the exhaust outlets and eliminate pockets of still air in the booth. Where spray-painting is carried out in a building or structure other than a spray booth or confined space, it should be of open construction or a mechanical exhaust system should be used to prevent the build up of flammable or toxic fumes.

Spray-painting guns
High-volume-low-pressure (HVLP) spray guns are recommended over conventional gravity or siphon-feed guns because HVLP guns cut paint over-spray concentrations in half. HVLP guns transfer paint more efficiently and can reduce paint usage.

Respiratory protection
Even the best precautions do not completely eliminate overspray from the air workers breathing zone. Personal respiratory protective equipment is also recommended.

References: The NZ EPA have released guidance on the HSNO aspects of spraycoating for panelbeaters at:

Standards
**TIMBER TREATMENT**

**What is the problem?**

Timber is treated with chemicals to kill insects and fungi to maintain the quality or life of the timber. A variety of chemicals and methods are used:

- CCA (copper, chrome, arsenic).
- Boron salt preservatives.
- LOSP – usually tributyl tin oxide (TBTO) in white sprits.

The different methods and chemicals used present different exposure hazards.

**Problem assessment**

Exposure monitoring will depend on what chemicals were used in the treatment and where exposure is being assessed. Monitoring should be discussed with an occupational hygienist.

Employee health surveillance may be necessary, particularly where minimisation is used to control exposure. The surveillance required will depend on the chemicals used and should be discussed with a Departmental Medical Practitioner.

**LOSP treated timber hazards:**

LOSP treatment presents special hazards associated with the solvents used and the preservative tributyl tin oxide (TBTO).

**Tributyl tin oxide** is a potent skin irritant and an extreme eye irritant, so skin and eye protection must be worn until the timber has dried adequately.

**The solvents** can off-gas for some time after treatment. Typical solvent in air levels and the flammability hazard are unknown. If adequate drying time is not given at the point of treatment, the plastic-wrapped timber can give off enough vapour when unwrapped to cause problems eg for employees in a truss and frame plant or a builder working in semi-confined areas.

**Control measures**

- filleting the stack of timber after treatment for airflow
- adequate off-gassing time
- assessment of solvent residues at the point of use and consequent precautions. eg additional drying time in open air, general air ventilation etc
- use of organic solvent respirators
- when LOSP-treated timber is used in a confined space (eg at a closed-in house at a residential site) it must be substantially solvent-free first
- provision of information on chemical preservative products (including safety data sheets)
- detailed technical advice from the Building Industry Association.

**Ecology:**

Tributyl tin compounds are ecologically toxic. Eg their use for anti-fouling for ships hulls is banned.

Other control measures:

- substitution
- specially designed plant
- ventilation
- personal hygiene
- PPE
- housekeeping
- training
- medical surveillance HSNO controls are applicable.

ARSENIC

What is the problem?
Timber treatment (eg with CCA) and its downstream use may cause exposure to arsenic and other chemicals.

Problem assessment
Environmental measurements can indicate the concentration of arsenic in the breathing zone. Biological monitoring involves urine testing for inorganic arsenic plus its organic metabolites (dimethyl arsenic and methyl arsenic acids), while abstaining from seafood for a few days prior to testing(!) This is best done at the end of a shift at the end of the week. The BEI is 100 µg/L. (~1.3 μmol/L).

Control measures
Timber treatment:
> integrity of the process/plant
> adherence to operating procedures – implied elimination of contact with chemicals
> drip-free exit from pressure vessels
> subsequent handling of wet timber requires waterproof gloves, overalls and aprons.

Subsequent usage
> Sawing of treated timber may cause airborne dust but the risk is time dependent – significant only if it goes on long enough.
> Other mechanical, powered working of timber – risks unknown.
> Prudent avoidance – wearing gloves and dust masks when sawing, routing and planing.
> Hand hygiene.

Source: Working with Timber Treatment Chemicals:

WELDING

The common processes are:
> Gas – brazing, oxyacetylene.
> Electric:
  - manual metal arc (MMA)
  - metal inert gas (MIG)
  - tungsten inert gas (TIG)
  - submerged arc welding (SAW).

Airborne contaminants include:
> Dusts and Fumes – eg metal fumes, flux dusts and fumes. Some are extremely toxic, eg cadmium and beryllium (deaths have occurred within 4 hours of uncontrolled exposure).
> Products of combustion – eg nitrogen oxides (lungs), carbon monoxide (systemic), carbon dioxide (asphyxiant).
> Others – eg inert gases (from shielding gas), the toxic ozone and the highly toxic phosgene.
Risk assessment
See the Table on the next page.

If welding is being done at a workstation in an assembly line then air monitoring and appropriate analysis will give a good indication of exposure to fume/dust.

A Tyndal Lamp will show dust plumes.

Welding may occur in the open or in a workshop (eg construction site – ship fabrication – erection of steel structures etc) Risk assessment is harder there.

Controls
1. Substitution of welding rods: some welding rods emit much less fume than others. Seek advice from the supplier.
2. Current control: follow preferred work practices. Keep the current to the minimum to minimize emissions.
3. Flame optimisation: following safe work practices reduces emission of contaminants such as carbon monoxide.
4. Local exhaust ventilation: fixed extraction hoods can be provided for assembly line work but portable ‘vacuum cleaner’ type extraction flexible, ducted extraction systems will be needed where welding is carried out in many locations.
5. General air ventilation: Build-up of welding fumes can be unpleasant but can be avoided by open doors and adequate ceiling extraction. There must be enough air changes per hour and no ‘dead spots’.
6. Work practices: keeping the head away from the rising plume of dust/fume.
7. Personal protective equipment: eg UV visor, face shields (which may need to be air-supplied for extended periods of work), gloves, overalls and aprons. Specialised help in selection and fitting is advised.

Confined spaces
Confined spaces increase hazard levels.

Phosgene
Phosgene can be produced when chlorinated solvents are heated. This may occur when steel is not properly cleaned after degreasing.

Other hazards
Ultraviolet light; electrical hazards; hot metal particles; flammable gases; compressed gases; noise; heat stress; manual handling.


Cross Reference: 2.2.6 Page 28, 2.3 Page 44, 3.5.4 Page 120
Welding Fume Control Table: Add the three weightings obtained from the Tables 1–3 to find out the control actions needed from Table 4.

### 1. PROCESS WEIGHTING FACTOR

<table>
<thead>
<tr>
<th>PROCESS</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submerged arc welding (remote); laser cutting and welding; micro plasma</td>
<td>0</td>
</tr>
<tr>
<td>Gas cutting (remote operations).</td>
<td></td>
</tr>
<tr>
<td>Submerged arc welding (manual); submerged arc welding (multi arcs).</td>
<td>2</td>
</tr>
<tr>
<td>Brazing (manual operation); TIG (manual operations); gas welding</td>
<td>4</td>
</tr>
<tr>
<td>and cutting (manual); silver soldering (manual); resistance spot welding</td>
<td></td>
</tr>
<tr>
<td>(manual); plasma cutting (under water table); plasma arc welding;</td>
<td></td>
</tr>
<tr>
<td>MIG (remote operation); resistance seam welding (remote operation);</td>
<td></td>
</tr>
<tr>
<td>electroslag welding.</td>
<td></td>
</tr>
<tr>
<td>MIG (hand held); MMAW; Resistance seam welding (manual operation);</td>
<td>7</td>
</tr>
<tr>
<td>thermit welding; electrogas welding.</td>
<td></td>
</tr>
<tr>
<td>Arc cutting; plasma arc gouging; air arc gouging; flux cored arc welding</td>
<td>9</td>
</tr>
<tr>
<td>(manual and remote operation).</td>
<td></td>
</tr>
<tr>
<td>Plasma arc cutting</td>
<td>15</td>
</tr>
</tbody>
</table>

### 2. FUME CONSTITUENT WEIGHTING

<table>
<thead>
<tr>
<th>FUME GROUP</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Iron, aluminium, tin, titanium with &lt; 5% of group B or C &lt; 0.05% of</td>
<td>0</td>
</tr>
<tr>
<td>group D.</td>
<td></td>
</tr>
<tr>
<td>B: Copper, magnesium, manganese, molybdenum, silver, tungsten, zinc,</td>
<td>10</td>
</tr>
<tr>
<td>Flux fumes such as fluorides, rosin, phosphoric acid, zinc chloride and</td>
<td></td>
</tr>
<tr>
<td>boric acid.</td>
<td></td>
</tr>
<tr>
<td>C Barium, chromium, cobalt, lead, nickel, ozone, vanadium, phosgene,</td>
<td>20</td>
</tr>
<tr>
<td>organic fume.</td>
<td></td>
</tr>
<tr>
<td>D Beryllium, Cadmium.</td>
<td>55</td>
</tr>
</tbody>
</table>

### 3. WORK LOCATION WEIGHTING

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoors</td>
<td>0</td>
</tr>
<tr>
<td>Open</td>
<td>12</td>
</tr>
<tr>
<td>Limited</td>
<td>16</td>
</tr>
<tr>
<td>Confined</td>
<td>24</td>
</tr>
</tbody>
</table>

### 4. CONTROL REQUIREMENTS

<table>
<thead>
<tr>
<th>SUM</th>
<th>CONTROL REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 9 or 9</td>
<td>Natural Ventilation</td>
</tr>
<tr>
<td>&gt; 9 to 21</td>
<td>Mechanical ventilation</td>
</tr>
<tr>
<td>&gt; 21 to 54</td>
<td>Local exhaust ventilation</td>
</tr>
<tr>
<td>&gt; 54</td>
<td>Local exhaust ventilation and respiratory protection.</td>
</tr>
</tbody>
</table>

**Example:** TIG Welding is carried out on manganese steel in a confined space.

The weighting factors are 4 + 10 + 24.

The total of 38 indicates that local exhaust ventilation is required.

**Note:** The approach taken in the Control Table on this page is an example of ‘Control Banding’. 
3.3.4 BIOLOGICAL

OCCUPATIONAL ASTHMAGENS GL

Most people with asthma have irritable, swollen air passages, partly blocked with too much sticky mucus. This narrowing of the air passages leads to the symptoms of wheeze, breathlessness and cough. Work and non-work factors can cause this narrowing or make it worse:

- dusts and fumes (at work and home, eg: cigarette smoke)
- exercise
- cold air.

People with asthma in the workplace may notice a number of symptoms including:

- either a dry cough or one that produces sputum. Often people whose asthma is caused or made worse by work will notice the cough predominantly at night
- shortness of breath or chest tightness and wheezing.

All of these symptoms may improve when the person is away from work.

Allergic reactions to substances used at work such as TDI (toluene diisocyanate), or western red cedar can cause asthma. Minute amounts may be involved.

The person may become ‘sensitised’ to the substance after weeks, months or years of exposure with no ill effect. Sometimes the reaction develops hours after exposure, which can make the workplace factor difficult to identify.

Other people develop irritant asthma for the first time after a very heavy single exposure to an airway irritant in the workplace such as welding fume or an irritant gas such as sulphur dioxide.

Pre-existing asthma may be made worse by dusts or fumes, and in this case the symptoms tend to follow the exposure closely.

The worker will often be very aware of the area of the worksite or of the substance which makes their problem worse.

Advice for people with asthma

Talk with their GP or occupational health nurse if something at work is causing asthma or is making it worse. They will:

- ask what substances or processes are present at work
- ask if symptoms worsen during each shift or over the shift period
- ask if there is any improvement away from work
- teach how to use a peak flow meter.

In New Zealand the substances or processes recognised as likely to cause asthma problems are:

- working with chemicals such as isocyanates (TDI, MDI, two-pot paints and glues, foam manufacture, etc) epoxy resins and wood dust.

Common industries include spray painting, boat building and working with wood.

Problem dusts include:

- western red cedar
- some particle-boards (building and joinery industries)
- metal fumes or dusts (aluminium smelting, welding)
- dusts from organic materials such as flour (bakers) animals (veterinarians) and insects.

According to information found at the address cited, about one out of every six adult asthmatics has asthma that is either caused or made worse by workplace exposures. See: www.health.state.ny.us/nysdoh/lung/toolkit/asthmagens.htm

The US Association of Occupational and Environmental Clinics has a downloadable self paced learning module. See: www.aoec.org
## Occupations at Risk of Asthma

<table>
<thead>
<tr>
<th>WORKERS AT RISK</th>
<th>AGENTS</th>
<th>WORKERS AT RISK</th>
<th>AGENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal handlers</td>
<td>Animal urine, dander</td>
<td>Machinists Tool setters</td>
<td>Metal working fluids, oil mists</td>
</tr>
<tr>
<td>Bakers</td>
<td>Enzymes, flour/grain dust/mites</td>
<td>Office workers</td>
<td>Cleaning materials, dusts, moulds</td>
</tr>
<tr>
<td>Carpenters</td>
<td>Acrylate, amines, diisocyanates, epoxy</td>
<td>Pharmaceutical workers</td>
<td>Cephalosporins, pancreatin, papain, pepsin, psyllium</td>
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<tr>
<td>Sawmill</td>
<td>resins, wood dusts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaners, Janitors</td>
<td>Cleaning materials, dusts, moulds</td>
<td>Photographers</td>
<td>Complex amines</td>
</tr>
<tr>
<td>Day care providers</td>
<td>Cleaning materials, dusts, latex (natural),</td>
<td>Plastics, Rubber</td>
<td>Anhydrides, diisocyanates</td>
</tr>
<tr>
<td></td>
<td>moulds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electronics workers</td>
<td>Amines, colophony, metals, soldering flux</td>
<td>Seafood</td>
<td>Crabs, prawns</td>
</tr>
<tr>
<td>Farmers</td>
<td>Animal urine, grain dusts, mites, insects</td>
<td>Teachers</td>
<td>Cleaning materials, dusts, moulds</td>
</tr>
<tr>
<td>Hairdressers</td>
<td>Henna, persulfate</td>
<td>Textile workers</td>
<td>Dyes, gums</td>
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<td>Health care workers</td>
<td>Formaldehyde, glutaraldehyde, latex,</td>
<td>Welders</td>
<td>Welding fumes</td>
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<tr>
<td></td>
<td>methylidopa, penicillin,</td>
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<td>Laboratory workers</td>
<td>Animal urine, dander, feathers, enzymes,</td>
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<td>formaldehyde, glutaraldehyde, late,</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>insects, latex</td>
<td></td>
<td></td>
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</tbody>
</table>

**Source:** Guideline: Asthma – A Guide to the Management of Occupational at:


**BIRD DROPPINGS**

Bird droppings, left behind by large numbers of roosting birds, may be found by employees during:

> construction work
> maintenance work
> work in roof spaces
> demolition work.

They can cause very serious disease. The most serious risks are from organisms that grow in the droppings, feathers and nesting debris. External parasites may also become a problem when infested birds leave them behind. They can invade buildings and bite or irritate people’s skin.

Possible diseases:

> **bacterial** – eg e-coli, salmonella, listeriosis, campylobacter, psittacosis
> **fungal** – eg histoplasmosis, cryptococcosis, candidiasis
> **viral** – eg meningitis, Newcastle disease
> **parasitic/protozoal** – eg toxoplasmosis, trichomoniasis.
The bacteria and parasites can be:
> breathed in
> ingested by eating contaminated food or by
> ingested by eating with dirty hands.

Infection is most likely, however, when dust containing massive amounts of the bacteria or parasites is inhaled.

The risk of disease is greatly increased for people with weakened resistance:
> antibiotic therapy
> skin damage - through injury or surgery
> chronic disease.

**Source:** Demolition Code at:


**LEGIONNAIRES DISEASE**

**Introduction**

Legionnaires’ disease is a lung infection (a type of pneumonia) that can be either mild or severe enough to cause death. In its mild form, it is called ‘Pontiac fever’. The disease got its name in 1976 when an outbreak of pneumonia occurred in people at an American Legion Convention.

Legionnaires’ disease is caused by a bacteria called Legionella. It is treated with antibiotics.

The bacteria are usually found in water and soils, depending on the species.

In New Zealand:
> **Legionella pneumophila** is the most common cause – and is connected with hot water systems and cooling towers.
> **Legionella longbeachae** is the next most common and is found in soils, compost, and potting mixes.

Legionella can grow on wet surfaces of the cooling units that are part of some building air-conditioning systems and other industrial cooling equipment. It can also grow in pools of water, and its growth is more rapid the higher the temperature of the water. It will not grow in water over 60 degrees C.

In certain circumstances, legionella can become airborne and be ejected out of a cooling tower or scrubber in water droplets. The airborne bacteria can be dispersed by the wind to affect members of the public outside a building, or be captured by poorly positioned air intakes of an air-conditioning system.

Some people are more at risk than others. Adults over the age of 50, smokers, people prone to lung disease and other people with low immunity are particularly vulnerable.

Legionnaires’ disease is not contagious and outbreaks are localised. In New Zealand, Legionnaires’ disease is a notifiable disease under the Health Act 1956. This means that a doctor is required to notify the medical officer of health at the Public Health Service if he/she suspects a patient suffers from, or is diagnosed with, Legionnaires’ disease.

The actions needed to prevent the growth of the bacteria are relatively simple. Comprehensive Codes of Practice (eg the New Zealand Guidelines for the Control of Legionellosis and the more recent New South Wales Code of Practice for the Control of Legionnaires’ Disease and Standards describe the design, operation and maintenance and monitoring of air-conditioning systems.

**Preventing Legionnaires’ disease is more likely if:**
> a design of cooling tower that minimises the opportunity for the bacteria to grow on wet surfaces is chosen
> water handling systems are kept clean
> the water is treated with chemicals
the approach outlined in AS/NZS 3666.3 for monitoring water quality and interpreting the results is used. This standard also lists the actions that should be taken when these results indicate an increase of microbial growth in the water.

Practical actions

These observations mean that there are some clear responsibilities for:

- owners and operators of buildings with mechanical ventilation systems
- operators of cooling plant or equipment
- some employers.

Source: A Comprehensive Health Bulletin that elaborates on all these matters and includes separate suggestions for actions by building owners, and employers, is at:


References: For responsibilities under the Building Act refer to: the Department of Building and Housing: www.dbh.govt.nz, in particular

www.building.dbh.govt.nz/bcupdate-article-28

The Ministry of Health Guideline at:


MOULDS AND LEAKY BUILDINGS

What are moulds?

Moulds, along with mushrooms and yeasts, are fungi, which are simple, microscopic organisms. They are present everywhere, indoors and outdoors.

To grow they need a food source (any organic material such as leaves, wood, paper, or dirt), moisture and a place to grow. They don’t need light to grow. When they reproduce they release tiny, lightweight spores which travel through the air, and can be inhaled.

Adverse health effects

Everyone is exposed to mould spores without noticeable harm.

But they can cause health problems when they are inhaled in large numbers.

Symptoms that exposed people report include:

- respiratory problems – wheezing and shortness of breath
- nasal and sinus congestion
- eye irritation (burning, watery or reddened eyes)
- dry, hacking cough
- nose or throat irritation
- skin rashes or irritation.

People with pre-existing asthma are at greater risk, as even a relatively small number of spores may trigger an asthma attack. Similarly, those with weakened immune systems, the elderly and infants are more at risk.

A special danger

Certain types of moulds, such as Stachybotrys chartarum, can produce compounds called mycotoxins that have toxic properties.

The key cause – dampness

Excessive indoor humidity resulting in water vapour condensation on walls from plumbing leaks, spills from showering or bathing and water leaking through foundations or roofs – all will promote mould growth. Preventing mould growth is, in principle, a straightforward matter of keeping things dry.

Clean-up procedures

Dealing with mould is, in principle, simple:

- removing mouldy materials
- cleaning/drying mouldy areas.
Use of biocides
Don’t use bleach or other biocides, except in specific circumstances.

Personal Precautions
Use respiratory protection when dealing with moulds. A respirator with particulate filter(s) (P1 minimum) is required for spores. Protective clothing that is easily cleaned or discarded, and rubber or other suitable gloves should be worn.

Source: There is comprehensive advice from BRANZ at:

Organic Dusts

Allergic respiratory responses
Organic dusts include vegetable and animal bio-aerosols such as:
> bark and mulch
> mouldy hay
> animal dander (dandruff)
> grain dust
> silage
> potting mix
> animal droppings
> urine spray/aerosolised faeces.

Generally, health effects come from exposure to these plus pollen, fungi, fungal spores, mycotoxins, bacteria, endotoxins and dust from livestock – skin, hair, feathers and excrement.

Exposure can cause serious lung diseases from the allergic response.

The diseases are known by names like:
> organic dust toxic syndrome
> occupational asthma
> farmer’s lung
> Legionnaires disease.

Problem assessment
Assessing the risk is difficult. Some people may develop a disease while others may not.

Different people may take differing lengths of time to become reactive to the airborne contaminants.

Any activity which could create airborne dusts, spores and liquid aerosols can lead to exposure:
> disturbing mushroom compost
> producing, bagging, using potting mix
> removing animal droppings
> handling flapping chickens
> feeding-out mouldy hay
> seed dressing
> cleaning grain silos
> repairing leaky buildings.

Control measures
The primary aim is to reduce airborne contaminant levels.

> With waste material, dampening before disturbing, but this would not be appropriate for some products like seeds.
> In confined spaces (eg silos) avoiding entry by using other work practices is the preferred option. Appropriate protocols for confined space entry must be developed and adhered to if entry is essential.
> Technical innovation which isolates the worker from the source, such as not needing to enter silos or seed cleaning plant.

Personal protection is, as always, the last and least effective option.

Cross Reference: 2.2.23 Page 41

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3 Mycotoxins – toxins produced by fungi.
Endotoxins – toxins from bacteria.
3.3.5 CONFINED SPACES  ACOP FROM QUEENSLAND

OXYGEN DEPLETION
People entering a confined space may collapse and die if there is insufficient oxygen in the space to support life. Normal air has about 21% oxygen and adverse health effects may be noticed if oxygen levels fall below 19%.

Effects may vary from person to person, but at levels of between 8-12% oxygen, rapid loss of consciousness and death can occur, unless the person is removed from the space and resuscitated. Reduced oxygen concentrations initially cause increased breathing and heart rates, muscle incoordination, emotional changes, and fatigue. More severe conditions can cause nausea, vomiting, loss of consciousness, convulsions, respiratory collapse and death.

Examples of confined spaces are offal pits, iron-walled compartments (e.g., ships where rusting removes oxygen) feed silos and sewers. Sewers can also be a source of H2S.

Carbon dioxide (CO₂) is an inert gas, but may displace oxygen in confined spaces and because it is widely encountered in industry, CO₂ has been assigned a WES.

High levels of these gases can cause more rapid depressed consciousness than does a simple lack of oxygen. They should also be tested for in situations where they might be present.

Serial collapse
Often the rescuers of a person who has collapsed in a tank or pit also die because they rush in without adequate protection.

Problem assessment
Identify, in advance, confined spaces where oxygen depletion may occur. Before entering a confined space, the atmosphere must be checked with a meter.

Control measures
> Confirmation of adequate oxygen in the atmosphere before entry.
> Emergency rescue arrangements if the oxygen content in the confined space can drop.
> Wearing personal ‘low oxygen’ alarms.
> Wearing an emergency oxygen supply pack – that allows a limited time for exiting the confined space.

HYDROGEN SULPHIDE
What is the problem
This is a very toxic gas (like cyanide) and can cause rapid ‘knockdown’ and death.

Hydrogen sulphide is a potential hazard in tanneries, tanning abattoirs, mining, metal processing, the brewing and fishing industries, oil drilling or refining and the chemical, pulp and paper industries.

Other sources include industrial waste, facilities for domestic animals, sewers, natural and volcanic gas, and some hot springs (including the Rotorua thermal region). Confined spaces can increase accumulation and be rapidly fatal.

At low levels, complaints relate to odour, eye or respiratory tract irritation, nausea and headache.

Exposure at around 250 ppm for a minute or more can result in severe breathing depression, fluid in the lungs, depressed circulation, and seizures. Rapid unconsciousness and fatalities can occur at over 700 ppm.

The odour (of rotten eggs) can be detected at low levels (under 1 ppm) though in some people it is not recognised until 1 to 10 ppm.

Olfactory fatigue (i.e., it can’t be smelled any longer) occurs at about 50 ppm, and can develop within 10 minutes at about 100 ppm. This has obvious serious consequences
because prolonged exposure can occur if the disappearance of odour is mistaken for the dissipation of the gas.

**Problem assessment**

Hazardous situations include opening doors of pelt processing drums, which has resulted in collapse, coma, and convulsions. Mixing of sodium, calcium or other sulfides with acidic solutions can generate the gas. Agitation of solutions containing hydrogen sulfide may dramatically increase its air level.

Meters are available that indicate hydrogen sulphide concentrations in the air. Often these combine a ‘low oxygen’ warning feature.

**Control measures**

> Confirmation of the atmosphere before entry to areas of known or suspected hazard including confined spaces such as manure pits and sewers.

> Where levels are elevated or unknown, use air supply respirators (NOT air purifying), with sufficient supply – taking into account the time required for exiting confined spaces.

> Wear personal alarms.

> Provide emergency rescue arrangements if a prior risk assessment shows that the hydrogen sulphide levels in a confined space can rise.

> Do not attempt initial rescue unless wearing adequate respiratory protection. Self-contained breathing apparatus (SCBA) is indicated for poorly ventilated, enclosed areas and/or when the gas concentration is unknown. A positive pressure airline respirator is satisfactory under other circumstances.

Rescuers should have secure escape routes, safety harnesses and lines, and be observed by other (similarly protected) personnel, outside the area.

**CARBON MONOXIDE**

**What is the problem?**

Carbon monoxide in a confined space is a potent source of harm.

An example is the use of concrete cutting saws inside buildings.

See the section above at 3.2

**Cross Reference:** 2.2.6 Page 28

**Note:** Australian Standard AS 2865:2009 *Confined Spaces* is accepted as the current state of knowledge on confined space entry work.

See also the Queensland Confined Space ACOP at:


**3.4 CHEMICAL SAFETY**

**3.4.1 A GENERAL APPROACH EPA GL**

PART A – THE HSNO TOOLBOX

Chemical safety for small businesses is covered at the website:

www.hazardoussubstances.govt.nz/

It suggests five steps to safety:

1. Prepare an inventory of the chemicals on site
2. Assess their risks and apply controls
3. Use and store hazardous substances safely
4. get ready for an emergency
5. Key HSNO Controls
A toolbox may be ordered from this site. Pictorially it looks like this:

**Emergency flipchart**
This is a 21 page flipchart that covers all aspects of emergency management. It has two functions - (1) for use in training and (2) as a source of readily available information if there is an emergency.

There is space on it to:
> Write down contact information needed in an emergency
> Evacuation locations
> What to do in a fire, spill, LPG leak,
> How to do CPR and apply First Aid
> If there is a civil disaster
> Emergency equipment – type and locations
> People responsibilities and plan testing
> Incident reporting

**Your practical Guide**
The Guide provides reference information about each point made in the 5 Steps to Safety. The first step is to prepare an inventory of all of the hazardous substances at your workplace.

**Workbook**
The Workbook gives you instructions for completing an inventory on an inventory form. The form is set up so that you will record all of the information needed to use the HSNO Calculator.

**Animated safety videos**
Five on line videos present an introduction and then cover (1) Long term damage, (2) Read the label, (3) Use right containers and (4) Storage.
HSNO Calculator

The HSNO Calculator helps work out what key HSNO controls are needed based on the hazardous substances you use and store. To use the HSNO Calculator you must complete a hazardous substances inventory for all of the substances you used and store, using the Workbook. Once your inventory is complete, enter the details into the calculator to work out what key HSNO controls you need in place.

If you use chemicals in your workplace, the information in section C of this booklet will help you understand more about using and storing them safely.

PART B – PRACTICAL ADVICE ABOUT CHEMICAL USE IN WORKPLACES

1. **Name the chemical (use the Workbook referred to above)**
   - What do we use it for?
   - Who uses it?
   - Where is it stored?
   - How much is there?
   - What form is it in? (Gas, liquid, gel, solid, powder)
   - What container is it in?

2. **Determine the risk it poses**

What are the hazards for this chemical:
   - explosive
   - flammable
   - toxic
   - corrosive
   - oxidising
   - ecotoxic?

Also ask – what will occur during the process? Will new chemical substances be formed that require control?

Next, rate the **Severity (S)** of harm and its **Likelihood (L)** – each on scales of 1, 2 or 3.

Next – ask what is the overall **Risk**? Multiply the two ratings \((S \times L)\).

This will give an idea of the urgency and nature of controls that will be needed.

**Special Caution:**

HSNO deals with chemicals being held securely and individually in containers. It does not deal so well with what happens when chemicals are used in workplaces. Some questions illustrate:

- What happens when chemicals are mixed together?
- How quickly do they decay or change (if at all) when emitted into the workplace air?
- How do they enter the body?
- What toxic effects do they have – do they target specific body organs?
- How long do they last in the body?
- What exposure monitoring and biological monitoring is required?

You may need a specialist, such as an industrial hygienist, to help you answer questions like these.

3. **Decide how the hazards posed by the chemical will be controlled (Use the HSNO Calculator referred to above)**

Determine the overall strategy from **Eliminate, Isolate, or Minimise**. Decide the specific controls that will be needed:

- local exhaust ventilation
- safety data sheet
- protective safety equipment
- training
- secure storage
- segregation
- labelling
- signage
- spill control
- emergency response plan
- test certificates.
4. Write down the actions required to put controls in place

Write down the actions needed to put any missing controls in place - what needs to be done, who is responsible for doing it, deadlines etc.

PART C – THREE LEVELS OF EMERGENCY MANAGEMENT

The level of management required depends on the quantities of hazardous substances held. The levels are cumulative.

> Level 1: Information on labels. It must be clear so people know about the substance and what to do in an emergency.
> Level 2: Documentation such as SDS, so people can work out what to do in an emergency advance. Fire extinguishers will also be required.
> Level 3: Signage, Plans and secondary containment.

PART D – LABELLING

If the amount of substance present exceeds the trigger quantities, it must be labelled for emergency management and this must be available in 10 seconds.

Suppliers or sellers must ensure the information is provided and the person in charge at the workplace must ensure it continues to be met.

The trigger quantities are listed in Schedule 1 of the Hazardous Substances (Emergency Management) Regulations (HSEMR) at:


EPA has an additional ‘Quick Guide on Labelling’.

PART E – SAFETY DATA SHEETS

Safety Data Sheets must be held on site if the trigger quantities listed in Schedule 2 of the HSEMR for level 2 are exceeded. They must be available within 10 minutes. They must provide information about emergency preparations, any special training or equipment needed, actions to reduce or eliminate danger and actions to be taken to restore control after an emergency.

PART F – FIRE EXTINGUISHERS

Where explosive, flammable or oxidising substances are held above the trigger quantities listed in Schedule 3 of the HAEMR, the number of fire extinguishers given in the Schedule must be provided.

PART G – SIGNAGE

When the quantities of substances held exceed the trigger quantities shown in Schedule 5 of the HSEN, signs are required. EPA has an additional ‘Quick Guide on Signage’.

PART H – EMERGENCY RESPONSE PLANS

Schedule 4 of the HSEMR sets out trigger quantities that will require Emergency Response Plans (ERP).

An ERP must identify all likely emergencies that will occur. It must:

> Describe what to do in an emergency.
> Identify who is responsible for these actions.
> List contact details.
> Identify the location and purpose of materials needed in an emergency.
> Provide information on the EM decision making process and sequence of ER actions.
> Identify any additional fire-fighting equipment or facilities (e.g. shower) required.
> ERPs must be tested every 12 months.

PART I – SECONDARY CONTAINMENT

Schedule 4 of the HSEMR also sets out trigger quantities that will require Secondary Containment.

Source:
Basic website for Chemical Safety:
www.hazardoussubstances.govt.nz/

Worksafe new Zealand point of entry.
3.5 WORK RELATED MUSCULOSKELETAL DISORDERS

3.5.1 ACUTE LOW BACK PAIN AND SERIOUS BACK INJURIES

To appreciate the Worksafe NZ approach to preventing work related back problems, first recognise that there are differences between acute low back pain (ALBP) and serious back injuries (SBI).

a. Acute Low Back Pain:

This is what can happen when we bend down to tie up a shoelace – a sudden pain in the low back. ALBP is spontaneous and hard to prevent. However, we know exactly what to do to help ALBP get better quickly*. The employer role is to react properly once it occurs, concentrating on psychosocial factors in the workplace.

b. Serious Back Injuries:

Fractures, severe disc problems and co-morbidity. In theory these are ‘easy’ to prevent by applying the Manual Handling ACOP.

Differences between Acute low back pain and Serious back injury

<table>
<thead>
<tr>
<th></th>
<th>ACUTE LOW BACK PAIN</th>
<th>SPECIFIC BACK INJURIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Causation</td>
<td>Poorly understood</td>
<td>Readily identifiable causes</td>
</tr>
<tr>
<td>Pathology</td>
<td>Rare</td>
<td>Trauma often detectable</td>
</tr>
<tr>
<td>Prevention</td>
<td>Difficult</td>
<td>‘Easy’ to prevent, as causes are well known:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; heavy handling/high forces</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; sustained and repeated awkward</td>
</tr>
<tr>
<td></td>
<td></td>
<td>posture or movements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; slips, trips, falls and loss of balance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; exposure to whole-body vibration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; road crashes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; combination of above.</td>
</tr>
<tr>
<td>Management</td>
<td>Most ALBP gets better quickly.</td>
<td>Difficult</td>
</tr>
<tr>
<td>Psychosocial factors</td>
<td>Important in the continuance of pain</td>
<td>Less important</td>
</tr>
<tr>
<td>Prevention focus</td>
<td>Secondary – stop it getting worse</td>
<td>Primary – stop it happening at all</td>
</tr>
<tr>
<td>Costs</td>
<td>90% of all back claims</td>
<td>Responsible for more than 10% of costs.</td>
</tr>
<tr>
<td>Employer role</td>
<td></td>
<td>Use the Manual Handling ACOP to assess risks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and find controls.</td>
</tr>
</tbody>
</table>

Notes:

Psychosocial factors are the main barrier to preventing ALBP get better quickly.

They include things like these:

> a person believes that they can’t return to work while any pain remains
> a person ‘catastrophises’

* Bed rest, two days at most. Pain relief to the maximum dose. Resume normal movements and activities as soon as possible.
> there is a negative reaction from the employer and maybe the supervisor and workmates. Unpleasant things are said.
> spouses/partners are dismissive or over-protective(!).

3.5.2 DISCOMFORT, PAIN AND INJURY ACCG

This approach to Discomfort, Pain and Injury (DPI) developed by ACC covers:
> acute low back pain
> serious back injuries
> gradual process injuries.

Worksafe NZ suggests it is best to think about seven contributory factors that can influence DPI:
> individual
> psychosocial
> work organisation
> work layout/awkward postures
> task invariability
> load/forceful movements
> environmental.

Two Caveats:

A. One shot fixes can work:
That is not to say that one shot fixes cannot work, they can. For example:
> Computer users with neck discomfort often get relief when given a footrest.
> Discomfort in bindery operators disappeared with task rotation.

B. Missing a key facet may prevent resolution:
The generality of the 7 factor approach may suggest that making good on several factors may make up for factors that cannot be made good. This may be the case but should not be regarded as a rule. For example:
> Discomfort is unlikely to be prevented for all fish filleters or poultry processors if the task rate is too great.

Experienced workstation assessors can provide appropriate advice.

THE SEVEN CONTRIBUTORY FACTORS

1. Individual Factors
   a. Things a person can’t change about the way they are:
      > height, dexterity, strength
   b. Relevant things a person can change to some extent about the way they are:
      > exercise, sleep, food, breathing, fitness.

2. Psychosocial Factors
The way a person reacts in and to their social environment and its influences on their behaviour. It is, however, a two way thing. The way a person reacts to pain will depend, in part, on the way family, colleagues and management react.

Detail:
> Stress in section 7.2 of this booklet.
> Guidelines for Management of Some Common Musculoskeletal Disorders. ACC Publication 1038. Go to www.acc.co.nz and search with the publication number ‘1038’.

3. Work Organisation

How work is arranged, delegated and carried out – the timing of work, how much is expected, the discretion available in:
- how to do tasks and
- the order in which they are done.


In particular, see Table 1.2 of the Guideline: Healthy Work: Managing stress and fatigue in the workplace for ideas on making work healthy.

4. Work Layout/Awkward Postures

The way work is set up and the positions people have to adopt to do it. This is the traditional, physical ergonomics or ‘Fit Reach and See’.

For example:
> A short person has to hold their shoulders high because the bench where they fillet fish is not height adjustable.
> An older person has to lean forward to see a computer screen because their eyesight is not what it was and visual correction is not used.


5. Task Invariability

How much a task changes over time. For example:
> doing the same task all day without job rotation.

6. Load/Forceful Movements

The muscle forces a person has to use to get a job done. Detail: look at the Worksafe NZ/ACC Code of Practice for Manual Handling.

7. Environmental Factors

The conditions of lighting, heat, cold, humidity, air speed, airborne contaminants and noise that work takes place in. See section 8 of this booklet.

Further detail about each topic can be found at: www.acc.co.nz/preventing-injuries/at-work/workplace-health-issues/PI00082?promospotip

3.5.3 DISCOMFORT, PAIN AND INJURY, A PERSON CENTRED APPROACH

This approach is complementary to the one just described and focuses wholly on the person. It takes the view that prolonged muscle tension is a sensible thing to look for and alleviate when addressing gradual process injuries.

The approach is implicit in the above, but this section tries to make clear the various guises of muscle tension.

HOLDING MUSCLES TENSE

- Poor workstation design (eg: shoulders need to be raised).
- Inappropriate pace and organisation of work (eg: no breaks, no task variation).
- Environmental factors, (eg: sunlight through a window dazzles a person and causes them to move their head to avoid it).
- Physical demands of the task (eg: force and repetition requirements).

REPEATEDLY MAKING FORCEFUL OR JERKY MOVEMENTS

- Not enough recovery time between repeated actions – eg a person raises the arm to hold a component in place as it is soldered. This takes 10 seconds, There is a pause of only 3 seconds in the arm elevation as another component is grasped.
The task is beyond anyones’ capability: i.e the force and repetition too great for anyone.

Some numerical limits are available against which force and repetition requirements can be assessed. See page 122.

REACTING TO SOCIAL STRESSORS
The way people react to the whole sum of the factors at work (physical, environmental, psychosocial, personal etc) and maybe also at home.

PEOPLE DRIVING THEMSELVES HARD
For various reasons to do with personality, a desire to perform or unawareness of early warning signs, people work themselves too hard. This tendency is exploitable.

Solutions:
> workstation design
> task rate, breaks, pauses and task variation
> optimise holding time in relation to recovery time
> force reduction
> relaxation training
> working technique training.

Sources: Worksafe NZ Produced a prevention guideline in 1992
www.business.govt.nz/worksafe/information-guidance/all-guidance-items/pocket-ergonomist-keyboard-clerical-or-industrial-retail-1
Version 1 Clerical/Keyboard
Version 2 Industrial/Retail.

3.5.4 MANUAL HANDLING ACOP
There is a joint Worksafe NZ – ACC Code of Practice for Manual Handling. This entry describes its scope and presents the essentials of the risk assessment procedure.

The Code takes the following approach:

1. Identify MH hazards
2. Was hazardous MH present?
   Yes
   No
3. Was the risk score > 10?
   Yes
   No
4. Assess the contributory factors
5. Control the hazards
6. Review and evaluate
   Review regularly

These steps are laid out in a manual handling hazard control record on pages 46 – 49 of the ACOP.

1. Identify MH hazards
The Code suggests that company records, consultation with employees and observation of tasks will reveal tasks that involve manual handling.

2. Identify hazardous MH
The next step is to see if each task could involve hazardous manual handling.
Ask if the task involves any of the following:
> twisted, stooped, awkward, asymmetrical postures
> fixed, sustained, rigid, prolonged postures
> unvaried, repetitive movements
> sudden, uncontrolled or jerky motions
> handling/reaching away from the body
> using high or sustained force
> handling heavy/awkward loads
> whole body or upper limb vibration
> handling for too long without a break.

If the answer is yes to any one of these, then go on with the remaining steps, else review the situation from time to time.

3. Find the risk score

This occurs in 5 parts by assigning a score to four features of the task and adding them up. Reference to the risk assessment method on page 46 of the Code will be required to get the numerical scores.

a. Load score:
The load score is the muscle force applied by the worker. It may be the weight of the object handled or the forces applied may need to be measured with a spring balance or a force gauge – or an estimate made. If several people do the task, the score should reflect the ability of the least able.

b. Posture and workplace layout score:
Observe the postures adopted. Take an average value if necessary or use numbers between the ones shown.

c. Work conditions and environment score
Observe the space to work, obstacles, lighting, flooring etc

d. Time score:
Find the time score from the greatest of either the number of repetitions of the task or the time spent doing it during the shift.

e. Calculate the Overall Risk Score
Find the overall risk score by adding the load, posture and environment scores and multiplying their sum by the time score:

\[(A+B+C) \times T = \text{Overall risk score.}\]

Risk assessment:
The risk score can be compared with guidance presented in a table:

- <10: DPI risk is low. Monitor the contributory factors.
- 11–24: DPI is possible. Investigate all the contributory factors.
- 25–49: DPI is possible even for fit, trained people. Address all the relevant contributory factors.
- 50+: DPI is likely. Avoid the task and re-design the workplace urgently.

See questions 7–11 of the manual handling hazard control record.

4. Assess the contributory factors

If the risk score is over 10, the next step is to assess the ‘contributory factors’. They are set out at question 12 on pages 46 and 47 of the Code under the 5 headings below. They identify factors in a manual handling task that, if controlled, can reduce its risk. The 5 headings are:

- Load
- Environment
- People
- Task
- Management.

5. Control Hazards

This section of the Code (questions 13 – 18) sets out an approach to assessing the risk of each contributory factor, writing suggestions on how to control it and the cost and impact of each control. An action plan template is presented at question 14.
Questions 15 – 17 deal with the monitoring that might be required for employees exposed to manual handling.

6. Review and evaluate

Question 18 suggests ways of reviewing the effectiveness of control measures.

TRAINING

The Code makes suggestions about training for manual handling tasks. This does not focus on technique but rather on altering the different aspects of the task so that it can be carried out safely.

WHAT IS THERE TO BE GAINED?

On page 12 the Code suggests what is to be gained by its application:

> Removing risk factors for serious back injuries from manual handling tasks may reduce the incidence, delay the onset, or reduce the severity of an episode of acute low back pain.

> Preventing recurrent attacks of acute low back pain will prevent more serious persistent conditions from developing.

> Controlling the hazards posed by manual handling tasks, with the intention of bringing them within the reach of everyone in an organisation (including people with a disability or with acute low back pain) makes a lot of economic sense to employers.


3.5.5 GRADUAL PROCESS INJURIES

These are also known as ‘RSI’ and ‘Overuse Disorders’ (OOS), Work related upper limb disorders (WRULD), Cumulative Trauma Disorders (CTD) and many other names.

They include:

1. Localised inflammations:
   > tendonitis
   > tenosynovitis
   > epicondylitis
   > bursitis.

2. Entrapment syndromes:
   > carpal tunnel syndrome
   > ulnar or radial nerve compression.

3. Pain syndromes:
   > myofascial pain syndromes
   > fibromyalgia.

The table on the next page reports the work-relatedness of some of these conditions.

## Work relatedness of Gradual Process Injuries – by body part

<table>
<thead>
<tr>
<th>Body Part</th>
<th>Strong Evidence</th>
<th>Evidence</th>
<th>Insufficient Evidence</th>
<th>Evidence of No Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck and Neck/shoulder</td>
<td>Strong Evidence</td>
<td>Evidence++</td>
<td>Insufficient Evidence+</td>
<td>Evidence of No Effect</td>
</tr>
<tr>
<td>Repetition</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posture</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder</td>
<td>POSTURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetition</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>POSTURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetition</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand/wrist</td>
<td>CARPAL TUNNEL SYNDROME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetition</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posture</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tendinitis</td>
<td>POSTURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetition</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posture</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand-arm vibration syndrome</td>
<td>VIBRATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetition</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Force</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posture</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lifting/forceful movement</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awkward posture</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy physical work</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole body vibration</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Static work posture</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Causative factors – by general focus

The table below suggests how important some of the seven factors are in the causation of gradual process injuries, and thus the possible relative merits of focusing on them when attempting prevention.

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>CAUSATIVE FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localised inflamations</td>
<td>(a) evidence – repetition (work organization and/or task invariability), force and posture are risk factors (RF) (b) strong evidence – combinations of repetition, force and posture are RF.</td>
</tr>
<tr>
<td>Entrapment syndromes</td>
<td>(a) evidence – highly repetitive work (through work organization and/or task invariability) or in combination with other factors and forceful work and hand wrist vibration are RF. (b) strong evidence – combinations of force and repetition or force and posture are RF.</td>
</tr>
<tr>
<td>Pain Syndromes</td>
<td>Likely that few statements can be made, except that individual factors and psychosocial factors may play a more important role.</td>
</tr>
</tbody>
</table>

The next table reports on the best timing of prevention measures.

Prevention focus for Gradual Process Injuries

<table>
<thead>
<tr>
<th>CONDITIONS</th>
<th>PRIMARY PREVENTION</th>
<th>SECONDARY PREVENTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localised inflammations</td>
<td>More amenable to primary prevention</td>
<td>Important, though less so than for pain syndromes</td>
</tr>
<tr>
<td>Entrapment syndromes</td>
<td>More amenable to primary prevention</td>
<td>Important, though less so than for pain syndromes</td>
</tr>
<tr>
<td>Pain Syndromes</td>
<td>Amenable to primary prevention</td>
<td>Psychosocial factors are likely to be strong barriers to recovery</td>
</tr>
</tbody>
</table>

These comments result from the averaged findings about large groups of people.

Each situation will be different and will need evaluation on its own merits.

References:


Cross Reference: 3.5.1 Page 117
### 3.5.6 Assessing the Risks When Tasks Involve Repeated Motions

There are many ways of assessing risks of tasks that require repetitive movements. However, ‘repetition’ is misleading. It is not the moving muscles only that develop problems – but also the one that are held tense. A computer user’s fingers move quickly, but problems typically occur in the muscles in the top of the forearm, i.e., those which hold the wrist up and are in constant tension.

The pictures show some ways in which muscles can be held tight. If you see any of these in a task, it is not hard to work out which muscles are held tense.

These pictures are not exhaustive. One way of estimating risk for a repetitive task is to time the task for several cycles and measure the holding time and the cycle time. This also gives the recovery time available. Ask the worker to see if the muscle force is light, moderate or heavy.

The graph below will allow you to see if the recovery time is adequate.

For example, chickens pass on a conveyor every 12 seconds and an operator must spend 7 of those reaching up to mid chest height and forward with the hands to de-gut them. The operator says the work is moderately forceful.

Drawing a line up vertically from 12 seconds on the cycle time line to the ‘moderate’ curve, then going across horizontally to the holding time line gives you about 7 seconds allowable holding.

For this task, the recovery of 5 seconds time may be adequate. (That conclusion should be tempered in that all phenomena in nature are normally distributed.)

For a person (short, female) who had to reach up or forward more, however, the force requirement might be reported as high – and thus unacceptable.

The next page shows the UK HSE method which takes another common approach to risk assessment. It is called ART (Assessment of Repetitive Tasks) and is based on an examination of each body part in turn.

This chart prompts the consideration of different aspects of the way the body is used, assigns a score to each, adds the scores and then uses the total to indicate the severity of the risk.

The ART approach asks about:

- arm movements
- forces applied (strength x frequency)
- postures of the neck, back, arm, wrist and hands
- breaks in the work
- the work pace
- other factors
- the work duration.

These imply scores in 12 boxes. You add these together and multiply by the duration factor (for each arm, separately).
### STAGE A - Frequency / Repetition

- **A1 Arm movements**
  - Infrequent (eg some intermittent movement) - G 0 G 0
  - Frequent (eg regular movement with some pauses) - A 3 A 3
  - Very frequent (eg almost continuous movement) - R 6 R 6

- **A2 Repetition**
  - Similar motion patterns repeated 10 times per minute or less - G 0 G 0
  - Similar motion patterns repeated 11 to 20 times per minute - A 3 A 3
  - Similar motion patterns repeated more than 20 times per minute - R 6 R 6

### STAGE B - Force

- **B Force**
  - See grid on page 9 of the assessment guide
  - See grid on page 9 of the assessment guide
  - See grid on page 9 of the assessment guide

### STAGE C - Awkward postures

- **C1 Head/neck posture**
  - Almost neutral - G 0
  - Bent or twisted part of the time - A 1 R 2
  - Bent or twisted more than half of the time - R 2

- **C2 Back posture**
  - Elbow close to the body or the arm is supported - G 0
  - Elbow raised away from the body part of the time - A 1 R 2
  - Elbow raised away from the body more than half of the time - R 2

- **C3 Arm posture**
  - Almost neutral/Straight - G 0
  - Bent or deviated part of the time - A 1 R 2
  - Bent or deviated more than half of the time - R 2

- **C4 Wrist posture**
  - Power grip or no awkward grip - G 0
  - Pinch or wide finger grip for part of the time - A 1 R 2
  - Pinch or wide finger grip for more than half of the time - R 2

### STAGE D - Additional factors

- **D1 Breaks**
  - Less than 1 hour of continuous work - G 0
  - 1 to less than 2 hours of continuous work - A 2
  - 2 to less than 3 hours of continuous work - A 4
  - 3 to less than 4 hours of continuous work - R 6
  - 4 or more hours of continuous work - R 8

- **D2 Work pace**
  - Never difficult to keep up with the work - G 0
  - Sometimes difficult to keep up with the work - A 1
  - Often difficult to keep up with the work - R 2

- **D3 Other factors**
  - No factors present - G 0
  - 1 factor present - A 1
  - 2 or more factors present - R 2

- **D4 Duration**
  - Less than 2 hours - x 0.5
  - 2 to less than 4 hours - x 0.75
  - 4 to 8 hours - x 1
  - More than 8 hours - x 1.5

---

**STAGE A Frequency score**

- Left hand
- Right hand

**STAGE B Force score**

- B

**STAGE C Posture score**

- C1 + C2 + C3 + C4 + C5

**STAGE D Additional factors**

- D1 + D2 + D3

**Task score**

**Duration**

**Exposure score**
The score is interpreted as follows:

<table>
<thead>
<tr>
<th>SCORE</th>
<th>RISK</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 11</td>
<td>Low</td>
<td>Consider the individual circumstances</td>
</tr>
<tr>
<td>12 – 22</td>
<td>Med</td>
<td>Further investigation needed</td>
</tr>
<tr>
<td>22 +</td>
<td>High</td>
<td>Further investigations needed urgently</td>
</tr>
</tbody>
</table>

As with the method described earlier, the assessor needs to talk with the people doing the tasks to decide what force levels are being exerted. There is a chart in the body of the publication about that – with both the amount of force exerted and time it is exerted for being incorporated.

A copy of the ART guide is needed to help interpret the scores.

As the method is somewhat subjective, different assessors will likely arrive at different scores. This is inevitable and does not mean that one is wrong.

However, if different assessors can discuss results and refine their observations, it is to be expected that the overall result will be more reliable.

A common use of methods like this is for several assessors to arrive at agreed scores, then alter the task and re-evaluate to see if adequate change has occurred.

High scores in the individual parts of the assessment indicate obvious action points.

Source: Assessment of Repetitive Tasks of the upper limbs. [www.hse.gov.uk/msd/uld/art/](http://www.hse.gov.uk/msd/uld/art/)

### 3.5.6 PATIENT HANDLING **ACC GL**

**INTRODUCTION**

Healthcare workers have one of the highest rates of musculoskeletal disorders of all occupational groups, mostly through moving and handling people.

In 2003 ACC published a guideline⁴.

Developments in equipment and techniques mean that a more comprehensive guideline⁵ was published in 2012. It has the following 12 sections:

1. **Policy and programme planning**

   A moving and handling policy can help ensure staff are trained, equipped and supported in methods of safe moving and handling techniques.

2. **Risk Assessment**

   This section shows how to assess the overall risk when a carer is required to move a specific patient – taking into account the person being handled, psychosocial factors, the workplace layout, how work is arranged, tasks and environmental factors.

3. **Moving and handling people**

   This section of the guideline describes the techniques for handling patients that are that are either acceptable or unacceptable.

4. **Training**

   Training by qualified trainers, operating within a facility-wide, comprehensive programme under the control of a coordinator, is essential before using patient handling equipment (PHE) and the approved handling techniques.

   Training should be provided to new employees, existing staff as a refresher and/or after an incident or near hit. The focus of training is the handling of people, but it should address the wider context:

   > organisation training
   > equipment maintenance
   > upgrading facilities
   > developing a culture of safety
   > communication
   > monitoring and evaluation
   > audits.

⁴ New Zealand Patient Handling Guidelines.

⁵ Moving and Handling People – The NZ Guidelines 2012.
Training should be evaluated.

5. **Equipment for moving/handling people**

Many types of PHE exist including:

- slide sheets
- transfer belts
- transfer boards
- hoists including mobile, standing and ceiling.

Proper maintenance is vital. A register should schedule and record PHE location, use and maintenance.

6. **Facility design**

Health facilities should be planned, designed and built with moving and handling people in mind. New Zealand Standard 4121 and the Australian Health Facility Guidelines refer. The latter is at:


7. **Upgrading facilities**

Upgrading existing facilities is often the best option to make existing work spaces safer. Examples are:

- installing ceiling tracking
- providing access for mobile hoists
- installing hand rails
- re-designing bathrooms and
- equipment storage areas.

8. **Developing a culture of safety**

Developing a culture of safety can improve workplace conditions and reduce accidents. It is determined by:

- management policies and workplace practices
- effective organisation communication
- incident reporting system
- staff involvement in safety reviews and decisions

- physical resources and equipment provided that reduce hazards
- supporting a health and safety office or function.

9. **Bariatric patients**

Bariatric (very heavy) patients pose special risks. The Guideline covers their assessment under a series of headings.

10. **Communication**

Communication is essential in the implementation and delivery of an effective moving and handling plan. It informs clients and staff about the programme and its purpose.

A key part of the plan is informing and education client and families about the programme. This helps the client to feel comfortable about it. Questions are encouraged.

11. **Monitoring and evaluation**

A core part of developing and maintaining an effective programme is the process of collecting information about how well the activities and operations associated with the programme are working. It is useful to remember that programmes tend to lose their effectiveness over time unless there are ongoing audits and monitoring.

12. **Audits**

Audits are necessary to ensure the systems are working as intended. They should provide information that leads to improvements in the moving and handling programmes.

**Reference:** The ACC Guide of 2012 is called: Moving and Handling People: The New Zealand Guidelines 2012. It is at:

3.6 ERGONOMICS

3.6.1 INTRODUCTION

This section presents a brief overview of Ergonomics.

In brief, Ergonomics seeks to put human characteristics at the centre when things and systems are designed.

Good design is the desired outcome of Ergonomics.

This requires the integration of many aspects of a situation into a final product or service, and means that the design is usually harder than the ergonomics.

Ergonomics is or has been applied to the design of things in well known settings:

> the re-design of Henry Ford’s car assembly line – to make human effort more effective and less tiring
> computer and supermarket workstations
> hand tools
> aircraft cockpits.

However, it has a much wider range of application than most people know, as illustrated by:

> How should printed, public use forms be designed so people can use them easily?

Putting human characteristics at the centre requires discipline – and the avoidance of putting human nature at the centre.

This is touched on in the outer ring of the diagram at the left, work organization and job design, which is a difficult part of ergonomics. It is often referred to as the ‘psychosocial’ domain and implies as its main focus of attention the way people interact with each other.

The diagram also illustrates the overlap of ergonomics with the disciplines of Industrial Hygiene and Occupational Psychology.

In the remainder of this section, some practical details about sitting and standing at work, using computers safely, hand tool design and industrial workstation design are presented.

Source: Worksafe NZ has no information about Ergonomics per se.

3.6.2 SITTING AND STANDING AT WORK

Prolonged standing or sitting are both undesirable. A choice between the two needs to be given in many sorts of work.

Discomfort and fatigue both accompany prolonged sitting and standing. Therefore, if a choice is not provided, a decrease in effectiveness must be expected in workers such as:

> bank tellers
> postal sorting workers
> some parts of health care
> shop assistants
> laundry staff.
Word of mouth has it that retail practice regards sitting shop assistants as ‘unprofessional’ or that they cannot be ‘customer responsive’.

There is a need for shop assistants to:

> be vigilant for shoplifting
> be at the same eye-height as customers for clear communication
> be active in re-stocking shelves and keeping displays neat.

However, the rejection of any sitting is poorly informed, illegal and un-conducive to health and productive work overall.

SITTING ON AIRCRAFT FLIGHTS

Sitting for prolonged periods on aircraft is thought to have a slightly increased risk of venous thromboembolism – referring to both deep vein thrombosis (DVT – or the process by which a blood clot forms in a vein) and pulmonary embolism (PE – when the blood clot travels to the lungs).

Note that airline passengers are virtually confined to a seat for the duration of a flight but office workers who ‘sit all day’ rarely do so.

STANDING ALL DAY

The plight of shop assistants (usually female) who have to stand all day has been the focus of concern in past times. For example, in the 1870’s and 1880’s it was taken that this was unhealthy to the extent that, in 1880, the Lancet in the UK launched a campaign against this ‘cruelty to women’. Wearing high heels will, of course, make the effects of prolonged standing worse.

In the 1930’s the UK Government wrote a requirement for seats for workers into the Factories Act and, from 1946, New Zealand legislation has had a similar requirement. Concerns named include:

> varicose veins and circulatory problems
> leg and back pain
> difficulties in pregnancy.

EVIDENCE OF EFFECTS OF SITTING AND STANDING

Significant health effects have been shown to occur after prolonged standing and prolonged sitting.

There is good evidence that standing all day poses a significantly increased risk for varicose veins. There is evidence that prolonged sitting may pose a small risk for DVT and PE.

However, there is sufficient evidence to suggest that sedentary behavior is a distinct risk for diabetes, weight, heart disease and some cancers, and that this risk appears to be independent of time spent doing moderate and/or vigorous physical activity.

These diseases are among the most significant of all causes of morbidity and mortality, so there is a very likely a large public health effect as a result. This points to the need to break up time sitting with time spent standing or moving.

LEGAL

The intent of the HSE Regulations 1995 (Regulations 5(2), d and e) are to provide relief from the effects of constant standing. They state:

> where the work is of such a nature that it is reasonable for employees to perform it while seated, facilities for sitting
> (e) where the work is of such a nature that it is not reasonable for employees to perform it while seated, facilities for sitting that enable employees to take any reasonable opportunity for rest that may occur in the course of the work.

They do not imply that people need to be able to sit down all day or take a sitting break whenever they wish.

Studies in industry show that people with a choice seem not to choose to sit all day. Workers using 900mm high benches in one factory, for example, chose to use a sit-stand seat (see below) for between 25 and 40% of the day, for certain tasks.
TALL CHAIRS/STOOLS

Sitting on a tall stool without a backrest or footrest is worse than standing. For tall stools:
> seat height should be adjustable
> the seat should have a backrest, ideally height adjustable
> bench top supports should not interfere with the thighs
> adequate knee room
> a foot rest is essential.

Without support for the feet and lumbar spine, discomfort and fatigue will develop quickly when sitting on a tall chair.

SIT STAND SEATS

Sit-stand seats are a good alternative to tall chairs. The main feature of the posture when using one is that the hip angle (the trunk - thigh angle) is open. This means that a backrest is not required. The open posture:
> relieves tension in the erector spinae and gluteus maximus muscles
> tends to promote the correct shape of the lumbar spine and reduce pressure in the intervertebral discs
> all without needing a backrest.

The reduction in stature should be less than 20 percent of normal standing height, in which case users will be able sit while working at a bench, as long as knee space is OK – and retail assistants would be able to scan for shoplifters.

Note that sit stand seats and tall chairs can get in the way when people get off them. If they clutter the space available to move around in they may be unsuitable for some locations (eg: bank tellers).

MOVING AT WORK

A recent New Zealand report suggests:
> acknowledge sedentary behavior as a workplace health and productivity issue
> provide sit/stand workstations
> encourage staff to walk and talk, rather than sitting to communicate or using email or phones
> encourage staff to take breaks that involve movement.

Source: HSE Regulations.


3.6.3 SAFE COMPUTER USE ACC GL

Safe use of computer workstations comprises a surprising amount of detail, reflecting the constancy of the work, the static nature of the tasks and the intense concentration that can occur during them.

The current definitive guidelines are in the 100 page booklet published by ACC in November 2010. It replaces the previous ACOP. Sections in the guidelines are:

What can go wrong during computer use:
> physical discomfort
> visual discomfort
> stress
> fatigue.

The guidelines then present the DPI model (See section 5.2) as a model of the causation of these things.

Control of hazards – is covered under six headings:
1. Organising work
2. The work environment
3. Postures and practices
4. Furniture and equipment
5. Computer hardware
6. Education and training.
Details are given as follows:

1. **Organising work**
The way work is structured and organized. A variety of tasks, discretion in work scheduling and how to complete tasks, feedback on performance, control over priority, pace and procedure – are all regarded as healthy.

2. **The work environment**
This section covers working space, workstation location, lighting and décor, atmospheric conditions, noise and housekeeping – over 10 sides of A4.

3. **Postures and practices**
The way people use and hold their bodies can affect the development of discomfort. 6 sides of A4.

4. **Furniture and equipment**

5. **Computer hardware**
This section covers computer screens, screen placement, multiple screens, keyboards, pointing devices (mouse) handrests and laptops, again in considerable but highly relevant detail – on 17 sides of A4.

6. **Education and training**
Suggestions for training courses are made. The Guideline concludes with short sections on:
> managing health issues once they occur
> health monitoring
> FAQ.
There is a glossary and a bibliography.

**Source:** Guidelines for using computers – preventing and managing discomfort, pain and injury. ACC 5637 at: www.acc.co.nz/search-results/index.htm?ssUserText=guidelines+for+using+computers

### 3.6.4 HAND TOOLS

Hand tool selection is influenced by:
> the type of grip used to hold the tool (power grip or pinch grip)

- **Pinch grip**
- **Power Grip**

- the force applied to it – high force requires a handle diameter of 32–50 mm and a handle length longer than the palm width
- the position of tool use
- the height of the work
- the repetitiveness of the work - power tools may be needed for repetitive work.

Critical features of hand tool design are:
- **one-handed tools:** handle diameter – 32–50 mm power grip; 6–12 mm pinch grip; handle length – 100–120 mm for high force tasks, tool weight – a tool suspender may be needed
- **two-handed tools:** in addition consider the handle separation and trap points.
**Bent-handled pliers** are a good idea if they are used in an appropriate position.

A bent handled plier and a wrist in a healthy neutral position.

**Inappropriate use of a straight handled plier.** The wrist remains highly flexed. A bent handled plier should have been used.

This also shows the inappropriate use of a bent handled plier.

**GENERAL TOOL SUGGESTIONS**

1. Avoid the following actions:
   - a bent wrist when using a tool
   - repeated rotation of the forearm – a powered tool may be required
   - working with raised shoulders or elbows held out – alterations in the work height may be needed.

2. Provide the tool with:
   - comfortable, soft, non-slip handles
   - for two-handed tools: spring-opening
   - large triggers (at least three fingers)
   - avoid pinch points, sharp edges, finger grooves.

3. Tool selection can affect shoulder posture. Use of a short shank screwdriver is indicated here.

**HAMMERS**

- handle diameter 32–50 mm
- length at least 100–150 mm
- non-slip coating material.

**DOUBLE-HANDED TOOLS USED FOR POWER TASKS**

Double-handed tool openings need to be neither too small nor too great. They should also be spring loaded.

- grip span = 50 mm minimum and 90 mm maximum
- no sharp edges
- no finger grooves
- spring-loaded
- no pinch points
- can the tool be used while keeping wrists straight?

**DOUBLE-HANDED TOOLS FOR PRECISION TASKS**

- grip span = 25 mm min and 75 mm max
- no sharp edges
- no finger grooves
- spring-loaded
- no pinch points
- can the tool be used while keeping wrists straight?
LARGE SCREWDRIVERS
> no finger grooves
> grippy surfaces
> diameter 32–50 mm
> length 100–150 mm
> is the shank the right length?

PRECISION SCREWDRIVERS
> diameter 6–13 mm
> repeated use of a small screwdriver like the one shown here may cause damage to the palm.

SCRAPERS
> handle diameter 32–50 mm, no finger grooves or sharp edges
> can the tool be used while keeping wrists straight?

SAWS
> diameter 32–50 mm
> no finger grooves or sharp edges
> can the tool be used while keeping wrists straight?

HACKSAWS
> no finger grooves or sharp edges.

Reference: A Guide to Selecting Non-Powered Hand Tools, NIOSH. Cincinnati. DHSS publication 2004–164. (The pictures were taken from this publication.) See: www.cdc.gov/niosh/docs/2004-164/default.html


Cross reference: next section 3.6.5

3.6.5 INDUSTRIAL WORKSTATION DESIGN
When people stand at a bench to work, this series of suggestions may be useful.

WORKSTATION HEIGHT
> Provide a height that suits the height of the person and the type of work.

POSTURES
> neutral postures – joints at the mid point of their range of action
> work close to the body, as shown
> avoid leaning forward or twisting the trunk
> have both feet on the floor – with equal weight borne on each
> provide for a variety of postures.

MOVEMENTS AND EFFORT
> avoid sudden, jerky and forceful movements (eg using the hand like a hammer)
> provide breaks that compensate for periods of high or sustained muscular effort.
ANTHROPOMETRY (BODY SIZES)
> if different people are to use the workstation it should be adjustable to suit the majority.

SITTING
> high stools are difficult to get comfortable on – they need a firm backrest and a footrest
> alternate sitting with standing if this is possible.

STANDING
> provide a leg rest 80 – 100 mm high to put one leg up on
> perching stools are good for providing relief for standing
> foot pedals should not be operated by standing workers unless they are carefully designed.

WORKSTATION DESIGN
> avoid forward reaching too far
> provide a sloping work surface
> provide adequate legroom
> provide clear vision of work items.


3.7 PSYCHOSOCIAL FACTORS

3.7.1 INTRODUCTION
WHAT ARE PSYCHOSOCIAL FACTORS?
If ‘Psycho’ means Mind and ‘Social’ refers to Society we have ‘mind in society’.
The term reflects the idea that how we react to events and how we behave towards each other can be important in determining outcomes.
This idea is as old as history.
Note that behaviour can include what is said, what body language says and how a person is treated. This can stem from what we feel and think about another person.

Demonstrations of the importance of psychosocial factors are found in several sections in this booklet. eg:
> Acute low back pain – (Section 5.1) where psychosocial factors are described as the most important barriers to recovery ie: How managers and colleagues behave towards and speak to an injured person is very important in the success of their return to work.
> Section 5.2 includes comments on both psychosocial factors and work organisation as risk factors for overuse disorders.
> Bullying – This is really all about the quality of workplace relationships.

WHY ARE PSYCHOSOCIAL FACTORS IMPORTANT?
In being about how people hold themselves towards each other, they are perhaps the key underlying factor in determining health and safety outcomes.

In the first part of this section, summaries of the results of landmark studies from the psychosocial research literature are presented.
They are to do with the effects of workplace factors on:
> premature death
> heart disease
> clinical depression
> health, generally
> having a ‘bad’ boss
> justice at work
> drinking
> sickness absence.

THE WHITEHALL STUDIES AND PREMATURE DEATH
The ‘Whitehall Study’ now in its second phase, involves many thousands of public servants.
The data being gathered is specific to each person in the study. The study therefore offers
advantages over studies based on group averages at a single moment in time\textsuperscript{6}.

**The key result of the initial Whitehall Study**

![Graph showing premature death rate in 40–64 year old males](image)

The figure shows the stunning finding that emerged in 1970: There is a huge difference in the rate of premature death between top people and bottom people. Who did you pick as 3.5 times more likely to die prematurely, the senior administrators or the clerical/manual workers?

The finding is unequivocal: people at the bottom do worse. It’s the clerical and manual workers who have the higher death rate.

Summary conclusions of this part of the Whitehall Studies are:

- **Something** operates powerfully to influence health, and is correlated with hierarchy per se.
- It operates on a middle class of people and its effects are large.
- For both animals and humans, being near the bottom of the social ladder produces worse health outcomes than being near the top. This cannot be explained solely by diet, workload and lifestyle, which were controlled for in the analysis.

**KARASEK AND THEORELL – HEART DISEASE**

In what became a landmark study, Karasek and Theorell and their team selected 1600 men at random from the 40 – 64 year age group in the Swedish workforce and, for four years, followed the rate at which the men developed symptoms of heart disease. If one of the men developed two (of four) symptoms of heart disease in the 4 years, that was a hit. At the same time they questioned the men to see how they rated the control in their work (called decision latitude) and its psychological demands (workload).

Karasek and Theorell presented the results of the number of hits in each segment of a graph of control versus demand, as the figure below illustrates.

You will note that no men scored a hit where work was ‘best’ – low demands and high control. Where work was ‘worst’, (the highest demands and the lowest control), 20% of the men developed symptoms of heart disease.

That is one fifth of the sub-group!

This compared with about 3.5% where work had the highest demands, but high control or lowest control but reasonable demands.

**Results of Karasek and Theorell’s original research**

![Graph showing heart disease hits](image)

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These findings, like those of the Whitehall study, understandably took the world of work research by storm.

Because of the disparity between 3.5% and 20%, Karasek and Theorell thought that a synergistic effect between demands and control was operating – ie the presence of both made things not only worse but much worse.

This same pattern was repeated in several studies of males and females for a number of different aspects of health:

- depression
- alcoholism
- accidents to/from work
- attempted suicide
- gastro intestinal upset
- musculoskeletal disorders.

**KARASEK AND THEORELL – DEPRESSION**

Later, Karasek and Theorell did the same type of study, but this time with support alongside demand and control as influences to be investigated.

**Prevalence of Depression, as found by Karasek and Theorell**

<table>
<thead>
<tr>
<th>% OF PEOPLE REPORTING SIGNIFICANT DEPRESSION</th>
<th>DECISION LATITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPORT</td>
<td>High</td>
</tr>
<tr>
<td>Psychological</td>
<td>Hi Low</td>
</tr>
<tr>
<td>Low</td>
<td>9</td>
</tr>
<tr>
<td>Medium</td>
<td>6</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
</tr>
<tr>
<td>Demand</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>17</td>
</tr>
<tr>
<td>Medium</td>
<td>13</td>
</tr>
<tr>
<td>High</td>
<td>18</td>
</tr>
</tbody>
</table>
| Support meant things like:

- if I have a problem, there is help and advice how to fix it or
- people cover for me when I'm absent
- when relationships have turned bad, there has been help to get them back on track.

**FROM THE DUNEDIN MULTIDISCIPLINARY BIRTH COHORT STUDY**

We tested the influence of work stress on diagnosed depression and anxiety in young working adults.

Participants are enrolled in the Dunedin Study, a 1972–73 longitudinal birth cohort assessed most recently in 2004-2005, at age 32.

Work stress (psychological and physical job demands, decision latitude, low social support,) was ascertained by interview. Major depression and generalized anxiety disorder were ascertained using the Diagnostic Interview Schedule and according to DSM-IV.

Participants exposed to high psychological job demands (excessive workload, extreme time pressures) had a twofold risk of major depression or generalized anxiety disorder compared to those with low job demands. Analyses ruled out the possibility that the association between work stress and disorder resulted from study members’ socioeconomic position, a personality tendency to report negatively, or a history of psychiatric disorder prior to labor-market entry.

Prospective longitudinal analyses showed that high-demand jobs were associated with the onset of new depression and anxiety disorder in individuals without any pre-job history of diagnosis or treatment for either disorder.

Work stress appears to precipitate diagnosable depression and anxiety in previously-healthy young workers.

**EFFORT REWARD IMBALANCE AND POOR HEALTH**

This theoretical approach is focused on the notion of social reciprocity, a fundamental of interpersonal behavior and an ‘evolutionary old’ grammar of reciprocal social exchange.

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Effort-Reward Imbalance

The model of effort-reward imbalance (ERI) claims that failed reciprocity in terms of high efforts spent and low rewards received is likely to elicit recurrent negative emotions and sustained stress responses. Conversely, positive emotions evoked by appropriate social rewards promote well-being, health and survival. Reflecting these results, low status, self esteem and money were reported by WHO as being ‘harmful to health’.

Both higher effort-money ratio and higher over-commitment significantly correlated with the depressive state.

These findings suggest that in addition to effort-money ratio, over-commitment at work is an especially important issue that may be able to be managed in health promotion services for nurses in general hospitals.

IN A RESULT FROM JAPAN ABOUT EFFORT-REWARD-IMBALANCE

To examine relationships between effort-reward imbalance (ERI) and depression and anxiety in nurses of a Japanese general hospital.

A self-report survey was conducted among 406 nurses. Work stress was measured using a Japanese version of the ERI scale. Depression and anxiety were assessed by an item of the QOL-26. Logistic regression analysis was used to determine the independent contribution of the effort-reward ratios or overcommitment to the depressive state.

Both higher effort-money ratio and higher over-commitment significantly correlated with the depressive state.

These findings suggest that in addition to effort-money ratio, over-commitment at work is an especially important issue that may be able to be managed in health promotion services for nurses in general hospitals.

IN A STUDY TO SEE HOW GERMAN TEACHERS REACTED TO AN INTERVENTION BASED ON ERI

“We developed a manual-based psychological group program aimed at teachers and focussing on their professional relationships. The intervention comprised ten sessions over a 10-month period. The aim of the program was to strengthen teachers’ health.

We investigated whether the effects of our intervention, during which the MBI and ERI were applied, result in general alleviation of occupational stress experienced by teachers. This is a randomized controlled trial. All teachers (N = 2,484) of two school types (grammar schools and secondary modern schools) in 3 districts of south-western Germany were invited to take part in our program.

All teachers declaring their interest (N = 337) in the intervention were included in the project. They were randomly assigned to either the intervention group (N = 171) or to the control group (N = 166).

We found that teachers who participated in at least 50% of the program benefited from this short intervention.

Significant improvement was achieved on the two MBI scales, Emotional Exhaustion and Personal Accomplishment, as well as on the ERI subscale Appreciation.

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Teachers’ occupational stress level may be decreased by taking part in a short manual-based psychological group intervention that focuses on more effective handling of interpersonal problems in school.\textsuperscript{11}

**BLOOD PRESSURE FROM A BAD BOSS**

In what became a landmark study Wagner, Fieldman and Hussey\textsuperscript{11} compared the blood pressures of nurses as they worked for two supervisors, one perceived as ‘good’ vs another ‘not so good’.

The resulting differences in blood pressure were significant, to the point that inclusion of the advice ‘have a good boss’ in standard suggestions about avoiding heart disease was warranted.

**JUSTICE AT WORK AND INCREASED CHD RISK\textsuperscript{12}**

A prospective study of 506 males and 3,570 females measured the perceived justice in supervisory practices and absenteeism due to illness and self-reported health.

The rates of absence due to sickness among those perceiving low justice were 1.2 to 1.9 times higher than among those perceiving high justice. These associations remained significant even after statistical adjustment for behavioral risks, workload, job control, and social support.

**HEAVY DRINKING\textsuperscript{13}**

To investigate whether low perceived organisational injustice predicts heavy drinking.

Data from a prospective occupational cohort study, the 10-Town Study, on 15,290 Finnish public sector local government employees nested in 2,432 work units, were used. Non-drinkers were excluded. Procedural, interactional and total organisational justice, heavy drinking (>210 g of absolute alcohol per week) and other psychosocial factors were determined by means of questionnaire in 2000–2001 (phase 1) and 2004 (phase 2). Multilevel logistic regression analyses taking into account the hierarchical structure of the data were conducted and adjustments were made for sex, age, socio-economic status, marital status, baseline heavy drinking, psychological distress and other psychosocial risk factors such as job strain and effort/reward imbalance.

After adjustments, participants who reported low procedural justice at phase 1 were approximately 1.2 times more likely to be heavy drinkers at phase 2 compared with their counterparts reporting high justice. Low perceived justice in interpersonal treatment and low perceived total organisational justice were associated with increased prevalence of heavy drinking only in the model adjusted for sociodemographics.

This is the first longitudinal study to show that low procedural justice is weakly associated with an increased likelihood of heavy drinking.

**SICKNESS ABSENCE\textsuperscript{14}**

As part of the Whitehall II study, 6,442 male British civil servants were asked to rate supervisory practices (perceived justice at work) and were followed for cardiovascular events.

Those employees who perceived their supervisors treated them fairly had 30% lower CHD incidents after adjustment for other known coronary risk factors.


ENTRIES IN THIS SECTION

In this section 7 topics are covered:

**Stress**
- Key Worksafe NZ advice and key prevention points.

**Bullying**
- Key Worksafe NZ advice and key prevention points.

**Violence to caregivers**
- Outlines the actions suggested in the joint Counties Manukau DHB and Worksafe NZ Guideline.

**Fatigue and Shiftwork**
- Outlines the 2007 Worksafe NZ Guideline.

**Work hours and breaks**
- Makes summary observations that address FAQ.

**Mental health at work**
- Makes the point that mentally ill people are often productive.

**Older people at work**
- Myths and reality.

**3.7.2 STRESS**

This section about the Worksafe NZ advice is in two parts.

First, the Stress Guideline of 2003 is summarized,

Second, the advice in a revised, summary pamphlet developed in 2009 is presented. (The revision is based on significant research findings since 2003.)

SUMMARISING THE 2003 HEALTHY WORK GUIDELINE

**Chapter 1: Make work healthy**

Chapter 1 is a narrative about workplace stress. It lists the things people say are stressful (Table 1.1). Table 1.2 suggests things for employers and employees to consider re the development of healthy work, based on the idea that adding ‘good things’ to work is as necessary as ‘taking bad things out’. Tables 7.1–7.3 are tools to promote dialogue about that.

The elements of healthy work cited are:
- a balance of effort and rest
- variety of tasks
- a sense of personal control
- mechanisms exist to address poor workplace relationships
- there is good communication
- workplace hierarchies promote confidence
- collaboration
- a healthy and safe workplace
- good change management
- there are appropriate rewards
- the workplace is supportive
- opportunities for personal progress.

**Chapter 2: Take reports of ‘stress’ seriously**

Outlines a process for responding to reports of stress.

**Chapter 3: Deal with stressors as with any other workplace hazard**

Chapter 3 refers to 4 categories of work. The 4th category is work that is intrinsically stressful – because it is emotionally draining or repugnant or where work requires intense, prolonged concentration.

---

Where work is Category Four, harm is foreseeable and employers should assume that intrinsic stressors will need to be controlled, see Tables 7.4–7.6 of the Guide. Apply the standard approach of eliminate, isolate and minimise to control hazards.

Chapter 4: Prevention

Chapter 4 suggests that stress management is a waste – the evidence is that money is best spent on developing management competencies.

It also outlines the three approaches to managing workplace distress:

- **Primary** (make work healthy).
- **Secondary** (improve the fit between the person and the job).
- **Tertiary** mopping up after (stress management).

Limits to Employer actions

According to paragraph 83 of the Gilbert Appeal Judgment employers:

- are **not** required to ‘cocoon employers from stress and upset’ or to be the ‘guarantors of health and safety’
- are **required** to take the steps that are reasonably practicable in relation to known and foreseeable risks.

Creating healthy work is a shared responsibility that needs co-operation and accommodation between employers and employees to succeed.

Source: Stress Guideline: Healthy Work – Managing Stress and Fatigue in the Workplace (2003) at:


THE 2009 PAMPHLET – ‘MORALE, DISTRESS AND HEALTHY WORK’

This entry summarises key points from research findings reported since 2003.

1. Challenge and threat

There are two sorts of stress:

- **challenging** and **threatening**.

Where work leads to concrete, achievable and worthwhile goals, we almost always rise to the occasion, even with severe challenges and difficulties. We mostly cope with urgent deadlines, work overload and poor relationships – if there is a return to ‘normal’ in a reasonable time. Challenges are then ‘opportunities to win’.

But, when a ‘stressful’ situation is ongoing and or severe it can cause mental or physical illness. In these extremes the Health and Safety in Employment Act 1992 Act requires the situation to be managed.

Where work poses threats (opportunities to lose) people tend towards emotion focused coping. This is the unpleasant sort of stress. When we face a threat we tend to avoid it and delay dealing with it, to have negative thoughts, and to think of leaving. Of course, this spurs a lot of people into taking creative and productive action to turn the threat into a challenge. Threats can include:

- something a person thinks they can’t cope with
- a challenge – that can’t be met with the resources available
- bullying.

2. Morale and Distress

Morale and distress are precise words. Their use is more likely to result in precise ways to make use of opportunities and deal with problems.
**Morale**

Morale can exist alongside distress and can help us ride over it, but only so far.

Morale comes when we feel a sense of purpose in our work, where there is enthusiasm, a supportive team climate, when work is interesting and rewarding and where realistic challenges exist.

Challenges or ‘opportunities to win’ motivate us to accomplish. This is a good kind of ‘stress’.

When morale is high, we get on with the job and persist it is finished. Positive thoughts, optimism, self-restraint and humour are also present, and we get on well with others.

We tend to cope with challenges by seeking concrete help for specific, well defined purposes – task focused coping.

Morale seeps downwards, so it is the CEO's responsibility.

**Distress**

Distress may result from a threat at work but is more likely to result from organizational experiences.

Distress and low morale come from two main sources:

- **work experiences** – things like: physically, mentally or emotionally demanding work, little control over how the job
- **the organisational climate:** poor feedback about performance; unfairness; being ignored etc.

Consistently, people say that the second of these the ‘bureaucracy and red tape’, causes more difficulties than the first. This applies to everyone, senior executives as well as front line staff.

**Key idea:** Removing stressors will not automatically make things better. This is because people can view stressors positively and negatively.

> Some staff find ‘difficult customers’ a challenge (they are good at turning them into satisfied customers). Others can't cope at all.
> Some people are challenged by a task that others give up on.
> Some people prefer to work alone. Others like contact with lots of people every day.

There seems to be agreement about just two aspects of work.

> Work overload is toxic. Nobody finds it a challenge.
> Nobody reports negatively when they master a challenge.

This idea gives employers two things to do immediately:

> identify work overload and
> provide challenges that staff say are worthwhile.

It also means that when identifying stressors, employers need to talk with staff first before doing anything about them. If this step is omitted, something may be removed from a person’s job that they think is valuable.

*Thanks to Dr. Dianne Gardner, Senior Lecturer, Massey University, Auckland for the ideas in part 3.*

**STRESS PREVENTION**

Briefly, employers can:

> take steps to make work healthy
> build morale
> ask what category of work staff are doing
> identify stressors, talk with staff first and then deal with them

---

*3. Agreement about the significance of stressors is low*

*Thanks to Dr. Peter Cotton, Senior Consultant, Medibank Health Solutions, Melbourne, Australia, for the ideas in part 2.*

support staff appropriately
> take reports of stress seriously.

1. **Make Work Healthy**

Use the tools in the Guideline: *Healthy Work: Managing Stress and Fatigue in the Workplace* to promote healthy work (See Tables 1.2 and 7.1). Look for ways to increase job satisfaction.

2. **Build morale**

*Morale* seeps downwards, so it is the CEO’s responsibility. Find out views on:
> fairness/consistency
> leadership/direction
> appraisal, feedback
> rewards and goal clarity.

If problems are found, leadership development is key. Research indicates that money is better spent on this compared to ‘stress management’.

The UK Health and Safety Executive researched the matter extensively and identified the key behaviours that managers can deploy to make work more enjoyable. Summarising their findings, the named the four areas of opportunity for manager competency:

1. Respectful and responsible: managing emotions and having integrity.
2. Managing and communicating existing and future work.
3. Reasoning/managing difficult situations.
4. Managing the individual within the team.

Three competencies were regarded as most important:
> communication
> proactive workload management
> participative approach.

3. **Find out what category of work staff are doing**

Identify the category of work that employees are doing:

1. Healthy work – stimulating, enjoyable and rewarding though not necessarily without difficulties – contains genuine challenges.
2. Stress is self induced – employees contribute to their own difficulties by not asking for help, refusing reasonable change or saying ‘yes’ when they should say ‘no’.
3. Work is badly organised. Work is free of the stressors in Category 4 – but is organised so that a number of people find it hard to cope with.
4. Work that is intrinsically stressful (eg some health care, social work with children) or needs intense prolonged effort or has high consequences of error (eg air traffic control).

Employers should assume that, if category 4 work is identified, it will pose a risk of harm and that they will need to implement controls.

There are three general approaches to preventing stress:

> **Primary**: Make work healthy – remove stressors – acknowledge, appreciate and reward staff contributions.
> **Secondary**: Improve the fit between the person and the job through selection, training, feedback and the application of ergonomics.
> **Tertiary**: Helping affected people – so called ‘stress management’.

**Note**: There is no evidence that ‘stress management’ has any effect on anything other than a short increase in personal reports of well-being.

Tailor **control measures** to suit the category. See the Worksafe NZ website.
4. Identify stressors, talk with staff, and then deal with them.

Ask staff or use a questionnaire to identify stressors. The results need to be discussed with employees, otherwise something may be removed from a person’s work that they find challenging, interesting and/or stimulating.

Look out specifically for work overload. Everyone regards it as toxic.

Provide, as far as possible, opportunities for employees to win – to master something they see as a challenge.

5. Support staff appropriately

Distinguish between the stressors people say are challenging (an opportunity to win) or threatening (an opportunity to lose). If people are struggling in these situations, appropriate support is needed:

> Challenges. Give practical help eg enough resources and help to overcome specific difficulties.
> Threats. Give emotional support.

6. Take reports of stress seriously and investiage in good faith.

Investigate reports of stress at face value. See the six-step approach in section 2 of the Guideline.

Employers don’t have to agree with employees, but they should investigate in good faith.


HSE Management Competencies: www.hse.gov.uk/stress/mcit.htm

3.7.3 BULLYING

FEATURES OF THE NEW ZEALAND BULLYING LANDSCAPE.

Before discussing Worksafe NZ’s publication about bullying, here is a list of common themes:

1. The top ‘work content’ bullying behaviour named in the HSE research is ‘giving too much work’. (From Table 1 in the WorkSafe Bullying Guideline.) Note:

   a. The first item on the DOL list of Healthy Work (Table 1.2, published in 2003) is ‘A balance of effort and rest’.

   b. The top 3 management competencies named in the HSE research are: (a) Communication, (b) Negotiating workloads and (c) a Participative approach.

   c. Dianne Gardner found in her research about stress that there was general agreement about only two stressors:

      > work overload is toxic.
      > nobody complains about a challenge met and mastered.

   These observations indicate the importance of work overload – in both stress and bullying.

2. Mostly, all the person wants … is for the (bullying) behaviour … to stop. (An observation by MBIE Mediators.)

3. The bully stays, the bullied person has to leave.

4. Mediation may make things worse. We are not in a position to quantify this statement, but it is clear that mediation needs to be withheld in some circumstances, most specifically when there is a power imbalance.
5. HR Departments often fail people who turn to them for help with a bullying problem. In a recent survey, Dianne Gardner analysed the 300 worst cases of bullying. She found a theme common for these people: “after I reported the bullying to HR, I subsequently felt a sense of massive betrayal”.

6. The person who makes an allegation of bullying may be seen as a bully by their co workers.

7. It is an issue to do with my ‘management style’ – this is often used as an explanation when people react badly to a manager. Likewise, the phrase ‘tough management’.

8. Measuring the extent of bullying in a business is problematic.

Bullying is not limited to managers picking on staff. It can exist between colleagues. Employees, collectively or individually, can bully their manager (usually by withholding cooperation).

Behaviours of two types may occur:
> personal attacks (things like “put downs”, spreading malicious rumours and failing to give credit) and
> task related (things like giving too much work and withholding information).

Bullying is not:
> harassment
> discrimination
> workplace violence
> management activities like performance assessment, discipline or transfer
> workplace conflict.

There may be crossover and elements of bullying in any of these. However, addressing bullying by the legal mechanisms used for any of these will likely mean failure to resolve the issue.

Why is it the employer’s business?
Bullying can have serious consequences. An example is a person who leaves an organisation because s/he cannot cope any more. Productivity, creativity and enjoyment of work can suffer.

Recognising Bullying
Employee reluctance to report and the fear of isolation or reprisals may mean distressing behaviour is reported. Further, an organisation’s norms may allow bullying to flourish:
> The work outputs required may be beyond anyone’s capability – only employees ‘in the know’ understand the shortcuts.
> Swearing is ‘OK’.

One clear suggestion that bullying may be happening is a string of resignations.
Surveys may be needed to reveal the extent of unwanted behaviour. Experienced people brought in for the purpose may need to carry them out.

**What if trust is lacking?**
If employees are uncomfortable approaching employers at any level, they should seek advice from a Union or the health and safety representative.

**What happens if discussions fail?**
If an employee or employer feels that discussions have failed, they can seek advice and the services available, by contacting Worksafe NZ on 0800 20 90 20. This is a free service and is available to both employers and employees and can lead to:

- mediation
- investigation as a health and safety complaint.

**KEY PREVENTION POINTS**
Under the HSE Act employers have to identify and control hazards that could harm their staff. This includes hazards from undesirable behaviours.

Bullying has serious consequences for individuals, workplaces, relationships and productivity.

Here are summaries of the parts of the recently published Guideline that deal with prevention.

**Positive workplace relationships** between management, staff, unions and other groups are vital to organisational success and the wellbeing of staff.

A **distinctly different approach** to workplace relationships is one of the five key attributes common to organisations that have achieved successful workplace partnerships.

For tools to help develop positive workplace relationships, see **Workplace partnership**.

Any organisation that hopes to survive in the commercial world must be open to problem-solving and change. This means encouraging ideas and creativity across the business, and making use of staff diversity. An organisation that can tackle problems and challenges is likely to promote openness and minimise the sort of undesirable behaviours that let bullying thrive.

Table 3 and Table 4 on pp 35 and 36 of the Worksafe NZ Bullying Guideline help identify and address factors that allow bullying to flourish, and suggests ways to prevent it from thriving.

**Build managers who are leaders**
Many studies show the advantages of competent management. For example:

- it can reduce absenteeism
- an key determinant of job satisfaction is a person’s immediate manager.

The United Kingdom Health and Safety Executive (HSE UK) research showed that when managers behaved as in the table, stress and bullying were less evident.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DETAILS</th>
</tr>
</thead>
</table>
| **1. Be respectful and responsible.** | &gt; Show integrity.  
&gt; Manage emotions.  
&gt; Have a considerate approach. |
| **2. Manage and communicate existing and future work.** | &gt; Manage work proactively.  
&gt; Have good problem-solving skills.  
&gt; Participate with and empower others. |
| **3. Use good reasoning to manage difficult situations.** | &gt; Manage conflict.  
&gt; Use the organisation’s resources.  
&gt; Take responsibility for resolving issues. |
| **4. Manage the individual within the team.** | &gt; Be personally accessible.  
&gt; Be sociable.  
&gt; Use empathetic engagement. |

The 66 competencies which resulted from this research are grouped into the four areas in the table. For more on the research and all 66 competencies identified, see: **What are the management standards for work-related stress?**
**Leadership, Culture, Codes of conduct, Values and Vision**

Large and small businesses alike need to give **leadership training** to help managers effectively. Smaller businesses can access leadership courses through their local employers’ association or chamber of commerce.

**Management competencies** can be evaluated as above. High-quality leadership is a strong key to changing an organisation’s culture. When expectations for work and behaviour are clearly demonstrated by management, there’s less chance of undesirable behaviour from staff.

See ‘Infozone: Business essentials’ for more information on employment relations and health and safety in business, as well as links to templates, examples and other practical tools.

Any workplace needs clear statements on expected **conduct, core values, vision and purpose**, and employees should be consulted with and involved in their development.

A ‘vision statement’ gives the direction and desired result for an organisation.

Organisational behaviours can be supported through a range of policies and practices such as codes of conduct: “an agreement on rules of behaviour for a group or organisation” such as:

> the expected behaviours, rules, practices and responsibilities for people, groups and the organisation
> the consequences for not following the code of conduct
> what is considered serious misconduct.

Some organisations think of their **values** as the ‘guiding beacon’ that directs its growth and development. Others describe them as philosophically integral to how they work and do business. Defining workplace values can:

> provide a framework for how staff treat each other and customers
> provide a framework for achieving the vision and increasing the effectiveness of the organisation
> help clarify work-life and how people fit into the big picture
> create an environment that promotes job satisfaction and meaningful work
> differentiate one organisation from another.

Adopting a values approach can be difficult, as explained on page 145.

**Creating an environment** that builds good relationships prevents bullying. This is much easier than dealing with bullying once it occurs.

**Recognising diversity** means understanding how people’s differences can bring different strengths.

For more information see the ‘Equal Employment Opportunities (EEO) Trust’.

**Fostering a shared sense of purpose** for staff is another way to develop a culture that builds relationships and prevents bullying. It can be understood by staff and external stakeholders alike.

**EDUCATION**

Educating staff about bullying behaviours and their consequences is important because:

> they become more aware of their roles and responsibilities
> they become more aware of what bullying is and isn’t
> perpetrators can become more conscious of their behaviour, how it may be perceived, and the possible consequences of their actions, and be deterred from bullying
> they are made aware of the consequences of malicious, frivolous, or troublesome complaints
> it can promote cultural change and a healthy and safe workplace
> they’re encouraged to take responsible action against bullying behaviours
> they become aware of other people’s working styles.
A DESIGNATED CONTACT PERSON
Workplaces, especially larger ones, should designate and train a contact person to receive complaints about bullying.

This is useful when a person’s manager is the alleged bully.

The contact person will be the first port of call for people with a bullying problem and, initially, they can simply discuss perceptions and give advice and support.

TRY TO KEEP THINGS LOW KEY
Employers and employees should seek low key responses and solutions to distressing behaviour when it is in its infancy.

This is not to deny the possible severity of bullying, but to allow the best chance for things to work out well. This is because using the word ‘bullying’ at the outset may:
> set everyone on edge
> polarise a situation
> cause defensive reactions and outrage
> lead to the formation of cliques and
> cast a legal slant over the issue.

All of these may lead to organisational and personal harm. Case studies indicate that the potential for both types of harm is severe.

USE LANGUAGE CAREFULLY
The word ‘bullying’ should be a conclusion. It should not be used in an allegation.

If it is bullying, that will emerge spontaneously.

RESPONDING TO REPORTS OF BULLYING
If you receive a complaint about bullying take it seriously and be impartial. Follow your internal processes if you have them.

Consider an informal response first before taking more formal approaches (see below).

All reporting methods should be known to staff.

They should know what to expect and what will happen after they have made a report.

Staff should know:
> how to record instances of the unreasonable behaviour
> how to know if it is bullying or not, or something else
> how to report
> what to expect after they have made a report
> that all reports will be taken as complaints, whether or not the staff member intends them to be informal or informal.

Responding to reports: The key factors managers need to work through when dealing with complaints are:

1. Get the facts.
   > get clear descriptions of the behaviour and the incident, and being able to describe it
   > listen and gather the information in an unbiased, empathetic and respectful way
   > understand the issues and what’s needed to resolve them.

2. Does it fit the definition of bullying, or is it something else?

3. Decide on an effective course of action, tailoring your responses to the seriousness of the issue.

4. Get the parties to agree to resolve the issues.

5. Stop any potential retaliation.

6. Re-check you prevention measures.

If an employee takes an informal approach to dealing with bullying, it doesn’t absolve the employer from their duty to deal with the undesirable behaviour.
**Deciding how serious the issue is:** Your judgement will be needed to interpret the seriousness of the issue in the specific situation you face. The guideline has extensive advice and a flowchart.

**Response options:** There are a number of response options. Where possible, low key and informal solutions should be attempted:

- low key solutions
- informal, direct approach
- informal resolution process
- mediation
- formal investigation process.

All these plus explanatory flowcharts are covered in the guideline.

**Source:** The Worksafe NZ Stress and Bullying page.


### 3.7.4 VALUES – TWO SPECIFIC PROBLEMS

Values, according to Shalom Schwartz:

- are concepts or beliefs
- pertain to desirable end states
- transcend specific situations

Schwartz appears to be the most widely quoted values researcher.

**Schwartz’s values construct: Ten universal values are in a natural tension**
This figure seems to be found (in NZ in 2014) in most discussions of values, for example.

After analysis of results in 20 countries, Schwartz listed all the values that were reported by the subjects in his studies and, reduced them to ten categories.

These, he said, were universal.

He placed them round a circle – to demonstrate that they are in an internal tension.

If Schwartz’s values are, indeed, universal (with the additional implication of ‘complete’) then fostering all these values, and sustaining the implied tensions, is required for an organisation to do well.

This raises the questions of how to deal with the tensions caused by:

> these values being themselves in an internal tension and
> personal value preferences.

People’s values tend to be determined by their motivations. For example, some people prefer an exciting life with lots of stimulation while others work for social justice. These tendencies appear to be inbuilt.

So it is safe to say that an organisation that adopts a selection of these values (rather than acknowledging them all), will likely:

> get lopsided somehow and
> some of the people in it will be disenfranchised.

### 3.7.5 VIOLENCE TO CAREGIVERS

This section refers to the joint Counties Manukau DHB – Worksafe NZ publication: Managing the Risk of Workplace Violence to Healthcare and Community Service Providers.

1. **Take a comprehensive approach to health and safety management**

   This should be a given – based on the idea that it will be impossible to provide high quality client/patient care unless staff are safe and feel so. If staff feel unsafe it is likely to affect morale, with the implied consequences.

2. **Take all the reasonable and practicable steps available to prevent harm**

   Practicable steps that can be taken include:

   > **Client information**: Current information about each client/patient should be available and care plans should address issues of violence, if needed.
   > **Facility design**: Provide safe interview/assessment rooms; Consider lighting, space, noise, thermal comfort and security.
   > **Selection of staff**: Identify people who are suitable for the work; training/experience; immune status and background.
   > **Relationships**: Permit care of clients/patients only if within organisation’s capabilities. Negotiate realistic expectations with stakeholders.
   > **Job design**: Match employee skills to client/patient needs. Rotate staff, provide a variety of tasks, use buddying and provide feedback on performance.
   > **Security and emergencies**: Provide safety glass and walls where needed; use security equipment (CCTV, mirrors, cameras, safe rooms).
   > **Staff numbers**: Have enough people to do the work in a healthy and safe manner.
   > **Behaviour management**: Establish that violence is unacceptable and preventable.

3. **Provide information and training**

   Provide information and training. Induction and ongoing training will be needed about both general and specific hazards and at all levels so that shared expectations may be developed and implemented. For all staff, general training should be about:
3.0 OCCUPATIONAL HEALTH TOOLS

> orientation to the work, the environment and management
> health and safety policies, procedures and obligations
> skill in the use and interpretation of patient care plans
> calming and restraint training
> self-defence, where appropriate.
> Specific training can be given:
> ability to identify violent situations
> the capacity of event appraisal, coping and problem solving
> ability to deal with people with different needs and backgrounds.

4. Monitor staff health

If significant hazards remain, monitor staff exposures and health and safety in relation to them. Monitoring should include apprehension about the prospect of a violent assault, if that is necessary. There should be feedback to management about instances of violence to caregivers.

5. Provide first aid and rehabilitation

Provide first-aid after injuries, and rehabilitation plans if people are off work.

Trained first-aiders should be available. Developing a rehabilitation plan may require specialist assistance.

6. Assign responsibilities

Assign management, employee, patient and family responsibilities. This is part of establishing a violence-free culture.

Source: The Guideline is at:

Cross Reference: 2.2.21 Page 40, 2.2.27 Page 43

3.6.6 FATIGUE/SHIFTWORK

PRINCIPLES

The Guideline about shiftwork is based on 12 principles:

> Adequate sleep is essential for maintaining and restoring full physical and mental functioning, and is the only way of providing recovery from fatigue (especially for the brain).
> Stimulants, such as coffee, can provide only limited, short-term relief from the effects of fatigue.

> Fatigue leads to physical and mental impairment.
> Shift work (particularly night work) can be a significant contributor to fatigue.
> Human alertness and capability vary with the time of day.
> People are programmed to be awake during the day and asleep at night.
> The ability to fall asleep easily varies with the time of day.
How much time people need to recover from fatigue depends on the time of day.

Sleep loss is cumulative.

Strategies exist to minimise fatigue and promote sleep.

Preventing workplace fatigue requires cooperation and accommodation.

Various strategies are available for managing shift work to minimise fatigue.

Software exists for this purpose, but other methods can be used.

4. **Risk management**
   Identify fatigue hazards and avoid doing risky tasks when people are tired.

5. **Training and education**
   Provide information, training and supervision to employees doing shiftwork.

6. **Monitoring and evaluation**
   Monitor employee reactions to shiftwork.
   Evaluate shiftworking arrangements as an integral part of shiftwork management.

**SOME KEY MESSAGES AND TOOLS**

1. **Comprehensive and broad approach**
   Shiftwork management should take a comprehensive and broad approach.
   Looking for the perfect roster is a ‘wild goose chase’ – the wrong place to start.

2. **Balancing**
   A system of shiftworking is a balancing of interests that will require accommodation and flexibility from all parties.

3. **Success**
   Features of successful shiftworking systems include:
   > Accountability — a person has specific responsibility for shift-work management.
   > Promote consultative decision making, including workers and management.
   > Shift the locus of control towards workers and shift teams as far as possible, once ground rules are established.
   > Provide an appropriate induction to shift-work.

---

**1. Communication and Commitment**

Shiftwork can have major effects on long and short term health and productivity.

All parties need to commit to making the shiftwork system work well.

2. **Policies**

   Corporate and operational policies:
   
   > A **corporate** policy shows intent.
   > An **operational** policy shows how the system will operate.

3. **Review the hours of work**

   Management should provide enough people to do the work safely.
   
   > The fatigue consequences of the shift working arrangements should be assessed.
   > The actual hours of work should also be assessed.

   The differences between the planned and actual hours of work can be informative.
Provide education and training.
Include partners and families in consultation and education.

4. Designing rosters
Standard suggestions exist for the design of shift rosters.

5. Risk assessment
The risks posed by hazards need to be identified and placed in priority order. Hazardous tasks need to be performed at times of least risk.

6. Training
There are tools in Worksafe NZ’s guideline about training and the evaluation of employee knowledge on the hazards of shiftwork. From the results of its use, a training programme to address gaps can be developed.

7. Employee reaction
Employee reactions to shiftwork should be monitored to detect impairment and longer term health effects.
Systems of shiftwork will never be perfect, but they can be improved – through monitoring and evaluation.


Reference: www.princeton.edu/~ota
And search the 1991 publications to view:

3.7.7 STATEMENTS ON HOURS OF WORK AND BREAKS IN WORK

1. Hours of work
Sleep deprivation lasting 24 hours has a measurable effect on performance. The same level of impairment occurs after 17–19 awake hours as having a blood alcohol level at the legal limit for driving.

Working days more than about 55–60 hours per week over an extended period is likely to lead to significant health effects.

Extending a working week from 65 to 70 hours (ie by 5 hours) will have more of an impact than extending it by the same amount of time but from 40–45 hours.

Hours-of-work limits for day work will be different from those for night work.

Night work
Shiftworkers lose, on average, 1 to 1.5 hours sleep each 24 hour period, resulting in a sleep debt of six hours after four nights. This means significant consequences for health and safety.

Working nights and extended hours interact. Effects will be greater than the sum of the parts.

Extended hours and night work
Sleep deprivation, with long hours of work over a prolonged period of time (approximately 12 months) has both a short-term impact on performance and, in the long term, will lead to cardiovascular, mental health, behavioural and productivity losses.

Opportunities for recuperation
In the long term the average sleep period required for continued health and alertness is between 7 and 9 hours.

A minimum of six hours of consecutive sleep in a 24-hour period is the minimum needed to keep alert for the next 24 hours, but assumes a zero sleep debt.
It is likely that people who extend this regime more than 2 or 3 days will begin to make significant mistakes.

The length of the break required to sleep well depends on:

> the time the person spends getting to and from work
> the time they take to eat, get ready to sleep, toilet and dress
> social needs.

Two consecutive full nights sleep, with a normal day pattern, is required after 3–4 nights’ work for full recovery.

Source: Compiled from a variety of papers.

2. Breaks during work

Providing breaks within the working period allows the restoration of alertness and the relief of boredom & monotony.

**Fatigue and Productivity**

Beyond the needs legislated for there are additional reasons for breaks:

> to prevent fatigue accumulating
> to promote morale.

People can't generally go on performing at a high level without breaks of some sort. For the optimum result, breaks need to be matched to the intensity of the work, for example:

> A person in a call centre may need short frequent breaks to relieve the pressure of frequent, constant and demanding calls.

> Microscopists may need a 5 minute break from looking down a microscope every 20 minutes – to relieve the effects of keeping still.

> Air traffic controllers have a demanding mental task with extremely high consequences of error. The most difficult part of their work is obtaining a three-dimensional picture of the airspace they are controlling at the start of each period of work. Doing this 4 times a day, with 90 minute spells at the task is deemed the most effective balance.

> Policy analysts may need a 20 minute break after 2 hours concentrated effort. Taking a break before then might mean a significant interruption - which could mean having to start from scratch again.

The specifications in section 3.3 of the Safety Tools Booklet are legal minimums that address comfort and meal needs everywhere. However, health and safety may be compromised in other specific situations because breaks are not provided.

For example:

> Where fatigue can lead to harm (such as in driving or the operation of dangerous machinery) employers have an obligation to take all practicable steps to ensure that fatigue is not likely to cause harm.

> If an employee signals fatigue, s/he may need a spell.

**Napping**

Providing for naps is a current strategy in some occupations.

3.7.8 MENTAL DISORDERS AT WORK

This section is included to make the points that mentally ill people can often be highly productive and that a person without symptoms of mental ill health is not necessarily flourishing.

1. Key advice

A very dated approach to mental health is that a person is mentally ill or not.
More correctly, mental health is often seen as a simple continuum running from no mental illness through to a severe mental illness.

The assumption here is that if a person is not diagnosed with a mental illness then they must be mentally healthy.

However, optimal mental health and wellbeing (sometimes this combination is called flourishing) is more than the absence of a mental illness.

Flourishing is experienced as a combination of things like:
> positive emotions
> engagement and interest
> meaning and purpose to life
> optimism, resilience, vitality
> self determination.
> positive relationships.

So, people can flourish even if they are diagnosed with a mental illness.

The next model of total mental health shows the spectrum of mental health states that can exist in employees.

Employees who do not have a mental illness, but have low levels of wellbeing (bottom left quadrant) will tend to struggle in life and have poorer physical health.

People in the upper right quadrant will be diagnosed with a mental illness, but can still live healthy positive lives, and may be very productive.

Our place on this spectrum is not fixed during life and most of us will move in and out of all four quadrants.

Approaches in the workplace can be initiated to increase mental wellbeing (see 5 ways to wellbeing below).

**Understanding mental illness**

Courses for workplaces about Mental Health are available. Their aims are to help people in workplaces become familiar with the principles of assisting people with the following disorders:
> depression
> phobias.
> anxiety disorders
> psychosis
> schizophrenia
> addictions
> bipolar disorder.

Source: See, for example: Mental Health 101 at: www.mh101.co.nz

and Mental Health First Aid at:


2. A Maori Model:

The Four Cornerstones model – **Te Whare Tapa Wha** – the Four Faces of Life – draws attention to the importance of the cultural setting in which people live. It is in settings like these that mental illness occurs. For further information, see: www.maorihealth.govt.nz/moh.nsf/pagesma/445. Te Whare Tapa Wha – The Four Cornerstones.
# Te Whare Tapa Wha – The Four Cornerstones

<table>
<thead>
<tr>
<th>Te Taha Hinengaro</th>
<th>Te Taha Tinana</th>
</tr>
</thead>
<tbody>
<tr>
<td>The capacity to communicate, to think and to feel mind and body are inseparable.</td>
<td>The capacity for physical growth and development.</td>
</tr>
<tr>
<td>Thoughts, feelings and emotions are integral components of the body and soul. How we see ourselves in the universe, our interaction with that which is uniquely Māori and the perception that others have of us.</td>
<td>Good physical health is required for optimal development.</td>
</tr>
<tr>
<td>Our physical ‘being’ supports our essence and shelters us from the external environment. For Māori the physical dimension is just one aspect of health and well-being and cannot be separated from the aspect of mind, spirit and family.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Te Taha Wairua</th>
<th>Te Taha Whanau</th>
</tr>
</thead>
<tbody>
<tr>
<td>The capacity for faith and wider communication. Health is related to unseen and unspoken energies.</td>
<td>The capacity to belong, to care and to share where individuals are part of wider social systems.</td>
</tr>
<tr>
<td>The spiritual essence of a person is their life force. This determines us as individuals and as a collective, who and what we are, where we have come from and where we are going. A traditional Māori analysis of physical manifestations of illness will focus on the wairua or spirit, to determine whether damage here could be a contributing factor.</td>
<td>Whānau provides us with the strength to be who we are. This is the link to our ancestors, our ties with the past, the present and the future. Understanding the importance of whānau and how whānau (family) can contribute to illness and assist in curing illness is fundamental to understanding Māori health issues.</td>
</tr>
</tbody>
</table>

## 3. Promoting well-being

This section is included to make the point that the quality of work can affect mental health adversely.

**Mental health is holistic**

Mental health exists in all of us and changes over time, and can be understood differently depending on the cultural context. As well as being associated with mental illness, mental health (when experienced positively) underpins a productive, happy and healthy life.

**Employability**

Therefore, it should not be assumed that a person with a mental illness will be unproductive. Common and historical experience tells us that people with mental disorders can make significant contributions.

**Wellbeing can be promoted:**

Clear indications based on high quality research indicate how individuals may improve their own sense of wellbeing.

The picture to the right refers to the theme of the 2012 Mental Health Week presented by the Mental Health Foundation of New Zealand. For further information see:


This is derived from the work of the new economic foundation (sic) in the UK. See:

These websites make concrete, specific and tested suggestions about increasing people’s enjoyment of life and work.
Healthy work:
There is clear evidence that ‘good’ work can promote flourishing and diminish symptoms of mental ill health. This is the reason Worksafe NZ suggests that employers and employees make efforts to add good things to work.

Unhealthy work:
There is evidence the other way – that ‘bad’ work can adversely affect health.

> A recent New Zealand study concluded that increased work pressure was linked to an increased prevalence of depression.
> A recent Australian study concluded that some jobs with poor psychosocial attributes are no better than unemployment, and may have more adverse effects on mental health.

This emphasizes that employers and employees should be careful in identifying work pressure or work overload and seeking ways to eliminate or alleviate it.

Potential Benefits
Increases in mental wellbeing are associated with a wide range of social, economic and health benefits. Someone with high levels of mental wellbeing will also be less at risk of developing common mental disorders such as depression, which is now one of the most prevalent illnesses in Western society.

> The cost to the Australian economy of depression in one year is in the order of $12 billion, while the lifetime cost for the 2007 population is $213 billion.
> 6% of these costs were attributed to job strain.
> Interventions exist to reduce job strain and are effective.

Promoting high levels of mental wellbeing in the workplace and society will result in less sickness and absenteeism, improved social relationships, better problem solving and higher levels of creativity.

3.7.9 THE AGEING WORKFORCE
OLDER WORKERS ARE NEEDED
By 2020 one in four of New Zealand labour force is expected to be older than 55 years of age. At the same time, demand for skilled labour is growing. This means older people will be increasingly important in the workforce.

OLDER WORKERS ARE ASSETS
Older workers can bring many gains to the workplace, such as:
> a strong work ethic
> fewer workplace accidents
> more stability in work teams
> customer service that reflects their experience
> less short term sick leave
> retention of skills and knowledge.

Getting the best from older workers requires consideration of their needs, aspirations and expectations.

ADAPTING WORKPLACES
As the age profile of a workplace changes, providing a safe, healthy and stimulating work environment for older workers should take three main specific aspects:
Flexibility in employment arrangements – like providing scheduling choices to allow for part-time work, catering for caring responsibilities or avoiding night work.

> Suitable ergonomics – such as good lighting, control of noise, and minimizing or eliminating heavy lifting.

> Upskilling opportunities – make sure that all workers, regardless of age, have access to staff development and training.

MYTHS ABOUT OLDER WORKERS

Many employers appreciate having older members in their teams, but negative and stereotypes persist. Here are a few:

**Myth 1:** Older workers can’t or won’t learn new skills. **Reality:** Older workers can take longer to absorb new material, but their better study habits and experience lower training costs.

**Myth 2:** Older workers are not flexible or adaptable. **Reality:** Older workers are just as adaptable but they are more likely to ask why changes are being brought in.

**Myth 3:** Older workers have more accidents. **Reality:** Not true. Older workers work smarter, take fewer risks and have lower accident rates.

**Myth 4:** Older workers are less productive. **Reality:** Productivity is not a function of age. Mature workers produce high quality work which can result in significant cost savings for employers. Stories abound of highly committed older workers preventing costly mistakes.

**Myth 5:** Older workers take more sick days than younger workers. **Reality:** Attendance records are better for older workers.

**Myth 6:** Older workers are more expensive. **Reality:** Older workers tend to stay in a job longer than younger workers. Subsequently, less needs to be spent on their recruitment.

### 3.8 PHYSICAL ENVIRONMENTAL HAZARDS

#### 3.8.1 SIX FACTORS THAT AFFECT FEELINGS OF WARMTH

1. **Air temperature**

   How hot or cold the air around us is. It is what we measure with a thermometer. It will have a direct warming or cooling effect on a person. In situations with a high radiant heat level (e.g., a foundry), air temperature alone is not a good indicator of the thermal environment.

2. **Humidity**

   The moisture content of the air. The warmer the air, the more moisture it is able to carry. High humidity tends to make people feel hotter than low humidity. (This is because a person’s sweat will not evaporate and cool the person as the air is already moisture saturated.) Cold air has a lower moisture content, so humidity is not a factor in cold environments, except that mist, rain or wet clothing can cause a decrease in insulating characteristics.

3. **Radiant heat**

   Is emitted from hot objects. Radiant heat will in time heat the air, but people will absorb heat directly far more quickly. Radiant heat will affect people anywhere there is direct sunlight, or where a person is close to a process that emits heat.

4. **Air speed**

   In most situations air movement will cool a person. This will provide some relief to people in hot environments heat, but extra chill to people in the cold.

5. **Physical activity**

   Will increase the generation of heat in the body. In a cold environment, physical activity can help to warm a person. In a warm or hot
environment, physical activity can increase the load of heat on a person. A high level of physical activity on a hot day can place a worker at risk of heat strain.

6. Clothing

Aids or prevents heat transfer from our bodies to the surrounding environment. In a cold environment, a person should wear clothing that will prevent as much heat transfer as possible. Ideal clothing in a hot environment will allow a worker to freely dissipate heat.

RISK ASSESSMENT

**Hot environments:** To assess the heat load on a person use the WBGT Index – the wet bulb – globe thermometer index.

**Cold environments:** To find out the effect of the combination of air temperature, wind speed and physical activity, consult tables 6 and 7 on pages 52 and 53 of the Guideline referenced to obtain a measure called ‘equivalent chill temperature’ or ECT.

In both cases consult a hygienist.

**Source:** Heat Strain and Cold Strain: Guidelines for the Management of Work in Extremes of Temperature at:


3.8.2 HEAT STRAIN

PROGRESSION OF SYMPTOMS IN RESPONSE TO EXPOSURE TO HEAT

> Mental: Irritation, anger, aggression, depression.

> Physical: Sweating, increased heart rate.

> Early symptoms: Headaches, muscle cramps, changes in pulse and breathing rate, weakness, heavy perspiration, prickly heat, feeling faint, reduced performance.

> Later symptoms: Severe headaches, increased irregularity in pulse and breathing, severe muscle cramps, confusion, cold, clammy skin and cessation of perspiration. Health conditions associated with exposure to heat.

> Dehydration: The main signs of this are not passing urine and changes to mental state and personality.

> Heat syncope: Fainting – results from a drop in blood pressure during prolonged standing or sitting in heat.

> Heat rashes: 3 types occur and may be made worse by 2⁰ infections.

> Prickly heat (most common) occurs where clothing is restricted.

> Heat cramps: Occur in muscles when the salt balance is disturbed. Alleviate by rest, drinking water, and salt intake.

> Heat exhaustion: Linked to depletion of body fluids and electrolytes.

> Heat stroke: Least common but most serious. It causes central nervous system effects (convulsions, mania or coma, dilated pupils and a hot, dry skin). Rapid treatment is essential.

WHEN ARE THESE LIKELY TO OCCUR?
The more the person works hard, is exposed to high air temperatures, high humidity, high levels of radiant heat and wears heavy clothing, the more likely these symptoms are.

HOW CAN HEAT STRAIN BE PREVENTED?

> lowering the air temperature, humidity and radiant temperature

> increase the air speed (fans, ventilation systems)

> control activity timing (time of day, take breaks, spell the work)

> wear sunhat, suitable clothing – loose and thin but covering skin

> replace water lost through sweat

> shield radiant heat sources

> work in the shade – provide shade shelters

> use administrative controls (job rotation).
Treatment. Heat stroke can be rapidly fatal.

Where planning for work in hot environments, a first-aider with special knowledge of heat conditions will be required - in anticipation of emergencies.

Source: Heat Strain and Cold Strain: Guidelines for the Management of Work in Extremes of Temperature at:


Cross Reference: 2.2.17 Page 38

8.3 COLD STRAIN

PROGRESSION OF SYMPTOMS IN COLD

> Mental: Alertness reduced.
> Physical: Sensitivity and dexterity of fingers reduced.
> Frost nip: Blanching of fingers, toes, ears, cheeks and nose.

Progression of cold strain symptoms and signs

<table>
<thead>
<tr>
<th>TEMP. (°C)</th>
<th>SYMPTOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5</td>
<td>Normal core (rectal) temperature</td>
</tr>
<tr>
<td>37</td>
<td>Normal oral temperature</td>
</tr>
<tr>
<td>36</td>
<td>Metabolic rate increases to compensate for heat loss</td>
</tr>
<tr>
<td>35</td>
<td>Maximum shivering</td>
</tr>
<tr>
<td>34</td>
<td>Victim conscious and responsive, with normal blood pressure</td>
</tr>
<tr>
<td>33</td>
<td>Severe hypothermia from here</td>
</tr>
<tr>
<td>31–32</td>
<td>Consciousness clouded, blood pressure difficult to get, pupils dilated</td>
</tr>
<tr>
<td>30–29</td>
<td>Progressive loss of consciousness, muscular rigidity increases, pulse and blood pressure difficult to obtain, respiratory rate decreases</td>
</tr>
<tr>
<td>28</td>
<td>Ventricular fibrillation possible</td>
</tr>
<tr>
<td>27</td>
<td>Voluntary motion stops; pupils non-reactive to light; reflexes absent</td>
</tr>
<tr>
<td>26</td>
<td>Victim seldom conscious</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEMP. (°C)</th>
<th>SYMPTOMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Ventricular fibrillation may occur spontaneously</td>
</tr>
<tr>
<td>24</td>
<td>Pulmonary oedema</td>
</tr>
<tr>
<td>22–21</td>
<td>Maximum risk of ventricular fibrillation</td>
</tr>
<tr>
<td>20</td>
<td>Cardiac standstill</td>
</tr>
<tr>
<td>18</td>
<td>Lowest accidental hypothermia victim to recover</td>
</tr>
<tr>
<td>17</td>
<td>Brain waves stop</td>
</tr>
<tr>
<td>9</td>
<td>Lowest recovery temperature</td>
</tr>
</tbody>
</table>

> Frostbite: Occurs when blood circulation ceases due to frozen skin/tissues. Patchy skin inflammation and slight pain ranging to painless tissue damage; and the skin becomes prone to infection and gangrene.

> Trench foot: Occurs when feet are exposed to long periods of immersion in.

> Water: Damage to nerve and muscle tissues.

> Hypothermia: The culmination of a set of experiences leading through sensations of cold, shivering, pain in exposed parts of the body, increasing numbness, decreasing pain, weakness and drowsiness, cessation of shivering, diminished consciousness and dilated pupils.

PREVENTION STRATEGIES

Monitoring:

Use a suitable thermometer where the air temperature may drop below 16°C.

In workplaces where the temperature is below freezing (0°CECT), and/or the speed of air movement is greater than 2 m/sec, the temperature should be monitored at least every 4 hours.

Emergency procedures

Provide for an adequate first aid response.

Preventing cold strain

For continuous work in low temperatures, heated warming shelters, such as cabins and rest rooms, should be provided. The
level of activity should not be great enough to produce excessive sweating. If excessive sweating is likely to occur, or it involves working in the wet, facilities should be available for changing, or for drying clothes and footwear. Work environment: Shield workers from drafts and winds.

**Equipment design:**
Metal handles and bars should be thermally insulated. Tools and equipment should be designed so that they can be operated without removing gloves.

**Clothing:**
Wear protective clothing where work is done at temperatures below 4°C wind chill temperature. Select clothing to suit the temperature, the nature of the work, and the activity level. Clothing in multiple layers is better than a single thick layer.

**In wet conditions:**
Outer layers of clothing should be water repellent.

**In windy conditions:**
Wear clothing designed to prevent wind penetration.

**Hand protection:**
If fine work needs to be performed with the bare hands for more than 10–20 minutes at temperatures below 16°C, take special precautions to keep the hands warm, for example, by providing warm air blowers and insulated handles on tools. If fine manual dexterity is not required, gloves should be worn for:
- sedentary work in temperatures less than 10°C.
- light work – less than 4°C.
- moderate work – less than -7°C.
- below -170C, wear mittens.

**Footwear:**
Felt-lined, rubber-bottomed, leather-topped boots with removable thermal insoles are best suited for work in cold environments.

**Head covering:**
A head covering, such as a woollen cap or a hard hat with a thermal liner, should be worn in cold environments, as over 50% of heat loss is through the head.

**GENERAL SAFE WORK PRACTICES**
- Do not allow bare skin to come into contact with cold surfaces below -7°C, especially surfaces made of materials that are good conductors of heat, eg metals.
- Do not allow bare skin to come into contact with evaporative liquids, eg petrol, cleaning fluids, alcohol.
- Do not stay still for a long time.
- Do not consume alcohol.
- For warming purposes, supply hot non-alcoholic drinks. Limit caffeine consumption as it increases urine production and blood circulation – both increase the loss of body heat.
- Restrict tobacco consumption.
- Eat adequate food frequently.
- Drink plenty of water to rehydrate.
- In refrigerated rooms, keep air speed < 1 m/sec where possible.
- All work in cold conditions should be under constant observation (through a buddy system or supervision).
- New employees and workers should not be required to work full-time in the cold until they have become accustomed to the conditions and the personal protective clothing they need to wear.
- Apply lip balm and moisturising lotions to prevent lesions.
- Maintain a high level of fitness.
- If a worker cannot be adequately protected from the effects of cold, then work must be suspended, or work regimes modified, to remove the risk of harm.

**Cross Reference:** 2.2.17 Page 38
3.8.4 THERMAL COMFORT

Thermal comfort is a condition of the mind which expresses satisfaction with the thermal environment. Thermal discomfort is the uncomfortable place between an environment that is ideal and one that will cause harm (through heat stress or cold stress).

Thermal discomfort: This may not cause an immediate safety or health problem but may affect morale, and lead to feelings of tiredness and irritability which may lead to reduced production. As thermal discomfort increases, the line between safe and unsafe conditions becomes more and more blurred. Judgment will be needed to decide when conditions become unsafe.

Conditions in which most people will be thermally comfortable

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>SUMMER VALUE</th>
<th>WINTER VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air temperature</td>
<td>19–24</td>
<td>18–22</td>
</tr>
<tr>
<td>°C</td>
<td>16-21 (active work)</td>
<td>16-19 (active work)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>40–70%</td>
<td></td>
</tr>
<tr>
<td>Air speed</td>
<td>0.1–0.2 m/s, no draughts up to 0.5 m/s (active work)</td>
<td></td>
</tr>
<tr>
<td>Radiant heat</td>
<td>No direct exposure to a radiant heat source</td>
<td></td>
</tr>
<tr>
<td>Clothing</td>
<td>Light clothing</td>
<td>Winter clothing</td>
</tr>
</tbody>
</table>

In buildings, thermal discomfort may occur when a ventilation system is not able to provide enough heating in winter, or cooling in summer when sunshine through large windows adds a large heat load or where there is low air movement.


3.8.5 WORKPLACE LIGHTING

INTRODUCTION

Worksafe NZ has rudimentary advice only on lighting. There is a rationale for this - workplace lighting quickly gets highly technical and convoluted.

This summary tries to touch on why - and attempts to explain why consulting an established lighting engineer is worthwhile.

Apart from aesthetic considerations, (for mood and morale) excellent lighting can assist workplaces as follows:

- Not enough light on tasks means employees can be expected to complete them more slowly.
- Safety and ease of mobility can be compromised by non uniform or low light levels.
- Where colour discrimination is important, having the right lamp will enhance task performance.
- Where the three dimensional aspects of tasks are important having an appropriate vector/scalar ratio (see below) in the lighting will enhance task performance by improving modelling.
- Reflections compromise task performance.
- Glare causes poor task performance and discomfort.
- For inspection tasks the choices of lamp, luminaire and luminaire location can make a big difference in task performance.
- Well-designed lighting can make spaces appear more congenial and create positive moods.
ROUGH GUIDE TO THE AMOUNT OF LIGHT

The AS/NZS 1608: Pt. 1 suggests the following illuminances\(^a\) as a rough guide.

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>LUX</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movement and orientation</td>
<td>40</td>
<td>Corridors, walkways</td>
</tr>
<tr>
<td>Rough intermittent</td>
<td>80</td>
<td>Locker room, loading bays</td>
</tr>
<tr>
<td>Simple tasks</td>
<td>160</td>
<td>Staff canteens, casting concrete</td>
</tr>
<tr>
<td>Ordinary tasks</td>
<td>240</td>
<td>Food preparation</td>
</tr>
<tr>
<td>Moderately difficult tasks</td>
<td>320 - 400</td>
<td>Office tasks, fine woodland</td>
</tr>
<tr>
<td>Difficult tasks</td>
<td>600</td>
<td>Proofreading</td>
</tr>
<tr>
<td>Very difficult tasks</td>
<td>800</td>
<td>Fine inspection, retouching paint</td>
</tr>
<tr>
<td>Extremely difficult</td>
<td>1200</td>
<td>Hand tailoring</td>
</tr>
<tr>
<td>Exceptionally difficult</td>
<td>1600</td>
<td>Watchmaking</td>
</tr>
</tbody>
</table>

Making the four corrections:

1. The task is difficult + 200 lux = 500 lux
2. Task lasts 30 min per day - 200 lux = 300 lux
3. Errors = high + 200 lux = 500 lux
4. Normal vision no correction = 500 lux

Final result: 500 Lux

Note that measuring lighting levels at only one time of the day and for a particular weather condition is invalid if the daylight contribution can vary, for example if the sun is shining directly through the window causing glare.

HOWEVER, THERE IS MORE TO LIGHTING THAN JUST GETTING THE AMOUNT ‘RIGHT’

It is important to have enough light on the scene.

Equally important are:

> the type of lamp (the colour of the light produced)
> the type of luminaire (the way light is distributed and its location in the space to be lit)
> the décor (its colour, pattern and intensity must be regarded as part of the lighting design)
> control of daylight - window location and curtaining
> the people - age, visual status
> discomfort or disability glare
> lighting directionality.

LIGHTING AND SAFETY

A uniform distribution of light is needed for safety and to reduce visual fatigue. (eg there should not be big contrasts in the amount of light in a space).

Stairs, ladders, aisles, passageways, exits and outside areas all need to be adequately and uniformly lit.

Intrinsically safe fittings should be used where flammable substances are present.
Fluorescent lighting with moving/rotating machinery can cause difficulties because of the stroboscopic effect.

LAMPS
A lamp is a light-emitting device (bulb, fluorescent tube, metal halide etc) Different lamps are suitable for different purposes because of their:
> brightness
> colour
> cost to install
> cost to run
> dimmability
> heat output
> energy efficiency
> colour rendering ability.

LUMINAIRES
A luminaire is the combination of a lamp and its mounting and light control surfaces (eg a flush-mounted or a pendant fluorescent or an up-lighter).

Selecting the right type of luminaire, putting them in the right place on the ceiling (or hanging them below it) and maintaining them by regular cleaning and re-lamping is required to produce long lasting, good lighting.

Trying to light an area with the wrong luminaire is an exercise in futility.

DIRECTIONALITY OF LIGHTING. MODELLING AND THE VECTOR-SCALAR RATIO
There needs to be a mix of directed light and omnidirectional light to reveal the three-dimensional (3-D) nature of objects, spaces, people and faces. This is required for safety, ease of use and clear communication.

> directed light – eg from a spotlight
> omnidirectional light eg from the sun on a cloudy day.

An example of highly shadowed lighting
Directed light. The result of spotlighting. Light flowing in one direction only.

An example of bland, directionless lighting
This is light that flows equally every which way.

This sort of light occurs on a cloudy day.
It is bland. It illuminates all parts of an object equally but, without shadows, tends to obscure its three dimensional aspects.
An example of good modelling

A mix of both types produces the best result by faithfully modeling what is being lit.

The 3 dimensional nature of this space is clearly revealed.

Modeling is important in such tasks as:

- face to face communication
- when driving a forklift in the narrow aisles of a warehouse
- when operating a crane on a building site
- hairdressing.

DÉCOR

Walls and ceilings all emit light by reflection - so the decor is part of the lighting system. Colour also influences mood.

Reflective light surfaces (which implies light or pastel colours) make for lighter spaces and will save money. To reduce reflections, use dark colours.

DAYLIGHT CONTROL

Sunlight entering windows can cause glare or reflections in computer screens, an increased heat load and can increase light levels much beyond the tolerable.

Appropriate window treatments to control daylight will be required.

Given the wide variety of curtaining available, there is a lot of detail in this topic, so seek specialist advice.

GLARE

Glare may be direct or indirect.

Direct glare may be from:

- a brightly illuminated wall in the direct line of vision
- the sun coming in a window in the line of view or
- the sun while driving
- a poorly positioned spotlight.

This is often called disability glare – all the examples above make the task more difficult.

Indirect glare occurs when there is reflected light which obscures the task. It does not necessarily cause discomfort – and a person may not be aware of it.

Even indirect glare from typing paper reduces contrast and where low contrast acuity is reduced for the aging eye, visibility may be compromised.

A simple test for indirect glare is to place a mirror over the task. If a source of illumination can be seen in the mirror there is a problem. It can be resolved by altering the position of the light source or by relocating or rotating the work surface until the glare is reflected in an unharmful direction.

LIGHTING FOR AGING EYES

Lighting standards do not consider the aging eye well. A rule of thumb is:

- At 50 yrs of age the employee will require twice the amount of light they would have needed as a teenager
- At 60 years – 3 times
- At 80 years – 10 times!

Obviously, ambient lighting conditions cannot be elevated to these higher levels without compromising energy budgets so, for aging employees, task lighting must be considered.
The provision of local lighting is a task for a specialist. Providing a desk lamp ‘off the shelf’ is likely not to meet the needs of the user.

SUMMARY
This section has tried to convince employers that they should quickly refer to a qualified lighting engineer at an early stage. This is because good lighting design considers all of:

- the amount of light needed for the particular task
- how safety is influenced by lighting
- the importance of modelling, when it is important
- what lamp to use
- which luminaire to select
- where to put the luminaires
- how often to clean luminaires and re-lamp them
- how to control daylight
- how the décor influences lighting
- control of glare
- aging eyes
- local lighting, if required
- installation cost
- running costs
- benefits of good lighting - as described above.

Some employers may be interested in providing high quality lighting in order to promote both a congenial ambience and productivity. They may decide that this is worthwhile financially, in spite of the extra cost.

REFERENCES

The publications page of the Chartered Institute of Building Services Engineers website at www.cibse.org

The Society of Light and Lighting handbook at:

This is a definitive reference. Although costly, it is well written and illustrated – and probably more easily assimilated than the standards referred to.

GLOSSARY
- Lamp – a light emitting device.
- Luminaire – the lamp and the housing used to hold it in place and its light control surfaces.
- Illuminance – the amount of light falling on a surface.

Cross Reference: Page 84

8.6 NOISE

Excessive noise exposure can cause Noise Induced Hearing Loss (NIHL).

Noise-induced hearing loss is a permanent condition of the inner ear characterised by loss of hearing ability, particularly in the voice recognition range.

Noise-induced hearing loss is a major cause of disability and compensation in New Zealand.

The extent of noise-induced hearing loss (NIHL) depends on the intensity of the noise, its duration and its frequency (or pitch). Put simply, the more time a person’s ears are exposed to excessive noise, the greater the degree of hearing loss. More time equals more acoustic energy and hence more damage. The damage that results is irreversible, and the effectiveness of treatment is very limited.

Some individuals are more sensitive to noise than others and will lose hearing more readily through noise exposure. The large variations in susceptibility means that the exposure limits set out in the regulations are therefore not guaranteed to remove all risk of noise-induced hearing loss.
Regulation 11 of the Health and Safety in Employment regulations requires employers to take all practicable steps to ensure that no employee is exposed to noise above either/both of the following:

An **average** of **85 decibels** over 8 hours (A-weighted measurement);

A **peak** level of **140 decibels** (un-weighted measurement).

**Notes:**

> This standard also applies if the worker is wearing hearing protection.

> Just because someone is exposed to noise above 85 decibels for a short period during a shift does not mean their exposure exceeds the 8 hour standard. This is because the 8 hour standard is based on average exposure.

> The standard for people working longer shifts than 8 hours is less than 85 dB(A) average. For a 12 hour shift the Standard is 83 dB(A).

Preliminary noise measurement can be carried out by any person with no special training in noise however this is only a very basic assessment. The noise code of practice provides guidance on this type of assessment. A detailed assessment to determine if: noise control, hearing protection or audiometry is required should be done by a competent person using specialised monitoring equipment.

**Source:**

Approved Code of Practice for the Management of Noise in the Workplace at:


The table on the next page summarises the Code.

**Cross Reference:** Page 82

### A summary of the ACOP for Noise

<table>
<thead>
<tr>
<th>KEY PRINCIPLES</th>
<th>KEY ACTIONS</th>
<th>KEY TOOLS AND REFERENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide a safe place of work</td>
<td>Take all practical steps to ensure that no employee is exposed to noise in excess of the exposure limits.</td>
<td>See the Approved Code of Practice for the Management of Noise in the Workplace – section 2.2 ‘Providing a Safe Place of Work’.</td>
</tr>
<tr>
<td>Identify noise hazards</td>
<td>Carry out a preliminary noise survey to identify possible noise hazards. If present, assess their significance.</td>
<td>This does not need to be done by a ‘competent’ person. See the Approved Code of Practice for the Management of Noise in the Workplace – section 3 ‘Preliminary Noise Surveys’.</td>
</tr>
<tr>
<td>Assess their significance</td>
<td>Every 5 years - arrange for a detailed noise survey to be carried out to assess the significance of noise hazards.</td>
<td>This must be done by a ‘competent’ person. See the Approved Code of Practice for the Management of Noise in the Workplace – section 4 ‘Detailed Surveys–Assessing Noise Hazards’.”</td>
</tr>
</tbody>
</table>
KEY PRINCIPLES | KEY ACTIONS | KEY TOOLS AND REFERENCES
---|---|---
Control significant hazards by elimination, isolation, or minimisation | If practicable, eliminate noise at source. If not, isolate noise source. Provide hearing protectors when noise hazards can’t be eliminated or isolated, and while work is being carried out to control noise at source. Also monitor exposures to noise. | See the Approved Code of Practice for the Management of Noise in the Workplace – section 7 ‘Reducing Noise in the Workplace’. See the Approved Code of Practice for the Management of Noise in the Workplace – section 6 ‘Reducing Noise Exposure With Hearing Protectors’. |
Monitor the health of employees | Arrange for hearing tests (audiometry) to be carried out on all employees who work in an area with hazardous noise - when an employee starts work, and at intervals of no longer than 12 months thereafter. | This must be done by a ‘competent’ person. WorkSafe NZ must be notified if an employee has a hearing loss that meets the ACoP’s criteria. See the Approved Code of Practice for the Management of Noise in the Workplace – section 7 ‘Monitoring the Health Effects of Noise’. |
Provide information, training and supervision | Provide information/training/supervision to employees – on noise hazards – the safe use of plant and – the safe use of hearing protectors. | See the Approved Code of Practice for the Management of Noise in the Workplace – section 8 ‘Training and Education’. |

3.8.7 VIBRATION

INTRODUCTION

This entry refers to advice on the UK Health and Safety Executive website.

The advice posted there imposes legal requirements on employers in the UK. These, of course, are not enforceable in New Zealand. However, section 6 of the NZ Act imposes a general duty to prevent harm. Following the UK approach would be one way of meeting that duty.

It has been observed that vibration disease will be less likely in the warmer climate of New Zealand compared to the UK. While that might be true it will not mean that problems won’t occur. The comment does not apply to whole body vibration.

WHAT IS THE PROBLEM?

Vibration white finger (VWF), hand arm vibration syndrome (HAVS), carpal tunnel syndrome (CTS) and back pain are possible consequences of exposure to vibration.

HAND ARM VIBRATION SYNDROME (HAVS)

**Vibration white finger**, or Raynaud’s disease, is a disease of the hands in which the blood vessels in the fingers collapse due to repeated exposure to vibration. The skin and muscle tissue do not get the oxygen they need and eventually die. The process is hastened by exposure to cold.

**Hand-arm vibration syndrome** (HAVS) is a more advanced condition, and the entire hand or arm may be affected by exposure to vibration (typically from hand held powered tools or equipment). Early signs of HAVS are infrequent feelings of numbness and/or tingling in the fingers, hands, or arms, or numbness and whiteness in the tip of the finger when exposed to cold. As the disease progresses, a worker experiences more frequent attacks of numbness, tingling, and pain and finds it difficult to use his or her hands. A worker with advanced HAVS may be disabled for a long period of time.
Carpal Tunnel Syndrome is a disease that develops when the tendons in the carpal tunnel in the hand press on the nerve that passes through it. The disease is associated with vibration exposure.

HAZARD ID
Exposure occurs when using any powered hand tool or powered machinery. Examples are given in the table on the next page.

HAZARD ASSESSMENT – HAVS.
The risk of developing HAVS depends on the length of time the person is exposed for and the magnitude of the vibration.

New Zealand has no exposure standards for vibration. The Health and Safety Executive (HSE) in the UK proposes exposure action values (EAV) and exposure limit values (ELV). See:
www.hse.gov.uk/pubns/indg175.pdf

WHAT IS THE EXPOSURE ACTION VALUE (EAV)?
The EAV is a daily amount of vibration exposure above which it is suggested employers should take action to control exposure. The greater the exposure level, the greater the risk and the more steps employers should take to reduce the risk. For hand-arm vibration the EAV is a daily exposure of 2.5 m/s² A(8 hours).

WHAT IS THE EXPOSURE LIMIT VALUE?
The exposure limit value (ELV) is the maximum amount of vibration an employee should be exposed to on any single day. For hand-arm vibration the ELV is 5 m/s² A(8 hours). It represents a high risk above which employees should not be exposed.

A pamphlet on the HSE website:
> Outlines the signs and symptoms of HAVS, the effects on an employee’s ability to work, settings where HAVS occurs and the sorts of tools that cause it.
> Discusses how to assess risks – asking employees about symptoms, getting data from tool manufacturers, measuring trigger time (how long the employee is actually exposed to the vibration) and measuring levels of vibration.
> Suggests ways to estimate exposure without measuring vibrations levels.
> Gives a simple ‘points’ system for estimating overall exposure.
> Discusses health surveillance.
> Suggests information and training.

CONTROL OF HAVS
The pamphlet mentioned also discusses control measures such as:
> other work methods – automation
> equipment selection – use tools with low vibration levels
> purchasing policy
> workstation design – apply ergonomics principles to minimise muscle loadings
> maintenance to reduce vibration.
> work schedules – limit exposures by planning, rotation etc
> clothing – provide warm gloves.
Another booklet published by the UK HSE presents 50 case studies where hand arm vibration was successfully controlled. See: www.hse.gov.uk/pubns/books/hsg170.htm

This booklet contains an extensive checklist for the control of vibration.

- identifying vibration problems
- alter processes, installations and tasks
- review tool integrity
- tool maintenance requirements
- work schedules
- operator usage
- operator protection
- health monitoring.

WHOLE BODY VIBRATION (WBV)

WBV is transmitted through the seat or feet of employees who drive mobile machines over rough uneven surfaces. Large shocks and jolts may cause health risks including back-pain.

HAZARD ASSESSMENT

For WBV the HSE limits are different from those of HAVS:

- the daily exposure limit value (ELV) is 1.15 m/s² A(8)
- the daily exposure action value (EAV) is 0.5 m/s² A(8).

When measuring WBV, accelerations in the x, y and z directions will need to be made. A method for the measurement is set out in Schedule 2 of the HSE publication ‘Whole-body vibration, The Control of Vibration at Work Regulations 2005: Guidance on Regulations’. See: books.hse.gov.uk/hse/public/saleproduct.jsp?catalogueCode=9780717661268

Avoiding WBV in vehicles: – Employer:

- Select vehicles that are well-matched to the task.
- Construct roads and keep them smooth – eliminate potholes, ridges etc.
- Maintain vehicles – inflate the tyres properly – maintain suspension systems.
- Match vehicle seats to the vehicle when they need replacement. Seek advice from manufacturers.
- Consider administrative controls – limiting the time of exposure.
- Consider the specific needs of older and younger employees, people with back problems and pregnant women.
- Health monitoring – see 2.5.3.

Driver:

- Drive slowly.
- Adjust the seat settings properly, – match the spring tension to the driver’s weight.
- Adjust the seat location seat for clear lines of sight and ease of operation of foot/hand controls.
- Get the seat repaired, if necessary.
- Clean the windscreen.
- Adjust the mirrors properly.
- Keep to the designated smooth access-ways.
- Match the speed of the vehicle to the road surface to avoid jolting.
- Steer, brake, accelerate etc smoothly.

These suggestions are based on the idea that a person who is sitting awkwardly, craning their neck to see through a clear patch of otherwise dirty glass, driving a poorly maintained vehicle on rough roads etc, will be more susceptible to whole body vibration.

MEASUREMENTS FOR HAVS AND WBV

The equipment and expertise needed to perform monitoring for both HAVS and WBV is available in New Zealand. Consult the Technical Section for details.

An alternative approach is to use published data about representative levels of vibration produced by powered hand tools. The table below is derived from New Zealand measurements.
Time of use limits for common vibrating hand tools

<table>
<thead>
<tr>
<th>TOOL</th>
<th>DAILY EXPOSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jigsaw, Router, Screwdriver, Planer, Nailer, Impact wrench, Drill</td>
<td>8.0 Hr</td>
</tr>
<tr>
<td>Disc sander, Chainsaw, Concrete saw, Weed eater, Post hole borer, grinder</td>
<td>6.5 Hr</td>
</tr>
<tr>
<td>Roller, Concrete vibrator</td>
<td>5.5 Hr</td>
</tr>
<tr>
<td>Plate compacter</td>
<td>2.5 Hr</td>
</tr>
<tr>
<td>Lawn mower</td>
<td>2.0 Hr</td>
</tr>
<tr>
<td>Whacker plates</td>
<td>1.5 Hr</td>
</tr>
<tr>
<td>Hammer drill</td>
<td>75 min</td>
</tr>
<tr>
<td>Breaker</td>
<td>60 min</td>
</tr>
<tr>
<td>Scabbler</td>
<td>18 min</td>
</tr>
</tbody>
</table>

**Health monitoring** Specifically required to prevent the build up of signs of HAVS and WBV. See section 2.5.3.

### 3.8.8 HIGH PRESSURE FLUIDS

**MEDICAL EMERGENCY**

If a worker should happen to have high pressure fluids injected under the skin or into the body – it must be treated as a *medical emergency* and the person rushed to hospital immediately.

This holds even when the entry wound appears *small and benign*. The people accompanying the person should try to ensure that a specialist with knowledge of this particular injury is consulted.

The fluids most commonly involved are:

- air
- water
- grease
- hydraulic fluid.

Grease guns, horseplay with compressed air hoses and bursting hydraulic lines and compressed air lines have all been implicated.

**A High-Pressure Injection Injury**

Note the swelling and erythema (redness).

This illustration is relatively minor. It was about the least gruesome one available in a search using Google Images!

The injury was incurred when a grease gun accidentally discharged into a hand.

**Source:**

Access Emergency Medicine at:


Photo contributor: Richard Zienowicz, MD.

### 3.9 OCCUPATIONAL DISEASES

#### 3.9.1 LEPTOSPIROSIS

A Worksafe NZ guideline provides practical suggestions for preventing leptospirosis.

Because leptospirosis is a serious illness and potentially fatal, it is a ‘significant hazard’ as defined by the Health and Safety in Employment Act 1992.

Employers and other people in control of workplaces therefore have a responsibility to take all practicable steps to prevent workers suffering ‘serious harm’. 
The settings where people can be affected are anywhere the urine of infected animals can contact people:
> farms – particularly dairy farmers
> farm service workers
> freezing works – meat workers and meat inspectors
> veterinarians
> forestry workers.

The range of practicable steps includes:
> Vaccination can be effective in some situations (dairy herds).
> Preventing contact with urine as far as possible eg in milking sheds.
> Using PPE – gloves and face shields.
> Personal habits – wiping the mouth with the hands.
> Work practices.
> Engineering controls (guards).
> Many other practices are outlined for different occupational settings in the 80 Page Guideline. It should be consulted as a first resort.


A more recent research report indicates questions remaining over the issue: Leptospirosis – Reducing the impact in New Zealand workplaces.

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### 3.9.2 HEPATITIS

Hepatitis is swelling and inflammation of the liver. It is not a condition, but is often used to refer to a viral infection of the liver. There are several forms – Hepatitis A, B and C are common but others are possible.

In the occupational setting Hepatitis can be caused by infections from viruses bacteria, or parasites.

Hepatitis A is the least serious and mildest. The other hepatitis infections may become chronic illnesses, but hepatitis A does not become chronic.

Health care and sewerage workers and other settings where exposure to faeces can occur are places of risk. Prevention is basically by hygiene.

**HEPATITIS A**

The hepatitis A virus is found mostly in the stools and blood of an infected person about 15 – 45 days before symptoms occur and during the first week of illness.

Hepatitis A is transmitted by:
> eating or drinking food or water that has been contaminated by feces containing the hepatitis A virus (fruits, vegetables, shellfish, ice, and water are common source of the hepatitis A virus)
> contact with the stool or blood of a person who currently has the disease
> a person with hepatitis A not washing his or her hands properly after going to the bathroom and touches other objects or food.

Because not everyone has symptoms with hepatitis A infection, many more people are infected than are diagnosed or reported.
Risk factors include:

- living in a nursing home or rehabilitation center
- working in a healthcare, food, or sewerage related industries.
- Vaccination is possible.

HEPATITIS B

Hepatitis B infection can be spread through having contact with the blood, semen, vaginal fluids, and other body fluids of someone who already has a hepatitis B infection. Infection can be spread occupationally through:

- Direct contact with blood in healthcare settings.
- Tattoo or acupuncture with unclean needles or instruments.

People who are at high risk, including healthcare workers and those who live with someone who has hepatitis B, should get the hepatitis B vaccine.

Hepatitis B viruses cannot be spread by casual contact, such as holding hands, sharing eating utensils or drinking glasses, breast-feeding, kissing, hugging, coughing, or sneezing.

HEPATITIS C

Hepatitis C is a viral disease that leads to swelling (inflammation) of the liver. It is caused by the hepatitis C virus (HCV). Occupationally, people who may be at risk for hepatitis C are those who:

- have regular contact with blood at work (for instance, as a healthcare worker)
- received a tattoo or acupuncture with contaminated instruments (the risk is very low with licensed, commercial tattoo facilities)
- share personal items such as toothbrushes and razors with someone who has hepatitis C (less common).

Hepatitis C has an acute and chronic form. Most people who are infected develop the chronic form. Most people who were recently infected with hepatitis C do not have early symptoms or develop symptoms only after years.

Prevention is by avoiding contact with blood or blood products whenever possible. Health care workers should follow designated precautions when handling blood and bodily fluids.

3.9.3 TUBERCULOSIS

Pulmonary tuberculosis (TB) is a contagious bacterial infection that involves the lungs, but may spread to other organs. TB is contracted by breathing in air droplets from a cough or sneeze of an infected person. This is called primary TB.

Most people will recover from primary TB without further evidence of the disease. The infection may stay dormant for years. In some people it can reactivate.

Occupationally, the risk of contracting TB increases with frequent contact with people who have TB. Some cases are of bovine TB and have occurred in veterinarians and farmers in New Zealand.

People who have been exposed to TB should be skin tested immediately and have a follow-up test at a later date, if the first test is negative.

Prompt treatment is extremely important in controlling the spread of TB from those who have active TB disease to those who have never been infected with TB.

Some people are more susceptible such as people with HIV and silicosis.

3.9.4 HIV/AIDS

Health care workers should assume that the blood and other body fluids from all patients are potentially infectious. They should therefore follow infection control precautions at all times. These precautions include:

> routinely using barriers (such as gloves and/or goggles) when anticipating contact with blood or body fluids
> immediately washing hands and other skin surfaces after contact with blood or body fluids, and
> carefully handling and disposing of sharp instruments during and after use.

Many percutaneous injuries, such as needlesticks and cuts, are related to sharps disposal. Safety devices have been developed to help prevent needle-stick injuries. If used properly, these types of devices may reduce the risk of exposure to HIV.

Although the most important strategy for reducing the risk of occupational HIV transmission is to prevent occupational exposures, plans for post-exposure management of health care personnel should be in place.

3.9.5 SCABIES

Scabies is an easily spread skin disease caused by a very small species of mite. These mites burrow into the skin and deposit their eggs, forming a burrow that looks like a pencil mark. Eggs mature in 21 days. The itchy rash is an allergic response to the mite. Scabies is spread by skin-to-skin contact with another person who has scabies.

Scabies is found among people of all groups and ages. It is spread by direct contact with infected people, and less often by sharing clothing or bedding. Outbreaks of scabies are more common in prisons, schools, nursing homes, nursing facilities, and child care centers. Sometimes whole families are affected.

The symptoms are:

> itching, especially at night
> rashes, especially between the fingers
> sores (abrasions) on the skin from scratching and digging
> thin, pencil-mark lines on the skin.

Consult a physician for advice about treatment.

Prevention is through quick detection of any outbreaks, hygiene and preventing the arrival of the mite in a facility through screening new entrants.


3.9.6 ORF

Orf is a virus infection of the skin contracted from sheep and goats. It is caused by the parapox virus, which infects mainly young lambs and goats which contract the infection from each one another or possibly from persistence of the virus in pastures. Human lesions are caused by direct inoculation of infected material.

Orf is not uncommon among sheep farmers, shearers, freezing workers, vets and farmers’ wives or their children who bottle-feed lambs.

After an incubation period of 5 or 6 days a small, firm, red or reddish-blue lump enlarges to form a flat-topped, blood-tinged pustule or blister. The fully developed lesion is usually 2 or 3 cm in diameter but may be as large as 5 cm.

Patients whose immunity is reduced for some reason may develop larger or unusual orf lesions. Rarely, widespread small blisters may occur, suggesting blood stream spread of the orf virus.
No specific treatment is necessary in most cases, as orf usually clears up by itself in about 6 weeks. The lesion may be covered to prevent contaminating the environment or other people, although person-to-person spread is very uncommon. Any secondary bacterial infection should be treated. Large lesions can be removed by shave excision.

3.9.7 CAMPYLOBACTER AND MISCELLANEOUS DIARRHEAL INFECTIONS

Campylobacter jejuni and Salmonella species are frequently found in the gastrointestinal tracts of cattle, sheep, pigs, dogs, cats, rodents, and most importantly, poultry.

They are transmitted to humans by:

a. Consumption of foods derived from an infected animal, or ingestion of food contaminated by its faeces.

b. In abattoirs – where strict attention to personal hygiene is required to reduce the risk to an acceptable point.

These agents typically cause an acute gastroenteritis, though other effects can occur. Prevention requires strict hygiene practices, including handwashing and appropriate protective clothing. Campylobacter can be transmitted by droplet aerosol, so face masks may be useful in some circumstances. Cleaners in hospitals and residential care for both older and younger people are also at risk.

3.9.8 LEGIONELLA

See page 109.

3.9.9 OTHER RARE OCCUPATIONAL DISEASES

Aspergillosis – caused by a fungus which is commonly found growing on dead leaves, stored grain, compost piles, or in other decaying vegetation.

Brucellosis – an infectious disease transmitted from animals – very rare now, but maybe not extinct.

Cryptosporidiosis – infection of the small intestine with a parasite that causes diarrhea.

Giardiasis – infection of the small intestine caused by a microscopic organism. The source is drinking water contaminated with the urine of an animal.

Hydatids – no new cases for many years.

Histoplasmosis – The Histoplasma fungus grows as a mold in the soil, and infection results from breathing in airborne particles.

HSV (Herpes virus) – health care workers would be most at risk

Lyme disease – Lyme disease is an infection caused by a bacteria transmitted from animals through tick bites. In New Zealand, cases have only been reported in people that have recently travelled from an endemic area.

Ornithosis – Diseases transmitted to people from birds.

Q Fever – Found in Northern Australia, but probably not in New Zealand.

Sporotrichosis – caused by a fungus found in vegetation. Infection commonly occurs when the skin is broken while handling plant materials such as rosebushes, briars, or mulch-rich dirt.

Streptococcus – eg in pig farmers

Tetanus – eg in farmers

Toxoplasmosis – Toxoplasmosis is found in people worldwide, and in many species of animals and birds. Cats are the definitive host of the parasite.

Tularemia – an infection common in wild rodents that is passed to humans through contact with infected animal tissues or by ticks, biting flies, and mosquitoes.

Source:

Dr Michael Beasley and Dr Chris Walls.
3.10 SKIN DISEASES AND SKIN CANCERS

3.10.1 SKIN DISEASES

Contact dermatitis is of two kinds
- irritant and
- allergic.

These account for 60% of occupational dermatoses and from 40–70% of all occupationally-acquired illness!

Sectors where exposure is common are:
- food handler/chef
- hairdresser/beautician
- medical/dental/nurse/vets
- agriculture/florist/gardener
- cleaning/laundry
- painting
- mechanical/engineer
- printing/lithography
- construction.

Work-relatedness may be indicated by:
- particular tasks
- exposure to particular substances
- its resolution when away from work.

CONTACT IRRITANT DERMATITIS

Contact irritant dermatitis occurs when an irritant is applied to the skin:
- in high enough concentration
- over sufficient time and/or
- with sufficient frequency.

It is made worse by gloves, heat, friction and pre-existing disease. This form of dermatitis usually occurs on the hand or forearm. It is caused by:
- acids and alkalis
- solvents
- detergents/soaps
- abrasives
- enzymes
- oxidants
- oils
- reducing agents
- hygroscopic chemicals
- concentrated salt solutions
- low molecular weight plastics.

CONTACT ALLERGIC DERMATITIS

Over time, (often measured in years) an allergic response develops. The time interval between the first exposure and the development of symptoms depends on:
- the chemical
- the exposure conditions
- skin thickness
- personal factors.

Skin damage increases the risk that an allergy will develop. Sites distant from initial contact may be affected eg when fingers carry the chemical to the face.

Some allergic dermatoses require the interaction of sunlight and a chemical – eg plants, lichens and sunscreens.

CONTACT URTICARIA

Redness and blistering at the site of contact with the chemical within an hour of exposure, and resolving within 24 hours. There are immunological and non-immunological types.

Causes are:
- Non-immunologic: Peru balsam; Ethyl alcohol, caterpillars, jellyfish and moths.
- Immunologic: Seafood, fruits, vegetables, meat/blood, animal secretions, latex.

Control of all forms of dermatitis:
- remove from work (if severe)
- prevent contact or at least reduce its frequency and the duration of exposure
- choose gloves carefully – they can make things worse if the chemical gets into them – through a cut or by penetrating the material.
> avoid skin trauma
> avoid excessive heat/humidity
> avoid cold and chapping conditions
> use safe work habits
> clean hands with the mildest possible cleansers – avoid solvent-soaked rags, dry hands carefully.
> use a different chemical
> use non-rubber gloves
> avoid using allergens.

Treatment: Refer to a specialist.

Source: A Guide to Occupational Skin Diseases:

3.10.2 CEMENT DERMATITIS

CEMENT DERMATITIS

Handling wet cement – or even cement that has not cured properly – may, over time, lead some people (10% according to the UK HSE) to develop a form of dermatitis. This is due to the alkalinity of the cement and contact with chromates that exist naturally in cement.

Cement dermatitis is very hard to treat. Once a person is sensitised further exposure to chromates will cause symptoms.

CONTROL
There are three main strategies.

> Prevent contact by using gloves – if other concrete handling methods won’t prevent contact.
> Wash hands – this implies that running water and adequate hand washing/drying facilities are needed on site.
> Report dermatitis to the employer – if there is not an active programme of health monitoring already.

REFERENCE:

3.10.3 ULTRAVIOLET (UV) EXPOSURES

Skin cancer is by far the most common cancer in New Zealand and ranks as one of the most expensive cancers, costing the health system over $33 million p.a.

Skin cancer can come in three forms:
> Melanoma (least common but most dangerous)
> Basal cell carcinoma (most common but least dangerous)
> Squamous cell carcinoma (Less common but more dangerous that BCC)

Solar keratoses are also possible.

Photographs of each type are shown in various websites such as at: http://molemap.co.nz/

Our counterparts in Victoria, in Australia, are convinced that UV exposures of construction workers are a real hazard and have promoted programmes to prevent exposure throughout the industry in that State.

Given the intensity of UV radiation (UVR) in New Zealand in summer, it is sensible to advise workers to protect themselves from the sun, at least between early October and the end of March.
It is sensible for employees to check their skin every few months especially the face, lips, ears, neck, shoulders, arms and hands.

The following measures are advised:

> Increase the amount of shade available in the workplace.
> Wherever possible carry out work in the shade of trees or buildings, move jobs to shade areas, use portable shade and/or erect permanent shade structures.
> Reschedule work: UV radiation is strongest from 11 am to 4 pm. If possible, schedule outdoor work outside these times during the summer months.
> Rotate employees if possible, alternate employees between indoor and outdoor tasks.
> Personal protection: Cover as much skin as possible by wearing:
  - sun protective clothing (UPF rating 50+) for example collared, long-sleeve shirts, trousers or long-sleeve overalls;
  - legionnaire or broad-brimmed sunhats (minimum 7cm brim) or hard hat brim attachments;
  - broad spectrum SPF 30+ sunscreen (that comply with the AS/NZS2604);
  - sunglasses (that comply with the AS/NZS1067.1). Choose wraparound, close-fitting sunglasses for the best protection.

Source:
Downloads 27 and 28 on the ‘Sun Protection’ Information Sheets page.
www.sunsmart.co.nz
www.cancernz.org.nz

Thanks to Judith Galtry of the Cancer Society of New Zealand for reviewing this information.
GENERAL GUIDANCE
> 1080 – safety during aerial application
> Glutaraldehyde – general safe use
> Hairdressing – General guide
> Home based healthcare – Guideline
> Lead paint – removal
> Metal Casting – general guidance
> Mortuaries – general guideline
> PCBs – general guidance
> Printing
> Screen printing – general guide
> Synthetic glass wool – general comment
> Synthetic mineral fibres -guideline
> Theatre and entertainment Industry – general guidance
> Formaldehyde – paper about lowering the WES
> LPG – hazard alert after a couple were found dead in their bed
> Methyl Bromide – paper about lowering the WES
> Volcanic ash
> Wood dust– paper about lowering the WES for soft woods
> Work related disease – 2010 report

DISASTER RECOVERY – SEVERAL PUBLICATIONS:
> Sewage contamination
> Hazardous substances
> Health issues
> Biological agents
> Personal protective equipment
> Adverse weather conditions
> Fatigue

SECTION 3.0 // OCCUPATIONAL HEALTH TOOLS

3.12 DELAYED KILLERS, SERIAL KILLERS AND CUMULATIVE HARM

In the Safety tools section several serial killers were presented. Here we present a similar list:

1. Delayed Killers

These can result in death or very serious harm several or many years after exposure:

Asbestos
The dangers of asbestos are too well known to require further comment.

Silica
Acute silicosis is now rare but has the potential to kill after several weeks or months exposure.

2. Serial Killers

These can result in sudden death:

Carbon Monoxide
The dangers are well known.

Cold strain
Rare in New Zealand, but the potential remains.

Heat Strain
Rare in New Zealand, but the potential remains.

Hydrogen sulphide
Hydrogen sulphide is extremely toxic and can also dull the sense of smell.

Legionnaire’s disease
Poor control of cooling tower hygiene can allow Legionella to grow and become airborne. Deaths have resulted and are usually well publicised.

Oxygen deficiency
A particular danger of confined spaces. A breath or two of air with no oxygen in it can result in immediate collapse.
Welding
Welding with certain rods (i.e those that contain cadmium) or of certain metals (beryllium) can result in immediate death (i.e same day).

3. Serious harm, delayed or immediate

Electroplating
Poorly ventilated electroplating processes can result in severe illnesses due to chromium exposure.

Isocyanates
Isocyanates have the ability to affect lung function suddenly and permanently. A person may be left struggling for breath for decades.

Lead
Lead poisoning has been well known since antiquity.

Leptospirosis
For some people, Leptospirosis is extremely severe, with delayed effects lasting many months or for years.

Noise
Noise induced deafness is extremely common. The psychological effects of not being able to hear other people talking can be severe.

Organic dusts
An allergic response may leave a person unable to tolerate any exposure.

Solvents (Fibreglassing, Spraycoating, Boatbuilding, Collision repair)
Solvent exposure can result in acute temporary or permanent or prolonged effects on mental function. A person may be labelled with a ‘personality disorder’. In past times, Health and Safety Inspectors never visited painters on Fridays!

Timber Treatment
Past exposure to some timber treatment chemicals has resulted in severe illness many years later.

Vibration
Vibration disease can leave a person severely affected, permanently.

Welding
Exposure to uncontrolled welding fumes can lead to poor lung function in later life.

Wood dust
Cancer can result from exposure to softwood and hardwood dusts, after sufficient exposure.

4. Cumulative Harm

The items mentioned below can all result in harm or serious harm after exposure has been going on for some time. (Weeks, months or years may be required.)

Prevention strategies for all these items are well known.

Some people may be profoundly affected and others less so, by identical circumstances.

The statements made highlight the experiences of some people – and therefore point to future possibilities for other people.

The comments do not report on average results – such as when large populations of workers are surveyed at one point in time.

Bullying
Bullying can have severe effects on individuals (and on company performance). Some people have had to leave work and have lost confidence for long periods.

Computer use
For some people, constant computer use can result in severe discomfort, injury and pain. This may compromise their future employment.
Gradual Process Injuries
Repetitive work in various industries can leave people with discomfort, pain and injury.

Hand tools
For some people who use specific hand tools regularly, severe pain has resulted when the tool has been poorly designed. Health and job performance are compromised.

Manual Handling
An increased incidence of low back pain is associated with exposure to repeated heavy handling, especially when postures and movements are awkward. Some people have faced the rest of their life without a job because of the effects of uncontrolled manual handling tasks.

Skin Cancer
The most common cancer.

Skin Diseases
By far the most common of all occupational diseases and responsible for many people needing to change occupations.

Stress
Stress (most specifically, the exposure to too much work in the form of constant pressure, constant demands and recurring deadlines) has been shown to result in increased rates of heart disease and mental illness.

Violence to Caregivers
Caregivers report high rates of violence, both physical and verbal.

The results, in terms of decreased morale and compromised performance, are not well characterised.

Interestingly, the cumulative result of verbal violence may be more severe than that of physical.
IN THIS SECTION:

4.1 Introduction
4.2 Legislation
4.3 Compliance checklist
4.4 The nuts and bolts of the HSNO Act
4.5 Resources
4.6 A list of common toxic substances used by industry
4.7 Key definitions
4.8 Special notes
4.1 INTRODUCTION

THE SCOPE OF THIS DOCUMENT
This document applies to all Health and Safety compliance, enforcement and investigations, activities, projects and initiatives carried out by Worksafe NZ that involve hazardous substances covered by the HSNO and HSE Acts.

HSNO ACT AND THE HSE ACT
WorkSafe NZ’s HSNO activities are carried out under the umbrella of the Health and Safety in Employment Act 1992. This is the WorkSafe NZ’s principal means for promoting health and safety at work.

The purposes of both the HSE and the HSNO Acts, while different, are complementary and mutually reinforcing:
> the HSE Act’s purpose is to prevent harm to all persons at work while
> the HSNO Act’s purpose 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.

WHO HAS WHAT ROLES?
1. The EPA (Environmental Protection Agency (EPA))
   > administers the HSNO Act and
   > gives approvals\(^{15}\) for hazardous substances.

2. Worksafe NZ
   > Enforces the HSNO Act in workplaces (See Table 1).
   > Carries out the following functions on behalf of EPA.
   
Deciding HSNO Part 6 Applications to vary controls and approve items as follows:
> Approving equipment for ‘using’ flammable hazardous substances that meet criteria deemed to ensure safe design and operation - includes oil burners, LPG vaporisers, fuel dispensers.
> Approving compliance plans for stationary container systems, secondary containment, and tank wagons that existed before the commencement of the HSNO controls for these cases. The compliance plan will either approve a period of time for the items to be brought into compliance with new controls, or enable the item to be maintained and operated to the standard to which it was originally approved for the remainder of its lifetime.
> Approving a variation or waiver to the fire-fighting requirements for bulk tanks according to criteria, such as isolation and significant separation from other places of regular habitation.
> Approving disused underground fuel tanks to remain underground where they can be rendered safe and it is impractical to remove the tank, for example, removal would undermine adjacent buildings.
> Approving reductions to the separation distance requirements of flammable tanks, stores and use locations to the site boundary. The separation distance is set to protect people, places, and the environment in the case of a fire. The approval requires considering the equivalence of protection provided by items such as the fire rating of separating walls and the standard of fire protection systems.
> Approving the extension of a location test certificate issued by a test certifier from one year to up to three years based on evidence of quality management systems and compliance history.

\(^{15}\) An approval from the EPA is required before any hazardous substance can be imported, manufactured and/or used in New Zealand.)
> Approving one-off compressed gas cylinder imports that can be matched to key elements of existing cylinder design approvals.
> Approving inspection agencies to verify the manufacture of compressed gas cylinders to approved designs.
> Approving the extension of a stationary container test certificate issued by a test certifier for a period of time as allowed for under cl. 93(2) based on evidence of quality management systems and compliance history.
> Approving under Schedule 9, a modification to the aggregate capacity limit for groups of stationary containers (clause 2), or a modification to the maximum capacity limit for secondary containment systems (clause 2A), or a variation to secondary containment capacity required under Hazardous Substances (Emergency Management) Regulations 2001 (clause 3) in accordance with the criteria on those clauses.
> Deciding applications to hold a controlled substance licence (explosives and vertebrate toxic agents)
> Deciding applications for people to be a test certifier, or renew or extend their test certifier approval.
> Providing advice on hazardous substances controls (0800 number and hsinfo inbox).
> Conducting audits and investigations of test certifier performance.

WHAT ARE HAZARDOUS SUBSTANCES?

A substance is considered to be a ‘hazardous substance’ under HSNO when it has a level of hazard greater than the threshold(s) for one or more of the following intrinsic properties:

> explosiveness
> flammability
> oxidising capacity
> corrosiveness
> toxicity
> ecotoxicity.

A substance is also hazardous if it generates a substance that has one or more of these listed hazardous properties when it comes into contact with air or water. (This applies to situations other than air or water where the temperature or pressure has been artificially increased or decreased.)

4.2 LEGISLATION

42.1 RELATIONSHIP BETWEEN THE HSE ACT AND THE HSNO ACT

WorkSafe NZ has a mandate to ensure HSE and HSNO compliance. Where the compliance is related to harm from hazardous substances then, whether covered by HSNO or not, the hierarchy of all practicable steps under HSE is the first consideration.

When WorkSafe NZ looks at whether businesses are compliant with the HSNO Act, it looks for compliance with the controls required by the Environmental Protection Agency (EPA – the new name for the agency formerly known as ERMA).

However, note that there may be situations where the HSE Act’s hazard management process requires an employer to eliminate a particular hazardous substance as a ‘significant hazard’, meaning that implementing the HSNO Act controls will not provide sufficient compliance.

HSE warranted inspectors will know that the various controls in the HSNO Act are, essentially, practicable steps. Thus, while a
site may be HSNO compliant for a particular hazardous substance, there may be a far safer alternative to a substance or process.

Thus the site will be compliant under HSNO, but not necessarily under HSE. On the other hand, where the compliance is related to harm from hazardous substances and where isolation or minimisation is being considered then HSNO controls may provide ‘best practice.’

It is critical that Worksafe NZ Enforcement Officers (EO) are confident in providing advice in this area as even Test Certifiers may not be able to provide the correct advice.

Without fully understanding the nature of the interrelatedness of the HSE and HSNO Acts, we are leaving the client exposed to prosecution even though they may consider themselves compliant.

### 4.2.2 WHO ENFORCES THE HSNO ACT AND WHERE?

The HSNO Act in the purest form, is administered by the Ministry for the Environment with power given to the Environmental Protection Authority or EPA (formerly called ERMA).

As stated earlier in 2.1, if Employers meet the requirements of the HSNO Controls they may NOT meet the requirements of the HSE Act.

It is intended protect the environment and health and safety of people and communities by preventing or managing the adverse effects of hazardous substances and new organisms. WorkSafe NZ does not have jurisdiction in the area of New Organisms. This aspect of the Act is administered by MAF (Bio Security).

WorkSafe NZ is primarily concerned with the application of the legislation in places of work. Other responsible agencies and their jurisdictions are shown in Table 1.

<table>
<thead>
<tr>
<th>AGENCY</th>
<th>AREA OF ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worksafe NZ</td>
<td>Any place of work (as determined under s3 of the HSE Act).</td>
</tr>
<tr>
<td>Energy Safety</td>
<td>In, at, or around any distribution system, gas installation or gas appliance; Notification of gas and electricity accidents was transferred to the Worksafe NZ on 01/01/2009.</td>
</tr>
<tr>
<td>Land Transport NZ</td>
<td>Any motor vehicle, road, rail vehicle or railway line. (Enforcement is normally carried out by the Commercial Vehicle Investigation Unit or SVIU of the NZ Police.)</td>
</tr>
<tr>
<td>NZ Police</td>
<td>Any motor vehicle, road, rail vehicle or railway line.</td>
</tr>
<tr>
<td>Civil Aviation Authority</td>
<td>Aircraft (from gangplank).</td>
</tr>
<tr>
<td>Maritime NZ</td>
<td>Ships (from gangplank).</td>
</tr>
<tr>
<td>Ministry of Health</td>
<td>Where it is necessary to protect public health (not personal health, where the Health Act applies).</td>
</tr>
<tr>
<td>Territorial Authorities</td>
<td>In or on any premises in the district of the territorial authority other than those premises specified above, or in or on those premises specified above where the function, power or duty is transferred to them by another section 97 agency; In or on those premises specified above where they are on those premises for the purpose of enforcing the provisions of the RMA. (In this case they will enter under a RMA warrant and not HSNO.)</td>
</tr>
<tr>
<td>Regional Councils</td>
<td>In or on those premises specified above if they are on those premises for the purpose of enforcing the provisions of the RMA, or in or on those premises specified above if the function, power or duty is transferred to them by another section 97 agency.</td>
</tr>
</tbody>
</table>
Often Worksafe NZ officers may need to work with one or more representatives of these agencies. There are occasions when Worksafe NZ will lead an investigation that may involve people from one or more of the above agencies as well. In addition it must be noted that there will be occasions where jurisdiction is not immediately clear.

4.2.3 HAZARDOUS SUBSTANCES TECHNICAL LIAISON COMMITTEE (HSTLC)

The Hazardous Substances Technical Liaison Committee (HSTLC) is made up of representatives from central and local government along with industry who have expertise in the safe management of hazardous substances. They are not mandated by legislation, but by agreement by the participants. They have no legal connection with HSNO, nor do they have an enforcement function. There are National and Regional HSTLC committees throughout the country. They are chaired by the NZ Fire Service.

The HSTLC provides a means of coordinating technical support when hazardous substance emergencies or incidents occur. The committee can play a role in preparing plans prior to an emergency as well as a management function during an emergency or incident.

4.2.4 INSPECTORS’ EMERGENCY POWERS UNDER THE HSNO ACT

This section assumes prior knowledge by EOs of their powers of entry and general powers under the HSE Act and HSNO Act. As noted previously, there may be cause to exercise your powers under the HSE Act even though you are conducting a compliance visit re HSNO – ie to inspect a site for hazardous substances.

EMERGENCY POWERS

The following powers are accorded to an enforcement officer following their declaration of a state of emergency. The enforcement officer is in control of the emergency.

He/she may:
> prohibit any activity within the designated area
> evacuate the area and restrict entry to it
> request the assistance of any person including any other emergency service or enforcement agency to assist in dealing with the emergency
> use other hazardous substances to remedy the situation, provided the provisions of section 47 have been met
> destroy any property or any thing to render the situation safe
> exercise any of the powers under section 103 (powers of entry for inspection), or under section 119 (powers of entry under search warrant) for the HSNO Act.

4.3 COMPLIANCE CHECKLIST

On entry to a site it is necessary for an enforcement officer to identify the person in charge and identify him/herself them by means of their warrant. Two crucial pieces of information are required to conduct an effective inspection that suitably measures the HSNO component. Firstly identify the substance and second determine the quantity. The following information is required:
> Is there a register or inventory of hazardous substances on site?
> Are Safety Data Sheets (SDS) available in electronic form or as a hard copy – accessible within 10 minutes if held off site?
> Are the correct product labels on containers?
Are staff trained to handle the hazardous substances on site (this is an HSE requirement). Where necessary, are there correctly certified people in place, like approved handlers or approved fillers? The latter is a HSNO matter triggered by specific quantities, see Table 3.

Do employees have the correct equipment/PPE? This is an immediate consideration, but it is then desirable to consider the hierarchy of controls under HSE. This may have long-term implications for processes and the nature of work at a particular site.

Are stationary container certificates in place where required? Are they up to date and do stationary containers have the correct secondary containment if required? See Table 9.

Is there an emergency plan and emergency management procedures and have emergency drills and procedures been practised? See Table 9. The need to practice emergency procedures is a requirement under HSNO.

Signage and fire extinguishers? See Tables 7 and 8.

Segregation of incompatible substances?

Are there hazardous atmosphere zones (See Table 6) and are the sources of potential ignition clearly understood?

4.4 THE NUTS AND BOLTS OF THE HSNO ACT

The HSNO Act seeks to create order out of chaos by classifying substances into classes based on common hazardous properties. It then stipulates how to minimise the effects of the hazard by providing rules for the management (controls) of each class.

4.4.1 CLASSES

The HSNO Act classifies substances by their hazardous properties. Table 2 lists the 9 classes of substance.

Within these 9 classifications is a further series of sub-classifications denoted by the letters A, B, C etc. These letters reflect the risk posed by the substance to the environment or to people (A is high).

A particular substance may display a range of hazardous properties. Hence petrol, a flammable liquid is also:

- toxic if ingested
- explosive when mixed with oxygen in the correct ratio and
- ecotoxic.

Thus petrol may be classified as 3.1A, 6.1E, 6.3B, 6.7B and 9.1B.

4.4.2 CONTROLS

Hazardous substances have physical properties which may result in injury. The HSNO Act further specifies methods of managing and mitigating the effects of these substances. These are the HSNO controls. The Act also addresses quantities of hazardous substances. It thus speaks of ‘trigger quantities’ or quantities that are sufficient to require specific controls. HSNO controls are also designed to prevent an unplanned release of a substance by ensuring that they are bulk stored in the correct containment vessels and that they are correctly packaged for commercial and domestic use.

The Act thus makes provision for controls on the Hazardous Properties of a substance and system controls extending over the hazardous properties for its life cycle (pan-life cycle controls).

Note A: Class 7 is Radioactive substances. This aspect of HSNO is administered by the National Radiation Laboratory.
HAZARDOUS PROPERTY CONTROLS

- Manage hazards resulting from intrinsic hazardous properties.
- Reduce the likelihood of unintended occurrence of the hazard.
- Limit the adverse effects arising from exposure to the hazard by responders such as fire crews.

**Table 2. Classes and sub-classes of hazardous substances**

<table>
<thead>
<tr>
<th>CLASS</th>
<th>SUBSTANCE AND DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Substances &amp; articles having a mass explosion hazard</td>
</tr>
<tr>
<td>1.2</td>
<td>Substances &amp; articles that have a projection hazard but not a mass explosion hazard</td>
</tr>
<tr>
<td>1.3</td>
<td>Substances &amp; articles that have a fire hazard and either a minor blast hazard or a minor projection hazard but not a mass explosion hazard</td>
</tr>
<tr>
<td>1.4</td>
<td>Substances &amp; articles that present no significant explosive hazard</td>
</tr>
<tr>
<td>1.5</td>
<td>Very insensitive substances that have a mass explosion hazard</td>
</tr>
<tr>
<td></td>
<td>Extremely insensitive articles that do not have a mass explosion hazard</td>
</tr>
<tr>
<td>Class 2</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Flammable gasses</td>
</tr>
<tr>
<td>2.2</td>
<td>Flammable aerosols</td>
</tr>
<tr>
<td>Class 3</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Flammable Liquids</td>
</tr>
<tr>
<td>3.2</td>
<td>Liquid Desensitised Explosives</td>
</tr>
<tr>
<td>Class 4</td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Readily combustible solids and solids that may cause fire through friction</td>
</tr>
<tr>
<td>4.2</td>
<td>Self-reactive substances</td>
</tr>
<tr>
<td>4.3</td>
<td>Solid desensitised explosives</td>
</tr>
<tr>
<td></td>
<td>Spontaneously combustible substances.</td>
</tr>
<tr>
<td>Class 5</td>
<td></td>
</tr>
<tr>
<td>5.1.1</td>
<td>Oxidising substances that are liquids or solids</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Oxidising substances that are gasses</td>
</tr>
<tr>
<td>5.2</td>
<td>Organic peroxides</td>
</tr>
<tr>
<td>Class 6</td>
<td></td>
</tr>
<tr>
<td>6.1</td>
<td>Acutely toxic substances</td>
</tr>
<tr>
<td>6.2</td>
<td>Biologically toxic/dangerous substances</td>
</tr>
<tr>
<td>6.3</td>
<td>Skin irritants</td>
</tr>
<tr>
<td>6.4</td>
<td>Eye irritants</td>
</tr>
<tr>
<td>6.5</td>
<td>Respiratory and contact sensitisers</td>
</tr>
<tr>
<td>6.6</td>
<td>Known, presumed or suspected human mutagens</td>
</tr>
<tr>
<td>6.7</td>
<td>Known, presumed or suspected human carcinogens</td>
</tr>
<tr>
<td>6.8</td>
<td>Known, presumed or suspected human reproductive or development mental toxicants on direct exposure or via lactation</td>
</tr>
<tr>
<td>6.9</td>
<td>Toxic or harmful to human organs or systems</td>
</tr>
<tr>
<td>Class 7</td>
<td></td>
</tr>
<tr>
<td>Class 8</td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>Corrosive to metals</td>
</tr>
<tr>
<td>8.2</td>
<td>Corrosive to dermal (skin) tissue</td>
</tr>
<tr>
<td>8.3</td>
<td>Corrosive to ocular (eye) tissue</td>
</tr>
<tr>
<td>Class 9</td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>Ecotoxic in the aquatic environment</td>
</tr>
<tr>
<td>9.2</td>
<td>Ecotoxic in the soil environment</td>
</tr>
<tr>
<td>9.3</td>
<td>Ecotoxic to terrestrial vertebrates</td>
</tr>
<tr>
<td>9.4</td>
<td>Ecotoxic to terrestrial invertebrates</td>
</tr>
</tbody>
</table>

PAN-LIFE CYCLE CONTROLS

Certain substances are deemed so hazardous that they are subject to controls that cover their whole of their life. These relate to controls under 6 headings:
1. Identification
These concentrate on providing information to workers, visitors to a site and in an emergency:

- Signage about the type of hazardous chemicals on site.
- Containers to be clearly labelled as to contents/hazard.
- Safety data sheets and other documentation.

2. Packaging and containment
There are regulations that govern the materials which are suitable to be used to contain particular hazardous substances, as well as the strength and integrity of the packaging and bulk containers.

3. Tracking
Certain classes of hazardous substances are required to be tracked under HSNO throughout the lifecycle of the substance. This requires systems to be created to locate and track highly hazardous substances at all points in their usage cycle – from manufacture/importation to disposal and all points in between.

Details are required of the following:
- identity of the Approved Handler
- substance information
- location of the tracked substance
- transfer to another place
- disposal of tracked substance must be recorded at each stage of its lifecycle.

4. Competency of handlers
There is a requirement for suitably skilled people to be in charge of more highly hazardous substances (see section 4.3.1.).

5. Emergency preparedness
Information and training must be provided to inform employees on how to respond to emergencies specific to the type of hazardous substances held. It is also necessary to provide equipment (including fire extinguishers) to promote effective responses to emergency situations.

6. Disposal
Systems need to be in place for the disposal of hazardous substances in such a way that they do not pose a threat to humans and/or the environment.

ADDITIONAL CONTROLS

1. Competency
Requirements for test certifiers and enforcement officers.

2. Compressed gasses
The HSNO Act is also concerned with the correct containment and management of compressed gasses. This section of the act is not concerned with the chemical structure of these gasses but rather the physical dangers of containing gasses at high pressures.

There are thus minimum requirements for the construction and design of the cylinders that contain these gasses. There is also a requirement for certification of approved fillers.

3. Fireworks
There are restrictions on the sale of fireworks to the public as well as requirements for the certification of persons in charge of pyrotechnic displays. At a retail level, fireworks may only be displayed for sale or sold beginning on the 2nd of November and ending at the close of the 5th of November each year, and only to people over 14 years of age. At any other time the retailer requires a written approval from the EPA.
4. Exempt Laboratories

This covers research and development laboratories and those involved in teaching (section 140) where there is small-scale use of hazardous substances.

4.4.3 TEST CERTIFIERS AND TYPES OF CERTIFICATION

HSNO makes provision for suitably qualified people to inspect areas where hazardous chemicals are held and specify any needed corrective action to be taken to meet HSNO requirements. These ‘Test Certifiers’ can provide a certificate of compliance once compliance is achieved.

The HSNO Act specifies the requirements for the certification of people handling certain hazardous substances as well as those filling containers. There are a range of other certification requirements.

Test Certifiers can issue:
- Approved Handler Certificates.
- Location Certificates.
- Stationary Container System Test Certificates.

... for different classes of hazardous substances, depending on their competence as assessed by the EPA. The EPA holds a register of Test Certifiers and what they can certify.

APPROVED HANDLER CERTIFICATION

Approved handler certificates are required to provide evidence of competence and experience with the handling of certain classifications and quantities of hazardous substances.

Table 3 on the next page shows the quantities of the various classes of hazardous substance that trigger approved handler requirements.

In some specific cases it is not necessary to have class 6–9 substances under the control of an approved handler if they are secured from unauthorised persons. The list of substances to which this applies can be found in the Dangerous Goods and Scheduled Toxic Substances Transfer Notice No. 35 document (available from Government bookshops) or seek advice from a Test Certifier/Hazardous Substances Enforcement Officer.

Table 3. Quantities of Hazardous Substances that trigger the requirement for an Approved Handler. (Note: some classes do not trigger this need.)

<table>
<thead>
<tr>
<th>HAZARD CLASSIFICATION</th>
<th>QUANTITIES THAT TRIGGER SPECIFIC CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1A</td>
<td>100kg (not permanent gasses); LPG any amount at a refuelling outlet</td>
</tr>
<tr>
<td>Flammable gasses</td>
<td>100m³ (permanent gasses)</td>
</tr>
<tr>
<td>2.1.2A</td>
<td>3000L aggregate</td>
</tr>
<tr>
<td>3.1A</td>
<td>Any amount (except petrol, aviation fuel and racing fuel = 100L); Farms &gt;4ha up to 2000L</td>
</tr>
<tr>
<td>Flammable Liquids</td>
<td>250L (in containers &gt;5L)</td>
</tr>
<tr>
<td>3.1B</td>
<td>500L (when in containers up to 5L inclusive)</td>
</tr>
<tr>
<td>3.2A</td>
<td>Any amount</td>
</tr>
<tr>
<td>3.2B</td>
<td>100L</td>
</tr>
<tr>
<td>4.1.1A</td>
<td>100kg – Flammable solids</td>
</tr>
<tr>
<td>4.1.2A and B</td>
<td>Any amount</td>
</tr>
<tr>
<td>4.1.2C and D</td>
<td>25kg</td>
</tr>
<tr>
<td>4.1.2E and F</td>
<td>50kg</td>
</tr>
<tr>
<td>4.1.3A</td>
<td>Any amount</td>
</tr>
<tr>
<td>4.1.3B</td>
<td>100kg</td>
</tr>
<tr>
<td>4.2A</td>
<td>Any amount</td>
</tr>
<tr>
<td>4.3B</td>
<td>100kg</td>
</tr>
<tr>
<td>Hazard classification</td>
<td>Quantities that trigger specific controls</td>
</tr>
</tbody>
</table>
HAZARD CLASSIFICATION | QUANTITIES THAT TRIGGER SPECIFIC CONTROLS
--- | ---
5.1.1B | 500kg or L
5.1.1C | 1000kg or L
5.1.2A | 250kg or 200m³
5.2A or 5.2B | Any amount
5.2C, 5.2D, 5.2E or 5.2F | 10kg or 10L
6.1A, 6.1B, 6.1C – Toxic | Any quantity
6.7A | 10kg or more (solid) 10L or more (liquid)
8.2A | Any quantity
9.1A, 9.2A, 9.3A, and 9.4A | Any quantity: Class 9 substances may be handled by a person who is not an approved handler if the substance is in sealed packaging

An approved filler is required for filling:
> industrial gas cylinders
> LPG cylinders
> self-contained underwater breathing apparatus (SCUBA)
> self-contained breathing apparatus (SCBA)
> fire extinguishers
> aerosol cylinders
> paintball cylinders
> bulk storage containers.

LOCATION TEST CERTIFICATE (INCLUDE TRANSIT DEPOT)
A location test certificate is required when you exceed the quantities stated in Tables 4 and 5.

**Table 4. Quantities of those Hazardous Substances that trigger the requirement for Location Test Certificate – Gases and Liquids.**
(Note: some classes do not trigger this need.)

<table>
<thead>
<tr>
<th>HAZARD CLASSIFICATION</th>
<th>TRIGGER QUANTITY (CLOSED CONTAINERS)</th>
<th>TRIGGER QUANTITY (IN USE, OPEN CONTAINERS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1A and B</td>
<td>100kg (100m³ permanent gasses)</td>
<td>100kg (100m³ permanent gas)</td>
</tr>
<tr>
<td>2.1.2A</td>
<td>3000L (aggregate water capacity)</td>
<td>3000L (aggregate water capacity)</td>
</tr>
<tr>
<td>3.1A</td>
<td>20L</td>
<td>20L</td>
</tr>
<tr>
<td>3.1B</td>
<td>100L in containers &gt;5L</td>
<td>50L</td>
</tr>
<tr>
<td></td>
<td>250L in containers up to &amp; including 5L</td>
<td></td>
</tr>
<tr>
<td>3.1C</td>
<td>500L in containers &gt;5L</td>
<td>250L</td>
</tr>
<tr>
<td></td>
<td>1500L in containers up to &amp; including 5L</td>
<td></td>
</tr>
<tr>
<td>3.2A, B and C</td>
<td>1L</td>
<td>1L</td>
</tr>
</tbody>
</table>

**Note:** Propellant powders of classes 1.1C (UN 0160) and 1.3C (UN 0161) need an approved handler when 50kg or more is held before sale to the public or when 15kg or more is held after sale to the public.

**APPROVED FILLERS**
Any person filling a compressed gas container with a gas must be an approved filler. They are required to be trained and to have the necessary knowledge and skills to fill a container safely. A test certifier will assess potential approved fillers for the purpose of issuing them with an approved filler test certificate. These requirements apply to all compressed gasses whether they are hazardous substances such as LPG or non-hazardous gasses such as compressed air.
Table 5. Quantities of Hazardous Substances that trigger the requirement for an Approved Handler – Solids. (Note: some classes do not trigger this need.)

<table>
<thead>
<tr>
<th>HAZARD CLASSIFICATION</th>
<th>TRIGGER QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.1A</td>
<td>1kg</td>
</tr>
<tr>
<td>4.1B</td>
<td>100kg</td>
</tr>
<tr>
<td>4.1.2A and B</td>
<td>1kg</td>
</tr>
<tr>
<td>4.1.2C and D</td>
<td>25kg</td>
</tr>
<tr>
<td>4.1.2E, F and G</td>
<td>50kg</td>
</tr>
<tr>
<td>4.1.3A, B and C</td>
<td>1kg</td>
</tr>
<tr>
<td>4.3B</td>
<td>25kg</td>
</tr>
<tr>
<td>4.3C</td>
<td>50kg</td>
</tr>
<tr>
<td>5.1.1A</td>
<td>50kg or 50L</td>
</tr>
<tr>
<td>5.1B</td>
<td>500kg or 500L</td>
</tr>
<tr>
<td>5.1C</td>
<td>1000kg or 1000L</td>
</tr>
<tr>
<td>5.1.2A</td>
<td>100kg (non-permanent gas) 200m³ (perm. gas)</td>
</tr>
<tr>
<td>5.2A, 5.2B</td>
<td>More than 10kg</td>
</tr>
<tr>
<td>5.2C or 5.2D</td>
<td>More than 25kg</td>
</tr>
<tr>
<td>5.2E or 5.2F</td>
<td>More than 100kg</td>
</tr>
</tbody>
</table>

HAZARDOUS ATMOSPHERE ZONE
Where volatile and flammable chemicals and gasses occur there are specific maps of how close a source of ignition may be located. Removal of sources of ignition may be the removal of an incandescent light bulb from the area where volatile organic chemicals are decanted or preventing vehicles from entering an area where there is a concentration of flammable gasses.

A hazardous atmosphere zone has to be established when you exceed the following thresholds listed in Table 6.

Table 6. Quantities of Hazardous Substances that trigger the requirement for plotting a Hazardous Atmosphere Zone. (Note: some classes do not trigger this need.)

<table>
<thead>
<tr>
<th>HAZARD CLASSIFICATION</th>
<th>TRIGGER QUANTITIES</th>
<th>EXAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1A, 2.1.1B</td>
<td>100kg (non-permanent gas) 300m³ (perm. gas)</td>
<td>LPG, Hydrogen</td>
</tr>
<tr>
<td>2.1.2A</td>
<td>3000L aggregate water capacity</td>
<td>Aerosols</td>
</tr>
<tr>
<td>3.1A, 3.1B, 3.1C</td>
<td>100L closed 25L decanting 5L open occasionally 1L open for continuous use</td>
<td>Petrol, acetone, methylated spirits</td>
</tr>
</tbody>
</table>

The hazardous atmosphere zone needs to be in compliance with:
> AS/NZS 2430.3; or
> AS/NZS 2439.1:1987; or a Code of Practice approved by the Authority (ERMA-now the EPA).

STATIONARY CONTAINER SYSTEM TEST CERTIFICATES
A stationary container test certificate is required in the following cases:

a. A stationary container system that includes a stationary tank intended to contain a hazardous substance if the stationary tank —
   ix. is a below ground stationary tank; or
   x. has a water capacity greater than 500 litres and is used or intended to be used to contain a gas; or
   xi. has a capacity greater than 2,500 litres and is used or intended to be used to contain a class 3.1A or class 3.1B hazardous substance (ie flammable liquid); or
xii. has a capacity greater than 5,000 litres and used or intended to be used to contain a hazardous liquid, other than a hazardous liquid that is a class 3.1A or class 3.1B hazardous substance (eg diesel class 3.1D).

b. A stationary container system that includes a process container (eg a reaction vessel or a distillation column or a dip tank) that is part of a stationary container system intended to contain a hazardous substance if the process container:
   i. is situated under ground, including ground that has been raised to provide cover for the process container; or
   ii. is covered by material other than ground; or
   iii. has a water capacity greater than 250 litres and is used, or is intended to be used, to contain a hazardous gas; or
   iv. has a capacity greater than 1,000 litres and is used or is intended to be used to contain a hazardous liquid.

c. A stationary container system that includes a vaporiser to which Schedule 8 of the Dangerous Goods Transfer Notice No. 35 applies.

d. A stationary container system attached to an oil burning installation (excluding installations at domestic premises as specified in clause 64 of the Dangerous Goods Transfer Notice No. 35).

The above legislative requirements do not apply to a stationary container system that:

a. does not have a service tank; and

b. has a capacity less than —
   v. 500 litres for class 3.1D substances (eg diesel) supplying an internal combustion engine; or
   vi. 50 litres for class 3.1A (eg petrol), 3.1B and 3.1C (kero-sene) substances supplying an internal combustion engine; or
   vii. 60 litres for class 3.1 substances supplying a burner (includes 3.1A, 3.1B, 3.1C and 3.1D).

TRACKED SUBSTANCES
Certain classes of hazardous substances must be tracked under HSNO throughout the lifecycle of the substance. Details of:

> identity of the Approved Handler
> substance information
> location of the tracked substance
> transfer to another place; and
> disposal of tracked substance must be recorded at each stage of its lifecycle.

4.4.4 SEGREGATION
Some types of chemicals are incompatible with others in that if they mixed they would combine via an undesirable chemical reaction resulting in such as a fire or explosion.

An example of such substances would be chlorine (an oxidiser) and brake fluid (flammable). In this case minimum segregation distances are stipulated. These distances can be accessed via Chemsafe, but as a rough guide they should be separated by as much distance as is practical at a particular site.

4.4.5 TRIGGER QUANTITIES
On the following pages Tables 7, 8 and 9 present information about the quantities of hazardous substances that trigger the need for:

> Signage (Tables 7).
> Fire Extinguishers (Table 8) and see section 6.1.
> Emergency Plans and Containment (Table 9) and see section 6.3.

Note that not all classes are listed in these tables because some of the classes do not trigger the need for signage, fire extinguishers or emergency plans and containment.
Table 7. Quantities of Hazardous Substances that trigger the requirement for signage (Classes 1 – 5) Some classes do not trigger this need.

<table>
<thead>
<tr>
<th>HAZARD CLASSIFICATION</th>
<th>TRIGGER QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1A</td>
<td>250kg (non-permanent gas) 100m³ (permanent gas)</td>
</tr>
<tr>
<td>2.1.1B</td>
<td>500kg (non-permanent gas) 200m³ (permanent gas)</td>
</tr>
<tr>
<td>2.1.2A</td>
<td>3000L aggregate water capacity</td>
</tr>
<tr>
<td>3.1A</td>
<td>50L liquid 50kg solid</td>
</tr>
<tr>
<td>3.1B</td>
<td>250L liquid 250kg solid</td>
</tr>
<tr>
<td>3.1C</td>
<td>1000L liquid or 1000kg solid</td>
</tr>
<tr>
<td>3.1D</td>
<td>10 000L</td>
</tr>
<tr>
<td>3.2A</td>
<td>50 L liquid 50kg solid</td>
</tr>
<tr>
<td>3.2B</td>
<td>250L liquid 250kg solid</td>
</tr>
<tr>
<td>3.2C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>4.1.1A</td>
<td>250k</td>
</tr>
<tr>
<td>4.1.1B</td>
<td>1000kg</td>
</tr>
<tr>
<td>4.1.2A, 4.1.2B</td>
<td>50L liquid 50kg solid</td>
</tr>
<tr>
<td>4.1.2C, 4.1.2D</td>
<td>250L liquid 250kg solid</td>
</tr>
<tr>
<td>4.1.2E, 4.1.2F, 4.1.2G</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>4.1.3B</td>
<td>250L liquid 250kg solid</td>
</tr>
<tr>
<td>4.1.3C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>4.2A</td>
<td>50L liquid 50kg solid</td>
</tr>
<tr>
<td>4.2B</td>
<td>250L liquid 250kg solid</td>
</tr>
<tr>
<td>4.2C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>4.3A</td>
<td>50L liquid 50kg solid</td>
</tr>
<tr>
<td>4.3B</td>
<td>250L liquid 250kg solid</td>
</tr>
<tr>
<td>4.3C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>5.1.1A</td>
<td>50L liquid 50kg solid</td>
</tr>
<tr>
<td>5.1.1B</td>
<td>500L liquid 500kg solid</td>
</tr>
<tr>
<td>5.1.1C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>5.1.2A</td>
<td>250kg (non-permanent gas) 500m³ (permanent gas)</td>
</tr>
<tr>
<td>5.2A, 5.2B</td>
<td>1L liquid 1kg solid</td>
</tr>
<tr>
<td>5.2C, 5.2D, 5.2E, 5.2F</td>
<td>10L liquid 10kg solid</td>
</tr>
<tr>
<td>6.1A</td>
<td>5kg (non-permanent gas) 2.5m³ (permanent gas) 50L liquid 50kg solid</td>
</tr>
<tr>
<td>6.1B</td>
<td>5kg (non-permanent gas) 2.5m³ (permanent gas) 250L liquid 250kg solid</td>
</tr>
<tr>
<td>6.1C</td>
<td>5kg (non-permanent gas) 2.5m³ (permanent gas) 1000L liquid 250kg solid</td>
</tr>
<tr>
<td>6.1D</td>
<td>10 000L liquid 10 000kg solid</td>
</tr>
<tr>
<td>8.1A</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>8.2A</td>
<td>5kg (non-permanent gas) 2.5m³ (permanent gas) 50L liquid 50kg solid</td>
</tr>
<tr>
<td>8.2B</td>
<td>50kg (non-permanent gas) 25m³ (permanent gas) 250L liquid 250kg solid</td>
</tr>
<tr>
<td>8.2C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>8.3A</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>9.1A</td>
<td>100L liquid 100kg solid</td>
</tr>
<tr>
<td>9.1B, 9.1C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>9.1D</td>
<td>10 000L liquid 10 000kg solid</td>
</tr>
<tr>
<td>9.2A</td>
<td>100L liquid 100kg solid</td>
</tr>
<tr>
<td>9.2B, 9.2C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>9.2D</td>
<td>10 000L liquid 10 000kg solid</td>
</tr>
<tr>
<td>9.3A</td>
<td>100L liquid 100kg solid</td>
</tr>
<tr>
<td>9.3B</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>9.3C</td>
<td>10 000L liquid 10 000kg solid</td>
</tr>
<tr>
<td>9.4A</td>
<td>100L liquid 100kg solid</td>
</tr>
<tr>
<td>9.4B, 9.4C</td>
<td>1000L liquid 1000kg solid</td>
</tr>
</tbody>
</table>
Examples of signage used for the different classes

<table>
<thead>
<tr>
<th>Class 1: Explosives</th>
<th>Class 2: Flammable Eg LPG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 3: Flammable Eg Petrol</td>
<td>Class 4: Flammable Solid Eg Sodium</td>
</tr>
<tr>
<td>Class 5: Oxidising Eg Hydrogen Peroxide</td>
<td>Class 6: Toxic Substance Eg Cyanide. 1080</td>
</tr>
<tr>
<td>Class 8: Corrosive Eg Acids and alkalis</td>
<td>Class 9: Ecotoxic Tributyl tin oxide</td>
</tr>
</tbody>
</table>

### Table 8. Quantities of Hazardous Substances that trigger the requirement for Fire Extinguishers

<table>
<thead>
<tr>
<th>HAZARD CLASSIFICATION</th>
<th>QUANTITY</th>
<th>NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1A</td>
<td>50kg (non-permanent gas) 30m² (perm. gas)</td>
<td>1</td>
</tr>
<tr>
<td>2.1.1B</td>
<td>200kg (non-permanent gas) 120m³ (perm. gas)</td>
<td>2</td>
</tr>
<tr>
<td>2.1.2A</td>
<td>3000L aggregate water capacity</td>
<td>1</td>
</tr>
<tr>
<td>3.1A</td>
<td>50L 200L</td>
<td>1 2</td>
</tr>
<tr>
<td>3.1B</td>
<td>250L</td>
<td>2</td>
</tr>
<tr>
<td>3.1C, 3.1D</td>
<td>500L</td>
<td>2</td>
</tr>
<tr>
<td>3.2A, 3.2B, 3.2C</td>
<td>50L</td>
<td>1 2</td>
</tr>
<tr>
<td>4.1.1A</td>
<td>250kg</td>
<td>2</td>
</tr>
<tr>
<td>4.1.1B</td>
<td>500kg</td>
<td>2</td>
</tr>
<tr>
<td>4.1.2A 4.1.2B, 4.1.2C, 4.1.2D, 4.1.2E, 4.1.2F, 4.1.2G</td>
<td>50L liquid 50kg solid; 200L liquid 200kg solid</td>
<td>1 2</td>
</tr>
<tr>
<td>4.1.3A, 4.1.3B, 4.1.3C</td>
<td>50L liquid 50kg solid; 200L liquid 200kg solid</td>
<td>1 2</td>
</tr>
<tr>
<td>4.2A</td>
<td>50L liquid 50kg solid; 200L liquid 200kg solid</td>
<td>1</td>
</tr>
<tr>
<td>4.2B</td>
<td>250kg</td>
<td>2</td>
</tr>
<tr>
<td>4.2C</td>
<td>500kg</td>
<td>2</td>
</tr>
<tr>
<td>4.3A</td>
<td>50L liquid 50kg solid; 200L liquid 200kg solid</td>
<td>1 2</td>
</tr>
<tr>
<td>4.3B</td>
<td>250L liquid 250kg solid</td>
<td>2</td>
</tr>
<tr>
<td>4.3C</td>
<td>500L liquid 500kg solid</td>
<td>2</td>
</tr>
<tr>
<td>5.1.1A</td>
<td>5L liquid 5kg solid</td>
<td>1</td>
</tr>
<tr>
<td>5.1.1B</td>
<td>200L liquid 200kg solid</td>
<td>1</td>
</tr>
<tr>
<td>5.1.1C</td>
<td>500L liquid 500kg solid</td>
<td>2</td>
</tr>
<tr>
<td>HAZARD CLASSIFICATION</td>
<td>QUANTITY</td>
<td>NO.</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------</td>
<td>-----</td>
</tr>
<tr>
<td>5.1.2A</td>
<td>10kg (non-permanent gas) 10m³ (perm. gas) 50kg (non-permanent gas) 50m³ (perm. gas)</td>
<td>1</td>
</tr>
<tr>
<td>5.2A, 5.2B</td>
<td>1L liquid 1kg solid</td>
<td>1</td>
</tr>
<tr>
<td>5.2C, 5.2D</td>
<td>10L liquid 10kg solid</td>
<td>1</td>
</tr>
<tr>
<td>5.2E, 5.2F</td>
<td>50L liquid 50kg solid</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 9. Quantities of Hazardous Substances that trigger the requirement for Emergency Response Plans and Secondary Containment

<table>
<thead>
<tr>
<th>HAZARD CLASSIFICATION</th>
<th>TRIGGER QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1A</td>
<td>300kg (non-permanent gas) 200m³ (perm. gas)</td>
</tr>
<tr>
<td>2.1.1B</td>
<td>1000kg (non-permanent gas) 600m³ (perm. gas)</td>
</tr>
<tr>
<td>2.1.2A</td>
<td>3000L aggregate water</td>
</tr>
<tr>
<td>3.1A</td>
<td>100L</td>
</tr>
<tr>
<td>3.1B</td>
<td>1000L</td>
</tr>
<tr>
<td>3.1C, 3.1D</td>
<td>10 000L</td>
</tr>
<tr>
<td>3.2A, 3.2B, 3.2C</td>
<td>100L</td>
</tr>
<tr>
<td>4.1.1A</td>
<td>1000kg</td>
</tr>
<tr>
<td>4.1.1B</td>
<td>10 000kg</td>
</tr>
<tr>
<td>4.1.2A, 4.1.2B</td>
<td>50L liquid 50kg solid</td>
</tr>
<tr>
<td>4.1.2C, 4.1.2D</td>
<td>100L liquid 100kg solid</td>
</tr>
<tr>
<td>4.1.2E, 4.1.2F, 4.1.2G</td>
<td>200L liquid 200kg solid</td>
</tr>
<tr>
<td>4.1.3A, 4.1.3B, 4.1.3C</td>
<td>100L liquid 100kg solid</td>
</tr>
<tr>
<td>4.2A</td>
<td>100L liquid 100kg solid</td>
</tr>
<tr>
<td>4.2B</td>
<td>1000kg solid</td>
</tr>
<tr>
<td>4.2C</td>
<td>10 000kg solid</td>
</tr>
<tr>
<td>4.3A</td>
<td>100L liquid 100kg solid</td>
</tr>
<tr>
<td>4.3B</td>
<td>1000L liquid 1000kg solid</td>
</tr>
<tr>
<td>4.3C</td>
<td>10 000L liquid 10 000kg solid</td>
</tr>
<tr>
<td>5.1.1A</td>
<td>50L liquid 50kg solid</td>
</tr>
</tbody>
</table>

4.4.5 GROUP STANDARDS

Group standards are approvals for a group of hazardous substances of a similar nature, type or use.

A group standard sets out the conditions that enable a group of hazardous substances to be managed safely. Most domestic and workplace chemicals (except for pesticides, veterinary medicines, timber treatment chemicals and vertebrate toxic agents) are approved under group standards. See:

www.epa.govt.nz/hazardous-substances/approvals/group-standards/Pages/default.aspx
GROUP STANDARDS

> Additives, process chemicals and raw materials
> Aerosols
> Animal nutritional and animal care products
> Class 4 substances
> Cleaning products
> Compressed gas mixtures
> Construction products
> Corrosion inhibitors
> Cosmetic products
> Denatured ethanol
> Dental products
> Embalming products
> Fertilisers
> Fire fighting chemicals
> Food additives and fragrances
> Fuel additives
> Graphic materials
> Laboratory chemicals and reagent kits
> Leather and textile products
> Lubricants
> Metal industry products
> Not Otherwise Specified (N.O.S.) substances
> Oxidising substances (class 5.1.1) and organic peroxides (class 5.2)
> Pharmaceutical active ingredients
> Photographic chemicals
> Polymers
> Refining catalysts
> Solvents
> Surface coatings and colourants
> Water treatment chemicals

Note: If a product has one or more of the following hazard classifications, then it will not fit within the scope of any group standard. Contact the EPA for further advice.

> class 1 (explosives)
> 3.1A (extremely flammable liquids)
> all class 3.2 (liquid desensitised explosives)
> all class 4.1.2 (self reactive substances), and 4.1.3 (desensitised explosive)
> 4.2A (pyrophoric substances)
> 4.3A (release flammable gas on contact with water)
> 5.1.1A, 5.1.2A, 5.2A (extremely oxidising)
> 6.1A (acutely toxic)
> 8.2A (highly corrosive).

4.5 RESOURCES

All the documents in this section are available on the Intranet. (Hold down the CTRL key and click on each one to access the document in question.)

ASSESSMENTS AND CHECKLISTS

A number of HSNO Checklists are available for assessing the situations listed below. They may be found on the Intranet at:

intranet/workgroups/workplace/news/wpsprojecttools/pages/projecttools.aspx

> Agricultural
> Automotive Spray Painters
> Farm Visits
> Fibre Reinforced Plastics
> Fire Extinguishers
> Forestry
> HSNO Hazardous Substances Register
> Hydrocarbon Refrigerants
> Location Certificate Inspection Checklist – Regulation 81
> LPG
> LPG Compliance
> Nail Bars
> Products Manufacturing
TC – Tests – Regulation 81
TC – Tests – Regulation 83
TC – Tests – Regulations 98 to 100
TC – Tests – regulations 120 to 122
Transit Depots
Sawmills
Secondary Containment
Service Stations
Signage Check-sheet
Site-plans
Spray painting
Water Treatment

HAZARD ALERTS OR HAZARD MANAGEMENT BULLETINS FOR SELECTED TOPICS

- Jun 2011 – Misuse of Intermediate Bulk Containers (IBCs) (re-issue)
- Jun 2010 – Cool store hydrocarbon refrigerant injures technician
- Apr 2010 – Employee overfills LPG cylinder (re-issue)
- Apr 2010 – Misuse of Diesel Results in Severe Burns (re-issue)
- Feb 2010 – Explosion at Fish and Chip Cafe
- Feb 2010 – LPG Portable Outdoor Heater

MISCELLANEOUS INFORMATION

- 2011 – Earthquake Fact Sheet: Earthquake Highlights Stacking and Shelving Hazards
- 2011 – Earthquake Fact sheet: Hazardous Substances
- 2010 – Formaldehyde WES Information sheet
- 2010 – Benzene WES information sheet

### 4.6 A LIST OF COMMON TOXIC SUBSTANCES USED BY INDUSTRY

Where the sub class is 6.9A or 6.9B the primary target organ(s) affected by each solvent are also listed.

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>CLASSIFICATION</th>
<th>PRIMARY TARGET ORGAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>3.1B, 6.1D, 6.3A, 6.4A, 6.8B, 6.9B, 9.1D, 9.3C</td>
<td>Central nervous system</td>
</tr>
<tr>
<td>Xylene</td>
<td>3.1C, 6.1D, 6.3A, 6.4A, 6.8B, 6.9B, 9.1D, 9.3C</td>
<td>Central nervous system</td>
</tr>
<tr>
<td>Hexane</td>
<td>3.1B, 6.1E, 6.3B, 6.4A, 6.9A, 9.1B</td>
<td>Central nervous system</td>
</tr>
<tr>
<td>Ethylene Glycol</td>
<td>6.1D, 6.4A, 6.9A, 9.3C</td>
<td>Renal toxicity (kidney)</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>3.1B, 6.1E, 6.4A, 6.9B</td>
<td>Numerous (incl. blood, brain, liver, thyroid, adrenal gland)</td>
</tr>
<tr>
<td>Dimethyl formamide (DMF)</td>
<td>3.1C, 6.1D, 6.3B, 6.4A, 6.8A, 6.9A, 9.3C</td>
<td>Liver</td>
</tr>
</tbody>
</table>

### 4.7 KEY DEFINITIONS

Aggregate water capacity means the aggregate or cumulative total volume of one or more containers, calculated as the equivalent volume of water at 20°C and at 101.3kPa. Data includes values that are directly measured, calculated, or estimated for any of the measures given Gas a substance that:

- is completely gaseous at 20°C and at 101.3kPa absolute pressure, or
- has a vapour pressure of more than 300 kPa absolute pressure at 50°C.
**Liquid** – a substance with a melting point of less than or equal to 20°C at 101.3 kPa absolute pressure, or a viscous substance, without a defined melting point (additional criteria apply).

**Permanent gas** – a gas that has a critical temperature at or below 0°C. The critical temperature is the temperature above which the gas cannot be liquefied by increasing the pressure.

**Solid** – a substance that is neither a liquid nor a gas.

### 4.8 SPECIAL NOTES

#### 4.8.1 FIRE EXTINGUISHERS

Table 8, taken from Schedule 3 of the Hazardous Substances (Emergency Management) Regulations (HSEMR) lists the trigger quantities for Fire Extinguishers. The highest number should be selected if two or more quantities trigger the requirement.

Fire extinguishers must be within 30 metres of the substance. This may require a greater number of extinguishers than specified.

The capability of the fire extinguisher required is set out in AS/NZS 1850: 1997 Portable Fire Extinguishers – classification, rating and performance testing. An extinguisher with a performance rating of 30 and classification B should meet the performance standard.

Fire extinguisher requirements to not apply in areas like unattended dispensing of petrol etc or an LPG facility.

#### 4.8.2 SITE PLANS AND DRAWINGS

A site plan is required whenever a hazardous substance location is to be established.

The site plan must show the physical position relative to legal boundaries of:

> All hazardous substances locations in classes 2, 3, 4 or 5.
> All hazardous atmosphere zones if classes 2 or 3.
> All controlled zones.

The site plan must be of a scale that can show the required detail (1:100 or 1:200 is suggested.)

The site plan could comprise a scaled drawing, a sketch or an aerial photograph, with all important dimensions being marked. It should A4 or larger in size.

More than one site plan may be needed to present all the required detail.

It should be kept up to date.

#### 4.8.3 EMERGENCY RESPONSE PLANS

Schedule 4 of the HSEMR shows trigger quantities of flammables and oxidisers that require an emergency response plan (ERP). See Table 9 above.

If one is needed, a single ERP is required and must identify all likely emergencies that will occur.

The Emergency Response Plan must:

> Describe what to do in an emergency:
  > Warn people at the site and surrounding areas; advising them.
  > What to do to protect themselves.
  > Help treat any injured person.
  > Contain the emergency as soon as possible.
  > Re-establish control.

> Identify who is responsible for these actions, including:
  > How to contact the person.
  > Any skills the person needs.
  > Any actions the person is expected to take.
> Specify
- How to obtain information about hazardous properties of the substances involved.
- How to contact any emergency providers.
- The purpose and location of any equipment or material to manage the emergency.
- How to decide which actions to take.
- The sequence actions should be taken in.

AVAILABILITY OF THE ERP
It must be available to:
> Be available to any person identified in the plan with any responsibility of some sort.
> Be available to every emergency attender.

EQUIPMENT AND MATERIALS
The ERP must:
> Specify the type and location of any additional fire fighting equipment, emergency equipment and materials, if any are specified in the plan.
> Provide for the retention of any liquid or liquefied oxidizing substance or organic peroxide and prevent it coming into contact with any incompatible substance.

TESTING THE PLAN
An ERP must:
> Be tested once every 12 months or within 3 months of any change to the plan.
> Records of tests must be kept for 2 years.
> Every procedure must be shown to be workable.
> Records could include:
  - the date of the test
  - elements of plan subject to test.
> Outcomes – such as – competencies of people – effectiveness of the procedures – items requiring corrective action.
APPENDICES

IN THIS SECTION:
5.1 References
5.2 Glossary
REFERENCES

ELECTRICAL SAFETY
Electrical Safety Hazards Awareness Training Module. EFCOG Electrical Safety Improvement Project. Los Alamos National Laboratory. Los Alamos.

HUMAN ERROR


HEALTH AND SAFETY AS PART OF NORMAL MANAGEMENT.

SEATED WORK

VALUES
## GLOSSARY

<table>
<thead>
<tr>
<th>TERM</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEGAL TERMS</strong></td>
<td></td>
</tr>
<tr>
<td>ACOP</td>
<td>Approved Code of Practice</td>
</tr>
<tr>
<td>APS</td>
<td>All Practicable Steps</td>
</tr>
<tr>
<td>ERA</td>
<td>Employment Relations Act</td>
</tr>
<tr>
<td>HSE</td>
<td>Health and Safety in Employment Act</td>
</tr>
<tr>
<td>HSEMR</td>
<td>Hazardous Substances (Emergency Management) Regulations.</td>
</tr>
<tr>
<td>HSNO</td>
<td>Hazardous Substances and New Organisms Act</td>
</tr>
<tr>
<td>PECPR</td>
<td>Pressure Equipment, Cranes and Passenger Ropeways Regulations</td>
</tr>
<tr>
<td><strong>TECHNICAL AND SCIENTIFIC TERMS</strong></td>
<td></td>
</tr>
<tr>
<td>ALBP</td>
<td>Acute Low Back Pain</td>
</tr>
<tr>
<td>µMol/L</td>
<td>micro moles per litre (A measure of the concentration of a substance measured in blood or urine.)</td>
</tr>
<tr>
<td>BEI</td>
<td>Biological Exposure Index (A measure of how much of a substance is allowable in the human body.)</td>
</tr>
<tr>
<td>CCA</td>
<td>Copper Chrome Arsenic (A method of preserving timber.)</td>
</tr>
<tr>
<td>dB</td>
<td>Decibel (A measure of noise loudness.)</td>
</tr>
<tr>
<td>HAVS</td>
<td>Hand Arm Vibration Syndrome</td>
</tr>
<tr>
<td>LEL</td>
<td>Lower Explosive Limit</td>
</tr>
<tr>
<td>LEV</td>
<td>Local Exhaust Ventilation</td>
</tr>
<tr>
<td>LOSP</td>
<td>Light Organic Solvent (A method of preserving timber.)</td>
</tr>
<tr>
<td>NIHL</td>
<td>Noise Induced Hearing Loss</td>
</tr>
<tr>
<td>PID</td>
<td>Photometric Ionisation Detector</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>PPM</td>
<td>Parts per Million (A measure, usually, of how much of a substance is in an air sample.)</td>
</tr>
<tr>
<td>SAR</td>
<td>Supplied Air Respirator</td>
</tr>
<tr>
<td>SBI</td>
<td>Serious Back Injury</td>
</tr>
<tr>
<td>SCBA</td>
<td>Self Contained Breathing Apparatus</td>
</tr>
<tr>
<td>TBTO</td>
<td>Tri-butyl Tin Oxide. (A method of preserving timber.)</td>
</tr>
<tr>
<td><strong>ORGANISATIONS</strong></td>
<td></td>
</tr>
<tr>
<td>ACC</td>
<td>Accident Compensation and Rehabilitation Corporation</td>
</tr>
<tr>
<td>AS</td>
<td>Australian Standards (Organisation)</td>
</tr>
<tr>
<td>AS/NZS</td>
<td>Joint Australia New Zealand Standard</td>
</tr>
<tr>
<td>DHB</td>
<td>District Health Board</td>
</tr>
<tr>
<td>EAP</td>
<td>Employee Assistance Programme. (This term is used generically, but there is a company called by this name.)</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency (Used to be called ERMA)</td>
</tr>
<tr>
<td>ERMA</td>
<td>Environmental Risk Management Agency</td>
</tr>
<tr>
<td>HSE</td>
<td>Health and Safety Executive (UK)</td>
</tr>
<tr>
<td>NIOSH</td>
<td>National Institute for Occupational Safety and Health (A research organisation in the USA)</td>
</tr>
<tr>
<td>NRL</td>
<td>National Radiation Laboratory (NZ)</td>
</tr>
<tr>
<td>NZS</td>
<td>New Zealand Standards (Organisation)</td>
</tr>
<tr>
<td>WES</td>
<td>Workplace Exposure Standard</td>
</tr>
<tr>
<td><strong>MISCELLANEOUS</strong></td>
<td></td>
</tr>
<tr>
<td>DMP</td>
<td>Departmental Medical Practitioner</td>
</tr>
<tr>
<td>APR</td>
<td>Air Purifying Respirator</td>
</tr>
<tr>
<td>HSTLC</td>
<td>Hazardous Substances Technical Liaison Committee. (Usually formed when there is a chemical emergency for its duration.)</td>
</tr>
<tr>
<td>NODS</td>
<td>Notification of Occupational Disease System</td>
</tr>
<tr>
<td>NZECP</td>
<td>New Zealand Electrical Code of Practice.</td>
</tr>
</tbody>
</table>
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