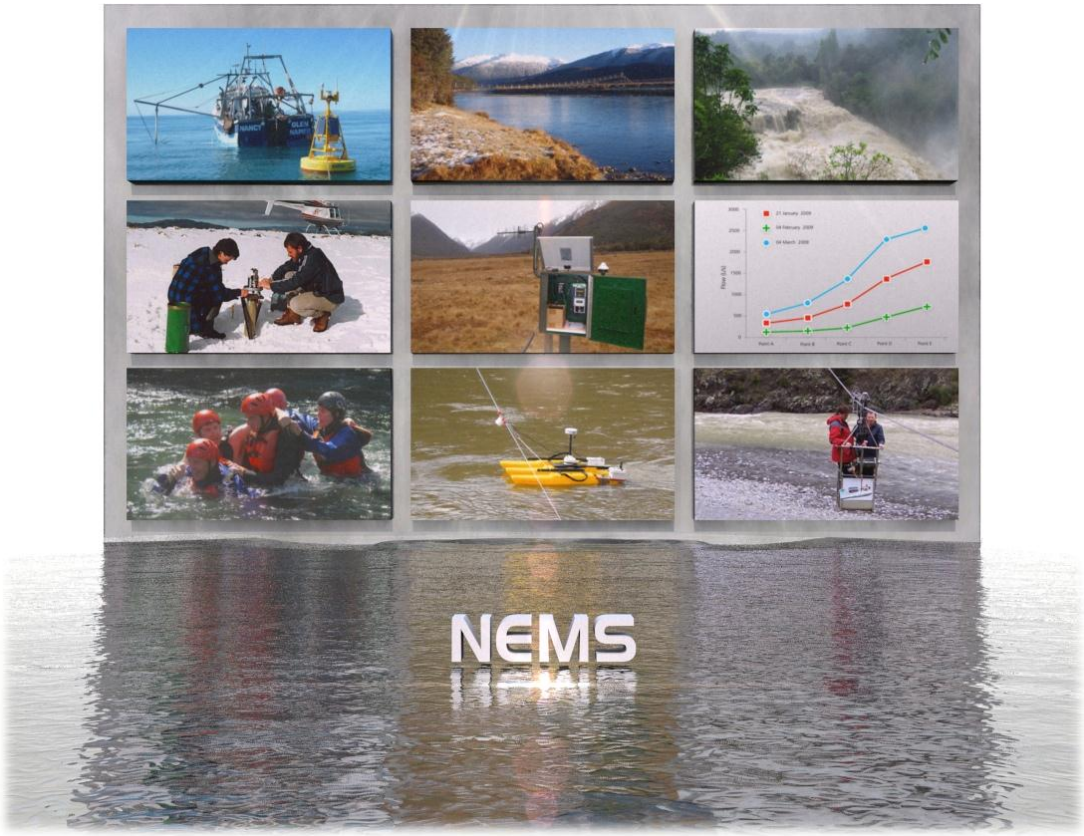
National Environmental Monitoring Standards

Safe Acquisition of Field Data in and Around Fresh Water

Code of Practice

Version: 1.1

Date of Issue: June 2013



NEMS Standards Documents

The following standards can be found at www.landandwater.co.nz.

- National Quality Coding Schema
- Safe Acquisition of Field Data In and Around Fresh Water
  Code of Practice
- Dissolved Oxygen Recording
  Measurement, Processing and Archiving of Dissolved Oxygen Data
- Open Channel Flow Measurement
  Measurement, Processing and Archiving of Open Channel Flow Data
- Rainfall Recording
  Measurement, Processing and Archiving of Rainfall Intensity Data
- Soil Water Measurement
  Measurement, Processing and Archiving of Soil Water Content Data
- Turbidity Recording
  Measurement, Processing and Archiving of Turbidity Data.
- Water Level Recording
  Measurement, Processing and Archiving of Water Level Data
- Water Meter Data
  Acquisition of Electronic Data from Water Meters for Water Resource Management
- Water Temperature Recording
  Measurement, Processing and Archiving of Water Temperature Data

Limitations

It is assumed that as a minimum the reader of these documents has undertaken industry based training and has a basic understanding of environmental monitoring techniques. Instructions for manufacturer specific instrumentation and methodologies are not included in this document.

The information contained in these NEMS documents relies upon material and data derived from a number of third party sources.

The documents do not relieve the user (or a person on whose behalf it is used) of any obligation or duty that might arise under any legislation, and any regulations and rules under those acts, covering the activities to which this document has been or is to be applied.

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Neither NEMS, nor any employee or agent of the Crown, nor any author of or contributor to this document shall be responsible or liable for any loss, damage, personal injury or death howsoever caused.

When implementing these standards, the following act, regulations and code of practice shall be complied with:

- Health and Safety in Employment Act 1992
- Health and Safety in Employment Regulations 1995
- NEMS Safe Acquisition of Field Data In and Around Fresh Water, Code of Practice 2012

National Environmental Monitoring Standards (NEMS)

The National Environmental Monitoring Standards steering group (NEMS) has prepared a series of environmental monitoring standards on authority from the Regional Chief Executive Officers (RCEO) and the Ministry for the Environment (MFE). The strategy that led to the development of these standards was established by Jeff Watson (Chairman) and Rob Christie (Project Director). The implementation of the strategy has been overseen by a steering group consisting of Jeff Watson, Rob Christie, Jochen Schmidt, Martin Doyle, Phil White, Mike Ede, Glenn Ellery, Eddie Stead, Lian Potter, Lucy Baker and David Payne.

The development of this code of practice involved consultation with regional and unitary councils across New Zealand, electricity generation industry representatives and the National Institute for Water and Atmospheric Research Ltd (NIWA). These agencies are responsible for the majority of hydrological and continuous environmental related measurements within New Zealand. It is recommended that these standards are adopted throughout New Zealand and all data collected be processed and quality coded appropriately. The degree of rigour in which the standard is applied, will depend on the quality of data sought.

This document has been prepared by the Local Authorities Environmental Monitoring Group (LAEMG) to help provide consistency in the application of work practices specific to environmental monitoring and data collection across New Zealand. The input of NEMS members into the development of this document is gratefully acknowledged; in particular the review undertaken by the NEMS Steering Group and non-technical editing by writer Chris Heath of Heath Research Services.

Funding

The project was funded by the following organisations:

- Auckland Council
- Bay of Plenty Regional Council
- Contact Energy
- Environment Canterbury Regional Council
- Environment Southland
- Genesis Energy
- Greater Wellington Regional Council
- Hawke's Bay Regional Council
- Horizons Regional Council
- Marlborough District Council
- Meridian Energy
- Mighty River Power
- Ministry for the Environment
- Ministry of Business, Innovation & Employment – Science & Innovation Group
- National Institute of Water and Atmospheric Research Ltd (NIWA)
- Northland Regional Council
- Otago Regional Council
- Taranaki Regional Council
- Tasman District Council
- West Coast Regional Council
- Waikato Regional Council

Review

This document will be reviewed by the NEMS steering group in February 2014, and thereafter once every two years.

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About this Code of Practice

Background

This 'Safe Working Code of Practice for Acquisition of Field Data In and Around Fresh Water' has been developed by the Local Authority Environmental Monitoring Group (LAEMG) at the request of the Resource Management Group (RMG).

It is recognised that a range of Standard Operating Procedures (SOP) are held by individual authorities and that these procedures often cover regional and site variance.

Purpose

The purpose of the code of practice is to help provide common working procedures for environmental monitoring of natural fresh water resources across New Zealand.

Application

Where no in-house standard operating procedures exist, this code of practice will be the guide by default.

Where new standard operating procedures are created or existing standard operating procedures revised, this code of practice will be the guide by default.

NEMS recommend that this code of practice be adopted throughout New Zealand.

Scope

The scope of the code of practice covers all common work processes that would be expected whilst engaging in:

- hydrology field work, and
- water quality sampling from non-urban rivers, streams estuaries and beaches.

Exclusions

This code is not fully inclusive. Self-awareness, personal responsibility and safe procedures training are prerequisites to this code of practice. Risk identification and mitigation is a continual process and risk will vary with operational procedures and geographical conditions. The document must be considered as a work in progress as monitoring techniques change, or are developed.

Note: A request for suggested additions and changes will be submitted to LAEMG members on a yearly basis and the document updated as appropriate.

It is not the intention of this code of practice to cover all risks involved in fieldwork both in and around water. It sets some general guidance that should be used in conjunction with training and specific risk identification at the place of work.

Under any of the following conditions, in-house Standard Operating Procedures will supersede this document:

- Specific risk assessment has occurred for an activity or location
- Specialised training has been provided
- Suitable prior experience exists at a certain location
  A prior experience and training identification procedure should be used to identify personnel as 'fit for site'.

This document does not attempt to cover emergency planning. In-house Standard Operating Procedures shall detail organisational specific emergency planning procedures.

1 Health & Safety

This code of practice (COP) has been prepared with particular regard to the Health and Safety in Employment Act 1992 which makes provision for securing the health and safety and welfare of persons at work and for protecting other persons against risks arising from the activities of those at work. Recommendations are made for common safety precautions and procedures that should be observed in the collection of field data in New Zealand, in or near to inland water and estuaries.

1.1 Responsibilities

1.1.1 Employer

Employers shall act in accordance with their obligations including but not limited to the Health and Safety in Employment (HSE) Act 1992, Health and Safety in Employment (HSE) Regulations 1995, their subsequent amendments and any associated legislation, regulations, codes of practice and best industry safe operating procedures with regard to health and safety of their employees and the working environment.

1.1.2 Employee

It is the responsibility of every individual to make themselves thoroughly familiar with, and to observe the safety instructions and rules pertaining to any work that they may have to supervise, direct or undertake. They shall always work in such a manner as to ensure safety to themselves, their workmates, the general public and their employer's property.

Employees must guard themselves against the creation of dangerous situations, and observe safe practices.

1.1.3 Contractor

The term 'contractor' refers to a contractor or a sub-contractor engaged by a principal to perform work on site.

A contractor is not an employee of the company engaging the contractor. A contractor is engaged in a 'contract for service' rather than a 'contract of service'.

Principal refers to the agent engaging a contractor as defined in S.18 of the HSE Act.

The principal has overall responsibility for the safety of all contractor/subcontractors and their staff.

The principal must ensure that the contractor either works in accordance with the principal's health and safety plan or provides and works in accordance with a suitable alternative approved by the principal.

1.1.4 Field Staff

Field staff carrying out data collection should have regard to this code of practice. It should be used in conjunction with a scheduled training programme and a well thought out health and safety plan that covers specific risk identification and mitigation.

1.1.4.1 Fieldwork

Fieldwork must not be undertaken where unreasonable risk exists or can be predicted.

Fieldwork shall be stopped immediately on identification of an unidentified or unplanned hazard until the level of risk has been deemed acceptable by the relevant authority.

Note: Fieldwork encompasses a variety of tasks which often need to be carried out in potentially hazardous conditions and locations. Often the field worker will be unaccompanied and the guiding principle in these circumstances should be to exercise proper care and to avoid risks.

A field worker should always approach his or her work:

- having received suitable training to do so
- with knowledge of the basic rules of safety, and
- with a personal awareness of their depth of experience in relation to the surrounding physical environment.

1.2 Planning Your Departure

Good planning of your field excursion is a prerequisite to:

- identifying the potential hazards that may exist at a site, and
- developing risk mitigation strategies.

Good planning will also help identify the personal protective equipment you will need in the field. Planning should include checking:

- the availability of a responsible person to hold your trip and estimated time of arrival details
- site Hazard ID Forms and/or Hazard Register for each site you intend to visit
- the short and long term weather forecast
- river conditions and rainfall (forecasted and actual) in and around the catchment
- for any planned releases from hydroelectric power schemes or other river control schemes/devices
- equipment that is beyond its recommended safe working life, is replaced.

All items should be checked prior to leaving base to ensure that the user is confident in their use and that they are in a satisfactory condition and good working order. Where applicable, all equipment used should conform to the appropriate New Zealand/Australian standard.

1.2.1 Planning Remote Works

When planning for works either of short or long duration in areas of limited access and/or limited communications, the following contingencies should be considered where appropriate:

- A works plan and intended travel details
- A dedicated contact made responsible for checking your safe arrival according to your schedule
- List of persons/other organisations that may require the schedule
- Personal tracking equipment and a personal locator beacon (PLB)
- Satellite phone or radio telephone
- A weather forecast for the period of the works
- Tide tables where required
- Survival equipment

1.2.2 Planning for Afterhours Work and for Work in Inclement Weather

Fieldwork should never be undertaken alone where poor visibility combined with inclement weather can create hazardous conditions.

When planning for works, either after hours or during inclement weather, the following contingencies should be considered where appropriate:

- A dependable powerful hand-torch
- Spare batteries
- Personal tracking device

- Personal locator beacon

Fatigue can add unacceptable risk when conducting long periods of work at night and/or in poor weather. When planning to avoid fatigue in your work, consideration should be given to working in pairs and/or shift work.

1.2.3 Planning Site Access

Agreements, informal or formal should exist with relevant landowners at most sites where fieldwork is conducted. Contact with landowners should be made to ensure access arrangements are kept up-to-date and that access is provided with heed to the Health and Safety in Employment Act.

The following actions should be carried out at sites that are visited infrequently:

- Provide adequate notice of your visit to all relevant parties.
- Ensure advice or instructions from appropriate property/landowners concerning safety, security, exclusion or access to restricted areas is followed.
- Do not enter areas containing potentially dangerous animals.
- Do not park vehicles or store equipment, or operate equipment where it is likely to cause a hazard or a nuisance to the owner/occupant or other persons on site.

1.2.4 Personal Protective Equipment

Field Staff must ensure that they are equipped for safe working in the field. As a minimum the following equipment should be used as conditions dictate.

- Reflective over jacket
- Hard hat
- Waterproof jacket, trousers and hood or warm hat
- Protective toe capped boots
- Neoprene waders and wader belt (only waders with positive buoyancy when full of water shall be used)
- Personal flotation device
- A change of clothing suitable for conditions and towel
- Protective gloves
- Protective glasses/sunglasses/goggles
- Sun block

Contingency planning should be adopted and items added to this list where necessary.

1.2.5 Field Safety Equipment

All members of the field team shall have ready access to the following equipment in the field.

- Communication equipment
- Maps
- First aid kit (Checked and In Date)
- Torch and spare batteries
- Throwbag
- Survival kit (as required, depending on the area of operation)

The survival kit may include a:

- thermal blanket
- whistle
- compass
- dried food, and
- a personal communication device.

1.2.6 Work Specific Safety Equipment

All members of the field team should have ready access to the following work specific equipment at their place of work.

- Personal Locator Beacon (PLB)
- Electronic Tracking Device
- Climbing ropes, harness and associated equipment (checked and in date)
- Calibrated Gas Detector
- Traffic-Warning Signs

All staff shall be trained in the use of work specific safety equipment.

1.2.7 Safe Handling of Field Gear

The handling, operation, maintenance and repair of specialised field gear often require specialised training. Manufacturer's instructions shall be followed.

Note: Types of equipment used by field teams include:

- *Explosive power tools*
- *Electric fishing gear*
- *Compressors*
- *Gas cylinders*
- *Lighting*
- *Generators*
- *Climbing ropes, harness and associated equipment (checked and in date)*
- *Power-hand tools (drills, abrasive wheels, cutters).*

Where relevant, personnel must undertake appropriate training before using equipment.

All mains/generator-powered equipment shall be electrically certified as per regulations.

1.2.8 Hazardous Substances

All hazardous substances shall be assessed under the Hazardous Substances and New Organisms Act 1996.

Personnel shall be trained in safe handling, together with the use of protective clothing and other specialist equipment.

1.3 Planning Your Return

1.3.1 Itinerary Notification

Prior to embarking on any field work, a field work itinerary shall be left with a colleague or posted at a designated site identifying at the least:

- the location where the field work is being conducted
- the time of departure and expected return.

A routine but flexible reporting in procedure at the end of the working day shall be developed.

1.3.2 Communications & Reporting

Fieldwork may often involve working in remote locations where conventional communication may not be possible, conditions may suddenly change and work may extend past the envisaged date.

Prior thought should be given to the communications available at the worksite and realistic / practicable arrangements made for reporting in.

1.3.2.1 Deviations

Any planned or unavoidable deviation from the reporting in arrangements should be communicated to your appointed colleague or office as soon as practically possible.

The appointed 'reporting in' colleague shall assume responsibility for ensuring that missed 'reporting in' as scheduled is investigated to resolution.

Any unexplained failure of staff returning to their office or home should also be followed up to resolution.

1.3.2.2 Contact Details

Field staff managers shall hold their direct reports home contact / next of kin details. The field staff's family, household or nominee should hold the names of the field staff's managers.

Any unplanned or non-notified deviation of the reporting in schedule should be alerted at the office and appropriate effective action be taken.

1.4 Health Care, First Aid And Reporting Accidents

1.4.1 Natural Watercourses or Polluted Water

Precautions shall be taken prior to entering natural watercourses or polluted water.

1.4.1.1 Risk Assessment

A site specific risk assessment should be completed to identify and mitigate risks prior to entry into polluted water.

1.4.1.2 Disinfecting

Special care shall be exercised when working in watercourses.

Hands and arms should be washed thoroughly in an approved disinfectant fluid after each operation that requires contact with water in a natural watercourse.

1.4.1.3 Vaccination

Employers shall ensure personnel working in or near water seek advice from a medical practitioner on the requirements for vaccination.

Persons required to work in polluted water shall be appropriately vaccinated, wear suitable protective clothing to avoid contact with water and avoid ingesting water.

It is strongly recommended that all personnel be vaccinated against poliomyelitis, Hepatitis A and B and take a course of anti-tetanus injections and subsequent boosters in accordance with medical advice.

Personnel shall be made aware of the risk of leptospiral jaundice (Well's disease) which can be contracted by contact with polluted river water

1.4.1.4 Swallowing Polluted Water

Personnel swallowing water or sustaining cuts while working in polluted watercourses shall seek medical advice in a timely manner.

1.4.2 Lifting-Related Injuries and Exhaustion

Fieldwork often involves the transportation of heavy equipment by hand to remote locations. The following precautions shall be observed.

- Plan for assistance if required.
  Consider the size, weight and shape of the load and the distance to be covered.
- Know your limits.
  Avoid heavy lifting that could cause injury.
- Take regular rests if over long distances.
- Ensure regular hydration and seek rests in the shade if possible.

1.4.3 Alcohol, Drugs and Medical Conditions

No person shall travel or undertake any tasks if they have reason to suspect that their judgement or performance may be adversely affected as a result of a medical condition, taking alcohol/drugs or because they are under medical treatment involving drugs likely to impair physical or mental capacity.

It is strongly advised that the consumption of alcohol is restricted up to 12 hours preceding any fieldwork in or near water.

1.4.4 First Aid

Fully equipped first aid kits should be placed in secure locations readily accessible to all staff both in the field and the office. Any items used should be replaced as soon as practically possible.

An itemised list of required contents shall be provided with each kit and checked against the contents periodically. Missing, damaged or out-of-date items shall be replaced.

All personnel should receive formal certified first aid training equal or equivalent to the St John's Basic First Aid course. Certification shall be kept up to date with a First Aid Refresher course undertaken every two years.

1.4.5 Reporting Near Misses and Accidents

The circumstances and details of any near misses or accidents involving injury or suspected injury shall be reported to a responsible superior at the earliest opportunity.

Records of near misses shall be documented according to organisational health and safety procedures.

1.5 Safety Training

Fieldwork, which can often be located on deep and/or fast flowing water and/or often sited away from well frequented roads or centres of habitation, necessitates special care as well as an awareness at all times of the hazards that can be encountered. Conditions can be particularly hazardous by reason of flood, darkness or adverse weather conditions.

Safety training for working in and around water is a co-requisite to this code of practice. The ability to assess potential hazards whilst working in and around water increases with experience.

Fieldwork in and around water can include the following tasks:

- Travel to and from sites
  Difficult and/or remote access and the carriage of heavy gear may require consideration.
- Site setup and maintenance
  This may involve the servicing and replacement of electronic instruments, fitting of gas bottles and other equipment (including winches and cableways).
- Logger data retrieval and replacement
- Stilling-well intake and gas orifice clearance
- Gauge readings and datum survey
- Stilling-well inspections and intake clearance
- Gas bottle and battery changes
- Inspection and cleaning of weirs
- Flow measurements
- Water quality sampling
- Ecological monitoring and sampling
- Water quality sonde installation and maintenance
- Electric fishing
- River channel survey
- Bank trimming and channel clearance
- Working from heights.

Special care should be taken whenever working near or approaching the water's edge.

1.5.1 Training Competencies

The following general competencies shall be addressed as a minimum for training of staff working in and around water:

- Understanding river hydraulics
  For example: standing waves, eddy lines, holes, sieves.
- Avoidance of foot entrapment and being swept against or under an obstacle
- Safety equipment use
  For example: Throw bag use, personal flotation device, helmet.
- Personal protective equipment, and dressing for the water temperature
- Wader safety
  Thigh and chest if appropriate.
- What to do if swept off your feet
  For example: white water swimming, self rescue & assisted rescue.
- River crossing technique
- First Aid & CPR
  Hypothermia prevention and care.
- Assessment of bank stability, and entry and exit points from river
- Assessment of velocity, depth & bed condition from river bank
- Assessment of downstream hazards should a swim occur
- Awareness of personal capability of what can be safely waded
- Consideration of environmental factors
  Weather conditions (extreme heat or cold), day/night, rising/falling river levels.
- Working around flooded rivers
  For example: Use a personal flotation device on banks. Assess bank stability. Be prepared to stay out overnight with sufficient food & water.

1.6 Watercourse Entry

Entry into or on a watercourse shall not be undertaken unless hazards have been assessed and personnel are properly equipped for the purpose.

Procedures for the following tasks shall be dealt with separately:

- Cableway Servicing
- Weir Cleaning
- Current Meter Gauging
- Gauging from Boats
- Working from Heights
- Electric Fishing

There are certain hazards and necessary precautions that are common to almost all work relating to data collection in the field.

1.6.1 Safety Provisions

1.6.1.1 Personal Flotation Devices and Accompanied / Non-Accompanied Work

The main recommendations relating to the use of personal flotation devices and working with or without other people are summarised in Table 1:

Table 1 – Recommended Safety Provisions for Work in Watercourses

Surface Velocity (m/s)	Depth				
	Shin	Knee	Mid Thigh	Full Thigh	Over Groin
> 1.0	Single manning	Single manning with personal floatation device	Double manning with personal floatation device	Double manning with personal floatation device and throw bag	Double manning with personal floatation device and throw bag
1.0 to 0.5	Single manning	Single manning. Personal flotation device is discretionary	Double manning with personal floatation device	Double manning with personal floatation device and throw bag	Double manning with personal floatation device and throw bag
< 0.5	Single manning	Single manning	Single manning with personal floatation device	Single manning with personal floatation device	Single manning with personal floatation device

***Note**: These provisions are applicable only to able-bodied persons in normal daylight, good visibility and firm bed conditions.*

The recommendations listed in Table 1 shall only be used as a guide by staff trained in the use of personal flotation devices. It is important for staff to develop individual wading capability awareness.

Identifying potential risks prior to or during working in or near water requires:

- in the first instance specific training (See 'Training Competencies' on Page 11), and then
- the continual education of staff to help increase their personal awareness to site specific risks.

1.6.2 Personal Flotation Devices

Personal flotation devices are designed for a variety of different purposes and due care should be taken when selecting the correct type of personal flotation device for the job at hand.

A proactive and conservative approach should always be taken when considering when and when not to wear a personal flotation device.

1.6.2.1 When to Wear

A personal flotation device shall be worn where there is risk of:

- falling
- being carried into deep or swift flowing water, or
- where swimming or wading ability is impaired.

The personal flotation device shall be worn as the outermost garment.

When working from a boat a correctly sized, serviceable personal flotation device shall be worn at all times.

The personal flotation device shall meet NZ Standard 5823:2005 or other standard that is accepted by Maritime NZ.

1.6.2.2 Discretionary Use

The use of personal flotation devices is discretionary if work entails entry into a section where the bed conditions are firm and regular and where the velocity is less than 0.5 m/s with a maximum depth of 0.5 m.

Note: See Table 1 (Page 12) for recommended usage of personal flotation devices in deeper/higher flow conditions.

1.6.3 Accompanied / Un-Accompanied Work

Careful consideration shall be given to Table 1 (Page 12) for single handed and accompanied fieldwork. If any doubt exists as to the prevailing conditions and personal ability to enter water single handed, then single handed wading shall not be attempted.

Regardless of the surface velocity, a personal flotation device should be worn at all times when wading in depths greater than knee deep.

No wading measurements should be attempted in fog or reduced visibility (both banks out of sight).

1.6.4 Beaches, Estuaries and Weirs

1.6.4.1 Swell, Tides and Wave Heights

Prior to sampling from beaches and in estuaries, weather conditions, swell, tides and wave heights should be determined.

1.6.4.2 Communication Devices

Hand held radios stored in a waterproof bag must be used for communication between teams if working at a distance greater than 100m apart.

1.6.4.3 Life Jackets

All staff must wear life jackets at all times:

- when entering water, or
- where a risk of accidental or unintentional entry to water exists whilst sampling around beaches and estuaries.

1.6.4.4 Waders

Waders shall not be used in areas likely to be affected by large waves, currents and tides.

1.6.5 Weir Cleaning and Weed Clearance

Risks associated with weir cleaning and weed clearance shall be considered by field personnel prior to works commencing.

The degree of risk associated with such activities can depend on a range of variables. The senior member of the field team shall carefully consider the following variables:

- Can the work be undertaken:
  - safely
  - single-handed (alone)
  - with two or more personnel, or
  - only by a fully equipped specialist contractor.
- Depth, turbidity and velocity of water
- Stability of channel bed
- Type and height of structure
- State of banks
- Existence of upstream release structures
- Extent of weed growth
- Downstream hydraulics (e.g. a recirculating hole) and hazards (e.g. wood debris that may act as a sieve).

Note: This list of variables is not a complete list. Other variables may require research and consideration.

Weir crest cleaning should be undertaken from stable structures such as bank, footbridge or walkway.

Double manning is recommended where the weir crest is in deep or fast flowing water.

1.6.5.1 Flotation Devices

As recommended in Table 1 (Page 12), personal flotation devices shall be worn.

Any weir maintenance work with a drop of greater than one meter shall be double manned.

1.7 Working Around Recreational and/or Commercial Traffic

Careful consideration shall be given to working in navigable waterways. Some may be too hazardous to be attempted. Closure of navigable waterways may be possible for short periods of time with the appropriate permissions from the Harbour Master. The field team shall comply fully with all the Harbour Master's requirements and regulations.

1.7.1.1 Other Persons

Where relevant (other persons are using the waterways, and the erection of a tag-line is required) local boating clubs and the harbour masters shall be contacted and alerted to the type and extent of fieldwork that is to take place in navigable waterways.

Note: Signs may be placed on boat ramps to further inform river users of fieldwork activities where appropriate.

1.7.1.2 High Visibility Clothing & Vessel Detection

Any persons entering the water shall have high visibility/reflective clothing visible above the water line

1.7.1.3 Vessels

Any persons entering the water shall be continually alert for the detection of vessels under way.

1.7.1.4 Warning Signage

Warning signs shall be posted upstream and downstream at distances of not less than 150m from the section or the most appropriate location.

Red flags or other warning signs shall be placed on the boat.

Any tag line shall be able to be released quickly (quick release mechanism) and wound in to the bank. A flag or reflector device shall be placed on the tag line.

1.7.1.5 Spotter

A spotter shall be placed on the river bank where:

- any river traffic travelling up or down the river can be identified
- communication with the field team in the boat can be maintained should appropriate action need be taken. Loud hailers may be required.

The spotter shall alert moving vessels (by way of loudhailer or flagging) of any fieldworkers and/or equipment in the water.

2 Equipment Operation and Maintenance

2.1.1 In this Section

This section contains information that relates more specifically to the safe operation and maintenance of equipment that is used in the acquisition of field data in and around fresh water.

2.2 Vehicles

2.2.1 Minimum Driver Requirements

Many hazards exist through the course of driving. Field staff can spend large periods of time on and off road.

The risk of injury can be reduced by:

- careful planning
- driver training
- vehicle maintenance, and
- defensive driving.

Drivers as a minimum shall:

- hold a current drivers licence
- abide by the NZ Road Code
- ensure the vehicle holds a current warrant of fitness
- ensure that the vehicle is serviced regularly
- be competent in the operation of the vehicle they are driving
  For 4WD vehicles this includes both on and off road use.
- check as far as practicable that the vehicle is safe prior to driving
- not attempt to carry an excessive load in any vehicle
  The vehicle driver is responsible for ensuring that loads are secured and do not present a hazard to occupants or other road users.
- ensure the vehicle is equipped with appropriate and suitably maintained fire extinguishers
- ensure the combined vehicle and trailer weight are not exceeded
- ensure that a cargo barrier is fitted where there is a risk of equipment becoming dislodged in the event of an accident
- not drive whilst under the influence of alcohol or other drugs
- not drive when tired, and
- adhere to rules and regulations whilst driving through or in controlled sites.
  Radios with set channels are often required whilst passing through areas influenced by logging operations.

2.2.2 Fording Rivers

2.2.2.1 All Vehicles

Rivers shall not be forded unless absolutely necessary. If in doubt, do not cross.

2.2.2.2 Four-Wheel Drives

Four wheel drive vehicles should not be driven through flowing rivers where water is any deeper that 2/3 of the way up the tyre.

The depth of the river and firmness of the bed should be checked before crossing.

Crossing should be made if practicable, diagonally to the flow of the river.

All staff required to drive four wheel drive vehicles shall receive appropriate training.

Note: Training courses that offer Unit Standards 17976, 17978 and 20848 provide a means of validating this competency.

Passengers should not be carried on an 'All Terrain Vehicle' (ATV) unless it has been specifically designed for this purpose.

2.2.2.3 Quad Bikes & Off-Road Bikes

In the event that a quad or off-road bike is required, the user:

- shall be properly trained in its use, and
- wear a helmet, gloves and appropriate footwear at all times.

Note: Unit Standards 24558 and 24561 (if using trailed equipment) are available for assessing ATV competency.

2.2.3 Public Safety

Fieldwork can be of particular interest to the general public and as such the field team will need to have regard to not only to their own safety but the safety of other persons.

2.2.4 Areas Accessible to the Public

Data collection can involve operating from bridges, stop banks, car parks, footpaths and the side of highways and roads. Often areas close to rivers are popular with recreational activity.

Consideration shall be given to:

- parking on the highway
- working at night
- obstructions caused by parking, and
- parking in dangerous areas.

2.2.4.1 Parking on a Highway or Road

If parking on the highway is legally permissible, all activities will be undertaken in accordance with the NZTA Code of Practice for Temporary Traffic Management.

All vehicles shall be equipped with appropriate warning signs.

Where appropriate, warning signs shall be positioned, and hazard-warning lights shall be switched on.

2.2.4.2 Obstructions Caused by Parking

Safely park vehicles off roads and highways so as not to cause an obstruction.

2.2.5 Working at Night

When working at night, the presence of vehicles and/or equipment should be well advertised to traffic and pedestrians by adequate lighting and undertaken in accordance with the Transit Code of Practice for Temporary Traffic Management.

2.2.6 Parking in Dangerous Areas

Safely park vehicles away from unstable riverbanks or areas likely to suffer sudden inundation.

Note: Care and attention should ensure that parking does not cause a hazard, obstruction or nuisance. Where doubt exists advice should be sought from NZTA or the appropriate local roading authority.

2.3 Helicopters

There are a number of risks present when working with helicopters. The pilot is a certified professional and as such is in command of the helicopter and all subsequent risks involved with the flying operation.

2.3.1 Mitigating Risks

However, there are a number of practices that can be implemented when working with helicopters in order to reduce or mitigate your risks.

- Prior to flying, pay attention to the pilot's safety brief.
- Do not approach or leave the helicopter without consent from the pilot.
  Ensure the pilot is aware whilst departing and approaching the helicopter.
  If the helicopter is idling, approach from the front or side where you can be seen by the pilot. Please note that a frontal approach cannot be undertaken with some helicopters. In this instance, seek clarification from the pilot during the safety brief.
- The aircraft shall be loaded under the supervision of the pilot.
- Notify the pilot of an hazardous cargoes such as fuel or batteries.
- Do not walk around the rear of the helicopter.
  DANGER! The tail rotor and hot exhaust will cause death or serious injury if contact is made.
- Always be aware of the distance from the ground to the main rotor when in the vicinity of the helicopter.
- Watch for undulating or sloping ground that can reduce the clearance to the rotors.
- Whilst the rotors are turning, do not carry any long or loose items whilst approaching or leaving the helicopter.
- Wear appropriate secure clothing. Do not wear hats or scarves.
- Do not rush around the aircraft.
- Always wear a seatbelt.
- Be prepared in the event the helicopter is grounded at a remote location. Ensure a grab bag with basic survival equipment is accessible.

Always have a pre-arranged means of communicating with the helicopter in case you are left at site.

2.4 Recorder Housing

Where practicable, recorder housing shall be kept in a tidy well-ordered manner.

Doorways shall be kept clear.

External doors shall be fitted with retaining hooks or hardware that:

- enables the doors to be held open, or
- prevents the doors from accidentally entrapping field staff.

2.5 Stilling Wells

The operation and maintenance of stilling wells may involve working in confined spaces and/or working from heights.

Hazard ID forms shall identify these sites and detail the required mitigation action.

2.5.1 Confined Spaces

Most stilling wells will meet the AS 2865:1995 description of a Confined Space and require special precautions to be put in place, such a securing a safe atmosphere.

A risk assessment shall be carried out by a competent person before work begins.

All tasks involving entry into stilling wells shall be double manned by staff with appropriate confined space training.

2.5.2 Working From Heights

If a well is more than 3 meters in depth, the person entering the well shall be trained in Industrial Height Rescue.

A means of personnel recovery must be installed if well entry is required.

2.5.3 Lighting

Wells shall be illuminated.

2.5.3.1 Mains Powered Lighting & Equipment

Mains powered lighting or equipment shall not be used where there is any possibility of the light source touching the water.

2.5.4 Ladders

Ladders shall be properly secured.

2.5.5 Safety Helmets

Safety helmets shall be worn at all times.

2.6 Slacklines

2.6.1 Single-Handed (Working Alone)

2.6.1.1 Normal Conditions

Properly equipped and maintained slack line setups can be manned single handed in normal conditions.

Particular care should be taken to avoid entanglement of hands, hair or loose clothing.

2.6.2 Double-Manned (Accompanied)

2.6.2.1 Flood Conditions

Slack lines shall be double-manned under flood conditions.

Where rivers are rapidly rising, personnel should ensure that, if faced with the risk of being cut off, they are able to move to safe ground. When working in these conditions the field staff shall identify how they may extract themselves from the site if river levels rapidly rise.

2.6.2.2 Poor Visibility / Severe Weather

In poor visibility or severe weather conditions, any gauging should be double manned (minimum).

2.6.3 Gauging Hazards

Slack line gauging hazards can exist but are not limited to the operation of winches, the handling of heavy weights and working with and around steel cables under tension.

2.6.3.1 Inspections

A visual inspection of the cableway structure shall be undertaken prior to use. Initially the winch should be operated without the sinker weight and a check carried out on the condition of the suspension, traversing cables and associated connections.

If any risk is detected of cableway malfunction or failure, the reason will be identified and repairs should be undertaken by an appropriately experienced person prior to use.

2.6.3.2 Common Risks of Slackline Gauging

All field staff shall give careful consideration to the following risk of injury:

- Injury to fingers, hands, hair or clothing in the gear train
- Heavy lifting of sinker weights
- Equipment failure such as drum brakes, cable or other component
- Sudden release of winding handles
- Failure to secure equipment after use
- Foreign bodies such as wire fragments falling into eyes.

2.6.4 Special Precautions for River Traffic

Cables and submerged equipment are a risk to river users. Where river traffic is likely to be encountered, gauging staff should have clear vision upstream and downstream in order to be able to take appropriate action.

A lookout should be placed in an appropriate location to warn the team of any approach of craft.

As an additional precaution, warning flags should be placed on any tag line and both banks to bring attention to the activity. All tag lines used in areas subject to traffic require a quick release system to be fitted. Where a collision appears likely and depending on the urgency and the approaching craft, the equipment should be reeled in, lowered, or cut.

The craft shall be warned by loud hailer and signalling. It is recommended that the harbour master, applicable commercial operators and jet boat clubs be contacted prior to working in areas of river where speed restrictions have been lifted above 5 knots.

2.7 Manned Cableways

2.7.1 Double-Manning

Cable car installations shall be operated double-manned. Consideration should be given to having a third team member who is:

- stationed on the bank in communication with the gauging team, and
- equipped to act effectively in the event of an emergency.

2.7.2 Flotation Devices

Consideration should be given to wearing personal flotation devices.

2.7.3 Long Hair & Loose Closing

Any long hair or loose articles of clothing shall be secured to avoid entanglement with cableway wheels.

2.7.4 Cable Cars

2.7.4.1 Cable Handling

Cable car occupants shall not handle the cable.

2.7.4.2 Brakes & Puller Handle Stops

All cable cars should be fitted with brakes. Puller handle stops should also be fitted.

Note: Puller handle stops prevent the crushing of hands between the puller and the cable car frame.

2.7.4.3 Essential Equipment

All essential equipment shall be attached by lanyards to the cable car frame.

2.7.4.4 Certification

A valid certificate certifying the cableway safe and fit for use issued by an appropriately qualified engineer is required prior to use.

The cableway must not be used if this certificate is not sighted or is out of date.

Measures must be taken to secure the cableway from use if certification has been revoked or is out of date.

The cableway must always be secured from any use by any parties not authorised or trained to do so.

2.7.4.5 Inspect Before Use

A visual inspection shall be conducted of the cableway and cable car prior to use. The inspection should identify any obvious / visually identifiable defects that may endanger life or pose risk of injury.

2.7.4.6 Servicing

All structures, including cable cars, cables, towers, ladders and platforms should be inspected by a qualified structural engineer, with special attention being given to the condition of steel components. All cableways should have a valid certification.

Only appropriately trained and qualified personnel shall service, tension or rig cables.

When servicing, rigging or tensioning cables, a safety helmet, protective eyewear and protective gloves shall be worn.

2.7.4.7 Maximum Load

The maximum load the cableway is certified to take should not be exceeded. The maximum load includes personnel and all associated equipment to be taken on the cableway along with the additional breaking strain on the cable. The instrument cable shall be fitted with a weak link pin or other suitable low breaking strain connection.

2.7.5 Cableway Towers

2.7.5.1 Earthing

Metal towers should be electrically earthed against lightning strikes.

2.7.5.2 Winches

Winches should be fitted to cableway towers where appropriate for raising and lowering equipment.

2.7.5.3 Fall Arrest Equipment & Training

Where an individual is required to climb a cableway tower, fall arrest equipment is required, and the individual must be trained in its use. Industrial fall arrest training is adequate to meet this requirement.

Fall prevention measures are legally required if you:

- risk a fall in excess of 3 m, or
- risk a fall from any height that could result in harm.

This should be identified and mitigation planned during a site specific job safety analysis.

2.7.5.4 Spotter - Fouling of Equipment

One member of the team shall be detailed to maintain watch upstream for any floating or submerged debris likely to tangle the instrument cable.

2.7.5.5 Cable Cutter

A suitable cable cutting tool shall be carried in the cable car at all times.

If the cable becomes snagged above the weak link connection and if the car cannot be manoeuvred into quiet water, the gauging cable should be cut immediately.

Remember that the cableway is only designed for a certified weight.

DANGER! Floating or Submerged Flotsam.
Immediately assess any snagging of flotsam and if any doubt exists cut the cable without hesitation. To avoid a recoil hazard when cutting, ensure that you stand at 90 degrees to

the direction that the cable is being pulled. Snagging floating or submerged flotsam when travelling at velocity can instantly endanger the lives of the team in the cable car if the weak link connection fails.

2.8 Bridge Gauging

A number of risks are associated with working from bridges, for example:

- Equipment is often heavy or physically cumbersome.
- There is a risk of accident and injury to third parties that requires consideration.
- Hazards associated with vehicular traffic are present.

If it is necessary to obstruct part of the path or roadway that is used by road traffic, the New Zealand Transport Authority Code of Practice for Temporary Traffic Management (COP/TTM) should be applied by a certified Traffic Controller.

Traffic management plans shall be a requirement for priority gauging bridges. A certified traffic controller is required to administer the traffic management plan.

Work from bridges shall be conducted by a minimum of two persons where any of the following conditions apply:

- A crane, trolley or sinker weight of 23 kg (50 lbs) or greater is required.
- The bridge carries vehicular traffic and work obstructs the road or pavement.
- River traffic is considered likely.
- Visibility is severely reduced.
- There is a flood events.
- There is a likelihood of equipment being snagged on debris.

During flood events bridge stability may be compromised. Field staff must not access any structure where doubt exists as to its integrity.

2.8.1 Spotter

At sections subject to river traffic, one team member should be stationed as a lookout to give clear warning to any approaching craft and to ensure that appropriate action (e.g. reeling in) is taken in time if there is a risk of collision with the suspended equipment.

The spotter should be positioned upstream or downstream as appropriate to cover the gauging technician's blind direction.

The gauging technician shall not straddle any safety barrier nor occupy the riverside of the safety barrier unless the gauging technician:

- is secured with a harness and safety line, and
- has had appropriate Industrial Fall Arrest training.

Personnel must not sit on, lean or stand on the gauging A frame.

2.8.2 Fouling of Equipment

In the event of suspended equipment becoming entangled with a floating object:

- do not attempt to rescue the equipment, and
- do not attempt to prevent damage to the equipment.

Wire cutters shall be carried at all times during flood gauging.

2.8.3 Bridges without Guard Rails

Any persons involved with working from bridges that do not have parapets or guard rails shall:

- have had appropriate Industrial Fall Arrest training, and
- be equipped with a harness and safety line secured to an anchor point.

The length of the safety line shall:

- minimise the fall distance, and
- prevent the wearer falling to below maximum expected water level.

2.8.4 Rail Bridges

Fieldwork will not be attempted from railway bridges unless prior permission is granted from the appropriate authorities. Any specific rules and requirements shall be followed.

2.9 Electric Fishing

2.9.1 Certification

Correct and current certification is required for the use of an electro fishing backpack or generator.

Certification should be refreshed after three years to ensure practices are up to date.

2.9.2 Site Safety Assessment

The most senior person in the field is responsible for assessing the safety of the site.

2.9.3 CPR

At least two field team members and the most senior person on site must be trained in CPR.

2.9.4 Personal Protective Equipment

Chest or thigh waders and gloves must be worn when operating the electro fishing gear.

2.9.5 Servicing

Backpack electro fishers must be serviced regularly to ensure safe operation of the equipment. They must be fitted with an emergency switch (dead man's switch) and a tilt switch.

2.9.6 Nets & Other Equipment

Nets and other equipment must have wooden, fibreglass (or other non conductive material) handles.

2.9.7 Weather & River Conditions

Electro fishing should not be carried out in bad weather conditions (rain, snow, low visibility) and should never be done in a non-wadeable river unless using a boat. General considerations as set out in 'Section 1 – Health & Safety' shall apply.

2.10 Powered Boats

The requirements (below) apply to working in inland waterways, rivers, estuaries and lakes.

Boats (used for field work) shall not be used within 500 m upstream of a weir, sluice, waterfall or rapids unless special safety measures (e.g. downstream stop cable, rescue vessel) have been provided.

2.10.1 Responsibility

One member shall be assigned to the tasks of skippering the boat and that person should have no other function. The skipper is a certified professional and as such is in command of the boat and all subsequent risks involved with the boating operation. The skipper must comply with all maritime rules. This includes ensuring that basic boat safety equipment requirements are provided.

2.10.2 Certification

The skipper or person in charge of powered boats shall meet Maritime NZ (MNZ) requirements which include the 'Boat Operator Permit' scheme (Permit to Operate Vessels). A permit to operate is usually issued by the appointed harbourmaster or relieving harbourmaster. Regional requirements for obtaining a permit to operate may differ across New Zealand and site specific clarification of these requirements should be obtained well in advance of the proposed activity. All powered boats used for fieldwork must have a valid Safe Ship Management Certificate issued by providers that are approved by Maritime NZ.

2.10.3 Planning

Preliminary planning is essential. The skipper shall be fully briefed as to the type of fieldwork to be conducted and shall ensure the boat is fit for purpose. The skipper shall be responsible for assessing weather conditions, tides and any other factors that may influence the safety of the work at hand. The viability of the work is solely at the skipper's digression.

2.10.4 Boat Condition

The boat shall be fully serviceable for the conditions under which it is to be used (prescribed in the Boat Operators Permit and boat survey documentation). The vessel should be large enough to provide sufficient working space for the crew and for the safe and effective operation of the work at hand.

2.10.5 Crew

Crew members should be able to swim.

When on board a boat, crew members:

- shall wear personal flotation devices fitted with a whistle at all times, and
- shall not wear chest waders on board the boat.

No fieldwork by boat should be attempted single-handed (alone).

2.10.5.1 Grab Bag

All crew must be shown the location of a grab bag.

The grab bag shall:

- be located on the boat to allow instant emergency access, and
- contain as a minimum, a secondary communication device and a personal locator beacon (PLB).

2.10.5.2 Short Term Immersion

Survival suits should be worn when working in any water body where short-term immersion in the water could cause the onset of hypothermia.

2.10.5.3 Deploying or Retrieving Equipment

Special attention should be given to the lateral stability of the vessel when deploying or retrieving equipment over the side of the boat.

If a sinker weight in excess of 14 kg (30 lbs) is to be used, the boat should be fitted with a properly secured boom and gauging winch and attention given to the stability of the boat. This equipment should be assessed and certified appropriate for the vessel it is attached to under the Safe Ship Management certificate.

2.10.6 Additional Information

For additional information refer to the appropriate Health and Safety guidelines on the Maritime New Zealand website: http://www.maritimenz.govt.nz/

Relevant regulations include:

- Maritime Transport Act 1994
- Navigation Safety Bylaws

2.10.7 Field Work by Boat Under Flood Conditions

Field work under flood conditions with non-powered boats shall not be attempted where debris is likely to endanger the stability of the boat and/or the surface velocity would make passage upstream difficult by rowing or paddling.

2.11 Kayaks

2.11.1 Enclosed Kayaks

Enclosed kayaks are not addressed in this document.

2.11.2 Sit-On Kayaks

Kayaking may be suitable for up to Grade 1 river sections.

Kayak gauging sites and flow ranges shall be identified by a person who has appropriate assessed kayaking experience and an understanding of gauging techniques. Personnel shall obtain knowledge of approved sites, approved flow ranges, and historical conditions at sites that may pose risks.

Note: Grade 1 white water is defined as: fast moving with riffles and small waves; there are few obstructions, all obstructions easily avoided with little need for training; risk to swimmers is slight; self-rescue is easy.

Kayaks shall only be used:

- within 200 m of a lake or sea shore, and
- in calm water and weather conditions.

A job safety form identifying all potential risks and appropriate risk mitigation procedures shall be completed prior to work progressing.

To use a sit-on (non-enclosed) Kayak, the following shall apply:

- Formal training is a requirement.
- A second person shall be on standby at site.
  Both personnel should have communications with each other.
- Two forms of communication and a 30m throwbag shall be readily available
- Personal flotation devices and a tethered paddle shall be used at all times.
- Personnel shall:
  - be competent swimmers
  - competent in the use of Kayaks
  - wear a kayak helmet
  - wear a wetsuit
    The wetsuit shall be of sufficient design for the conditions of use. Where conditions may pose a risk of heat stress or discomfort whilst in a wetsuit, both the paddler and second person shall wear footwear and clothing that will allow swimming, and be appropriate for prolonged immersion having regard for the current water temperature.

Annex A – List of Referenced Documents

Transit NZ Code of Practice for Temporary Traffic Management

Health and Safety in Employment Act, No 96 (1992).

Health and Safety in Employment Regulations, SR 1995/167 (1995).

Hazardous Substances and New Organisms Act, No 30 (1996).

Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations, SR 1999/128 (1999).

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Occupational Safety and Health Service. (2007). A guide to safety with chainsaws. Retrieved from http://www.osh.govt.nz/order/catalogue/31.shtml

Occupational Safety and Health Service. (2009). Approved code of practice for cranes. Retrieved from http://www.osh.govt.nz/order/catalogue/pdf/cranes-acop-2009.pdf

Occupational Safety and Health Service. (2009). First aid for workplaces: A good practice guide. Retrieved from http://www.osh.govt.nz/order/catalogue/pdf/first-aid-2009.pdf

Fish and Wildlife Service Occupational Safety and Health Occupational Safety and Health Part 241 Safety Operations Chapter 6 Electrofishing 241 FW 6

Relevant OSH Administered Statutes

- Dangerous Goods Act 1974
- Explosives Act 1957
- Health and Safety in Employment Act 1992
- Machinery Act 1950

Relevant OSH Administered Regulations

- First aid for workplaces – A good practice guide (Sep 2009)
- The Health and Safety in Employment Regulations 1995 (Apply to all workplaces)
- The HSE (Prescribed Matters) Regulations 2003
- Pressure Equipment, Cranes, and Passenger Ropeways Regulations 1999

Relevant OSH Codes of Practice

- Cranes
- Excavations and Shafts
- Forest Operations
- Passenger Ropeways
- Tree Work Pt 3 – River and Stream Operations
- Planning and Entry into Confined Space
- Manual Handling
- Management of Substances hazardous to Health (MOSHH) in the Place of Work
- Managing noise in the Workplace

Safe Use Guides

The following guides are worth reading as they cover the hazards of activities we undertake and provide a good practical in planning and safe use.

- Safe use of ATV's
- Safe Diving Rules (Department of Conservation)
- Guidelines for Working in Hot and Cold Conditions and in Mountains
- A Guide to Safety with Chainsaws
- Control Guide – Management of Noise at Work
- Managing Substances Harmful to health (MOSHH) – An Employers Guide
- Working Safely with Hazardous Substances (MOSHH) – Advice for Employees
- Guidelines for the Provision of Facilities and General safety in Commercial and Industrial Premises
- Safe Work at Heights
- A Guide to the Health and Safety Employment Act 1992
- Safe Working in Confined Space NZS/AS 2865


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