

Approved code of practice for cranes

**INCLUDES THE DESIGN, MANUFACTURE, SUPPLY,
SAFE OPERATION, MAINTENANCE AND INSPECTION
OF CRANES**

 **A GUIDE FOR WORKPLACES**



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NOTICE OF ISSUE

I have issued this *Approved code of practice for cranes*, being a statement of preferred work practices or arrangements, for the purpose of ensuring the health and safety of persons to whom this code applies and persons who may be affected by the activities covered by this code.

James Buwalda
Secretary of Labour

FOREWORD

I have approved this statement of preferred work practices, which is an *Approved code of practice for cranes*, under section 20 of the Health and Safety in Employment Act 1992. When a code is approved, a Court may have regard to it in relation to compliance with the relevant sections of the Health and Safety in Employment Act. This means that, if an employer in an industry or using a process to which an approved code applies can show compliance with that code in all matters it covers, a Court may consider this to be compliance with the provisions of the Act to which the code relates.

Hon. Ruth Dyson
Minister of Labour

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A SUMMARY OF THE HEALTH AND SAFETY IN EMPLOYMENT ACT 1992

The object of the Health and Safety in Employment Act 1992 (the Act) is to prevent harm to all people at work and people in, or in the vicinity of, a place of work. To do this, the Act:

- promotes excellence in health and safety management
- defines harm and hazards in a comprehensive way
- imposes duties on those who are responsible for work, or do work
- sets requirements that relate to taking all practicable steps to ensure health and safety, and that are flexible to cover different circumstances
- encourages employee participation in health and safety management and that the process is conducted in good faith by all those involved.

The Act creates duties for most people connected with places of work including:

- employers
- employees (including trainees and people gaining work experience and volunteers)
- the self-employed
- principals to contracts
- persons who control a place of work
- hirers, sellers and suppliers of plant.

Regulations

Regulations are promulgated from time to time under the Act. Regulations may, among other things, impose duties on employers, employees, designers, manufacturers and others relating to health and safety. These regulations may apply with respect to places of work, plant, processes or substances and may deal with particular problems that have arisen.

The Health and Safety in Employment Regulations 1995 require the provision of facilities such as toilets, meal rooms, first aid, and for employees to wash, and the provision of wholesome and sufficient drinking water. The regulations also set a range of general health and safety and welfare requirements in addition to the Act, including:

- restricting children and young people from certain hazardous work and times of work
- requiring certification of workers using some hazardous equipment
- requiring notification of particular types of hazardous work, including forestry and construction

- creating duties for the designers, manufacturers and suppliers of plant and protective clothing and equipment.

The Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 describe a system of design verification and inspection to maintain the integrity of hazardous equipment (refer to part 2).

Approved codes of practice

Approved codes of practice are provided for in the Act. They are statements of preferred work practice or arrangements, and may include procedures which could be taken into account when deciding on the practicable steps to be taken. Compliance with codes of practice is not mandatory. However, compliance with an approved code of practice may be used in Court as evidence of good practice and an employer or other duty holder having taken “all practicable steps” to meet the duty.

Note: Items covered in the lists of inspections for the various types of cranes, and Appendix A (where applicable) are compulsory to obtain the certificate of inspection for the crane before it can be used, as per the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 (PECPR Regulations). The accredited inspection bodies have advised their equipment inspectors of this requirement.

Employers' duties

Employers have duties to ensure the health and safety of employees at work.

Employers have a general duty to take “all practicable steps” to ensure the safety of employees while at work. In particular, they are required to take all practicable steps to:

- provide and maintain a safe working environment
- provide and maintain facilities for the safety and health of employees at work
- ensure that machinery and equipment is safe for employees
- ensure that working arrangements are not hazardous to employees
- provide procedures to deal with emergencies that may arise while employees are at work.

Taking “all practicable steps” means doing what is reasonably able to be done in the circumstances, taking into account:

- the severity of any injury or harm to health that may occur
- the degree of risk or probability of that injury or harm occurring
- how much is known about the hazard and the ways of eliminating, reducing or controlling it
- the availability, effectiveness and cost of the possible safeguards.

A person is required to take all practicable steps in respect of circumstances that they know or ought reasonably to know about.

Hazard management

Employers must identify and regularly review hazards in the place of work (existing, new and potential) to determine whether they are “significant hazards” and require further action. If an accident or harm occurs that requires particulars to be recorded, employers are required to have the matter investigated to determine if it was caused by or arose from a significant hazard (refer to part 2.2(2)).

“Significant hazard” means a hazard that is an actual or potential cause or source of:

- (1) serious harm (defined in a schedule to the Act), or
- (2) harm (being more than trivial) where the severity of effects on any person depend (entirely or among other things) on the extent or frequency of the person’s exposure to the hazard, or
- (3) harm that does not usually occur, or usually is not easily detectable, until a significant time after exposure to the hazard.

Where the hazard is significant, the Act sets out the steps employers must take:

- (1) Where practicable, the hazard must be eliminated.
- (2) If elimination is not practicable, the hazard must be isolated.
- (3) If it is impracticable to eliminate or isolate the hazard completely, then employers must minimise the likelihood that employees will be harmed by the hazard.

Where the hazard has not been eliminated or isolated, employers must, where appropriate:

- (1) provide protective clothing and equipment and ensure that it is accessible and used
- (2) monitor employees’ exposure to the hazard
- (3) seek the consent of employees to monitor their health
- (4) with informed consent, monitor employees’ health.

Information for employees and health and safety representatives

Before employees begin work, they must be informed by their employer of:

- (1) hazards they may be exposed to while at work
- (2) hazards they may create which could harm other people
- (3) how to minimise the likelihood of these hazards becoming a source of harm to themselves and others
- (4) the location and correct use of safety equipment
- (5) emergency procedures.

Employers are also required to inform employees of the results of any health and safety monitoring. In doing so, the privacy of individual employees must be protected.

Where there are employee health and safety representatives, the employer must ensure that the representatives have ready access to sufficient information about health and safety systems and issues in the place of work to enable them to be able to carry out their functions effectively.

Training and supervision of employees

An employer must ensure that every employee who:

- does work of any kind, or
- uses plant of any kind, or
- deals with a substance of any kind

in a place of work has the knowledge and experience – or is supervised by someone who has – so that they are not likely to suffer harm, or lead to the harm of others.

Every employee must be adequately trained in the safe use of all plant, objects, substances, and protective clothing and equipment that they are, or may be, required to use or handle.

Employers to provide opportunities for employee participation

Employers must provide reasonable opportunities for employees to participate effectively in on-going processes for improvement of health and safety in the place of work. Where there are more than 30 employees, or where an employee requests it, the employer must seek agreement on, develop, implement and maintain a system of employee participation. Where agreement cannot be reached on the system of employee participation, there are default provisions set out in the Act.

Where employee health and safety representatives are elected, they are entitled to paid leave to attend approved training courses.

A trained employee health and safety representative may issue a hazard notice to an employer where they believe there is a hazard in the place of work, they have brought it to the employer's attention and the issue has not been resolved.

Employers and employees must deal with each other in good faith while seeking agreement on, developing and maintaining a system of employee participation. The dispute resolution processes of the Employment Relations Act 2000 apply.

Responsibility for employees' work activities

An employer is also responsible for the health and safety of others arising from the work activities of their employees. They must take all practicable steps to ensure that no action or inaction of an employee while at work causes harm to any other person.

Deemed employees

People receiving on-the-job training or work experience, loaned employees and volunteer workers are all deemed to be "employees" of an employer or self-employed person for whom they are working. Most employer duties apply, but not the duty

to provide opportunities for employee participation. In addition, for volunteers, the exceptions are:

- to provide training and supervision
- to ensure volunteers' action or inaction at work does not harm others.

Duties of employees

Every employee must take all practicable steps to ensure:

- their own safety while at work (including using protective clothing and equipment)
- that no action or inaction of theirs while at work causes harm to any other person.

An employee has a right to refuse to undertake work that they consider likely to cause them serious harm.

The self-employed

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

Principals

Principals to contracts are required to take all practicable steps to ensure that:

- no employee of a contractor or subcontractor, or
- if an individual, no contractor or subcontractor

is harmed while doing any work (other than residential work) that the contractor was engaged to do.

Hirers, sellers and suppliers of plant

The Act places duties on people to ensure that any plant or equipment that is used in a place of work is designed and made, and has been maintained, so that it is safe for its intended use. The duties apply to people who:

- hire, lease or loan plant to another person that could be used in a place of work
- sell or supply plant (other than for hire, lease or loan)
- install or arrange plant in addition to either of the above.

Persons in control of a place of work

The Act places duties on "persons who control a place of work" in relation to people in the vicinity, and to visitors.

A “person who controls a place of work” includes a person who owns, leases, subleases or occupies a place of work, or who owns, leases or subleases plant or equipment used in a place of work.

Accidents and serious harm (recording and notification)

The Act requires employers, the self-employed and principals to contracts to keep a register of work-related accidents and serious harm.

For employers, this includes every accident that harmed (or might have harmed):

- (1) any employee or self-employed person at work
- (2) any person in a place of work under the employer's control.

Employers are also required to investigate all accidents, harm and “near misses” to determine whether they were caused by a significant hazard.

“Serious harm” is defined in Schedule 1 of the Act.

Any occurrences of serious harm of a kind that must be recorded, must also be notified to the Secretary of Labour (in practice, the nearest Department of Labour office) as soon as possible after the occurrence. In addition, the accident must also be reported in the prescribed form within seven days. (Forms are available from stationers, or from the Department of Labour website.)

If a person suffers serious harm, the scene of the accident must not be disturbed unless to:

- (1) save life or prevent suffering
- (2) maintain public access for essential services, e.g. electricity, gas
- (3) prevent serious damage or loss of property.

A health and safety inspector will advise whether or not the Department of Labour will investigate the accident and what action may be taken in the meantime.

PART 1: GENERAL

1.1 Preface

This code has been prepared by representatives of the crane and inspection industries and the Department of Labour. The purpose of the code is to support the requirements of the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 and the Health and Safety in Employment Regulations 1995. References in this code to “regulations” mean the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999.

Adoption of this code will provide for an increased level of safety for all types of cranes covered by this document.

Proposals for changes to this code may be submitted to the Department of Labour, for consideration by the industry group concerned.

Note: Operational matters such as site conditions, minimum distance from electrical conductors, operation of tower cranes and load-lifting gear are in the *Crane Safety Manual*, obtainable from the Crane Association of New Zealand (Inc.).

1.2 Scope

This code covers, but is not limited to, the following types of crane:

dockside	derrick/post
jib	mobile (including crawler)
overhead travelling and gantry	tower
pillar	self-erecting tower
vehicle-mounted truck loader	wharf and container
monorail	

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

- forklift trucks
- material handlers
- telehandlers
- earthmoving and forestry equipment

It does not cover derricks or spreader beams on-board ships. These are covered by the Maritime Rule Part 49 – Ships’ Lifting Appliances.

1.3 Definitions

For the purpose of this code, the following definitions apply:

Act: means the Health and Safety in Employment Act 1992.

Activity: in relation to any equipment, means any of the following:

- (a) adjustment
- (b) alteration
- (c) commissioning
- (d) construction
- (e) disposal
- (f) design
- (g) design verification
- (h) equipment inspection
- (i) installation
- (j) investigation
- (k) maintenance
- (l) manufacture
- (m) operation
- (n) repair
- (o) testing.

Alteration: means changing the design of, adding to, or taking elements away from the crane and includes the relocation of non-mobile equipment but does not include repairs, replacements, or routine maintenance.

Anchorage: means the securing of a crane in position, or the fixed end of a rope, or a dead-end of a rope.

Anti-two-block warning device: means a device that warns the operator that the hook block is about to hit the boom head.

Anti-two-block cutout: means a device that is activated as the crane hook block is about to hit the boom head and prevents any further upward movement of the hook block.

Automatic safe load indicator: means a device fitted to a crane to provide the operator with automatic warning of approach to an overload situation.

Boom: means a cantilevered structure from which a load is suspended.

Boom angle indicator: means a device that shows the angle of inclination of a luffing (derricking) boom.

Boom arrestors (also referred to as safety ropes): means ties fitted between the underside of the boom to a fixed part of the crane to prevent whip back. Safety ropes may also be fitted between the underside of a fly jib and boom.

Boom back-stops: means a device fitted to the crane to prevent whip back.

Certificate of inspection: means a certificate issued or renewed under regulation 32 that complies with regulation 33. In the case of an in-house

inspection body, the certificate may take the form of a computer record created by that body on the recommendation of the equipment inspector.

Chartered professional engineer (CP Eng.): means a person who is registered and holding a current registration certificate under the Chartered Professional Engineers of New Zealand Act 2002.

Competent person: means a person who has acquired, through a combination of training and qualification or experience, the knowledge and skills to perform the task required.

Controller: under the PECPR Regulations, means a person who is the owner, lessee, sublessee, or bailee of any equipment in a place of work.

Crane:

- (1) means a powered device, powered in both the vertical and horizontal directions that can, by the movement of the whole device or of its boom, jib, trolley or other such part, reposition or move suspended loads both vertically and horizontally
- (2) includes all parts of the crane down to and including the hook or load-handling device, and all ropes, wires, chains or other devices used to move the hook or device
- (3) does not include lifting tackle that is not an integral part of the crane.

Crane rating chart: means a notice fitted on or attached to a crane stating the maximum safe working load for the crane in specified operating conditions.

Crane operator: means a person who has acquired, through a combination of training, qualification or experience, the knowledge and skills to operate a particular type of crane.

Current: means for the time being in force and “currently” has a corresponding meaning.

Derricking: refer to “luffing”.

Designer: means a designer of equipment that could reasonably be expected to be operated in a place of work.

Design verification: means verification that the following comply, in every respect related to safety, with the requirements of the appropriate design standards and contain every safety feature that is relevant, whether or not referred to in those standards:

- (1) design of equipment
- (2) alterations to designs, affecting the structural strength or safety of equipment, made in the course of manufacture
- (3) designs of any repair or alteration affecting the operational safety of the equipment repaired or altered or any other equipment
- (4) the fabrication inspection requirements specified by the designer.

Design verifier: means a person who:

- (1) is employed or engaged by an accredited inspection body to carry out the functions referred to in the regulations
- (2) is the holder of a relevant certificate of competence.

Equipment: refer to regulation 4 of the PECPR Regulations.

Equipment inspection: means an inspection carried out by an equipment inspector that:

- (1) is carried out to determine whether equipment is safe and is likely to remain safe
- (2) takes place in one or more of the following periods:
 - (a) the period in which the equipment, or its component parts, is manufactured
 - (b) the period after the manufacture and before the commissioning of the equipment
 - (c) the period after the commissioning of the equipment
 - (d) the period after a repair or alteration to which the regulations apply
 - (e) the period after maintenance, or an adjustment, alteration, or repair to which the regulations apply.

Equipment inspector: means a person who:

- (1) is employed or engaged by an inspection body to carry out the functions referred to in the regulations
- (2) is the holder of a relevant certificate of competence.

Erection: means, in relation to any type of equipment, the assembly and construction, and includes installation.

Factor of safety: means the ratio obtained by dividing the minimum specified breaking load by the safe working load.

Hoist unit: means a standard mass-produced lifting unit providing powered vertical lifting capacity by either chain or wire, via a hook and block. Power may also be provided to a beam runner, if fitted, for horizontal travel.

HSE Act: means the Health and Safety in Employment Act 1992, as amended.

HSE Regulations: means the Health and Safety in Employment Regulations 1995.

Inspection body: means:

- (1) an organisation currently accredited by International Accreditation New Zealand (IANZ)

- (2) in relation to a design verifier or equipment inspector, the inspection body by which the design verifier or equipment inspector is employed or engaged
- (3) an organisation currently recognised under the PECPR Regulations.

Lifting gear:

- (1) means a device used:
 - (a) to attach the load to the hook or load-handling device, or
 - (b) to control the load independently of the hook or load-handling device, or
 - (c) as a container for the load
- (2) includes lifting beams, lifting frames, spreaders or similar devices that are not an integral part of the crane.

Limit switch: means an automatically activated switch to warn an operator or to stop a particular crane motion prior to reaching the extremity of operations.

Load-handling device:

- (1) means a device:
 - (a) that is an integral part of the crane
 - (b) that may be substituted for the hook
- (2) includes lifting beams, lifting frames and spreaders or similar devices and associated chains, pins, pulley blocks, pulley frames, ropes, shackles, twist locks and wires.

Load indicating device: means a device that measures and displays the weight being lifted or the force being applied.

Load moment: means the load multiplied by the horizontal distance from the centre of rotation to the hook.

Load moment indicator: means a device that indicates the load moment.

Load moment limiter: means a device, which is preset prior to operation, that limits the lifting capacity at any given crane configuration.

Load radius indicator: means a device fitted on a crane that shows the distance to the hook measured from the centre of the slew.

Lock out: means to use a piece of equipment that renders another item inoperable.

Luffing: means the raising and lowering of the crane boom.

Maintenance: includes servicing.

Maintenance records: consist of:

- (1) maintenance requirements provided by the manufacturer

- (2) in-house inspections/checks carried out by the controller or their staff.

Where the manufacturer's requirements are not available, advice must be obtained from within the industry.

Multi-lifting: means the use of more than one crane to raise a single load.

Must: where the word "must" is used, then the particulars that are referred to are mandatory.

Operate: in relation to equipment:

- (1) means to use the equipment
- (2) includes making the equipment available for use, whether by hiring or otherwise

and "operation" has a corresponding meaning.

Operating manual: means documentation published by the manufacturer(s) that includes maintenance procedures, general specifications and other relevant data.

Outriggers: means structural members used to provide stability during crane operations.

Overload protection: means a device that prevents the crane from moving into an overload situation by stopping all load moment increasing functions.

PECPR Regulations: means the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999.

Radius: means the horizontal distance from the centre line of the crane hook to the centre of rotation.

Rated-capacity indicator: see safe-load indicator.

Regulations: means the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 (PECPR)..

Repair: means to restore equipment to an operating condition but does not include alterations, replacements or routine maintenance.

Safe-load indicator: a device that, when fitted to a crane, within certain specified tolerance levels, gives a warning of the approach to the safe working load of the crane, and further warning when the safe working load has been exceeded.

Note:

- (1) In addition, a safe-load indicator may have to supply certain defined information associated with the safe use of the crane.
- (2) Rated-capacity indicator is an equivalent term.

Safety device: means any kind of device, item, or system that is used in or on equipment and that controls or monitors any aspect of the safety of the equipment and includes a safety relief device.

Safe working load (SWL): for gantry type cranes, means the maximum load the crane can lift and, for all other cranes, means the maximum load at minimum radius. The crane rating sheet shows the maximum load at other radii.

Secretary: means the Secretary of Labour.

Self-erecting tower crane: means a tower crane with the capability of self-erection. Self-erecting cranes are not to be confused with self-climbing cranes.

Self-climbing tower crane: means a tower crane using its own motive power to extend its height. Self-climbing cranes are not to be confused with self-erecting cranes.

Shall: where the word “shall” is used, then the particulars that are referred to are mandatory.

Slewing: means the rotary motion of a crane, boom or load in a horizontal plane.

Stability: means the ability of a crane to resist tipping.

Supplier:

- (1) means a person who supplies or imports equipment that could reasonably be expected to be operated in a place of work
- (2) includes a person who sells or hires, or offers for sale or hire, equipment that could reasonably be expected to be operated in a place of work.

Suspended load: means any load hanging below the hook or lifting equipment.

Telescopic boom: means a boom that incorporates telescopically extendable elements in the boom structure.

Type fault: means a fault inherent in a particular type of equipment, resulting from deficiencies in the design or manufacturing process, that may cause the equipment to cause serious harm to any person.

PART 2: APPLICATION OF THE REGULATIONS

2.1 Regulations

(1) Introduction

- (a) Part 2 is provided to assist readers to interpret and apply the PECPR Regulations to cranes.
- (b) The headings used in this part of the code follow the headings in the corresponding parts of the regulations.
- (c) The summary provided is necessarily brief. If there is any conflict between this commentary and the regulations, the regulations take precedence.

(2) Interpretation

Key words and terms are defined in part 1 of this code. (See also schedule 1 of the PECPR Regulations.)

(3) Meaning of “controller”

A “controller” of equipment is the person who is the owner, lessee, sublessee or bailee of equipment in a workplace.

(4) Meaning of “equipment”

Reference to equipment in this code means:

- (a) in relation to a controller, refers to equipment for which the controller is the owner, lessee, sublessee or bailee
- (b) in relation to a designer, refers to equipment being designed or already designed
- (c) in relation to a manufacturer, refers to equipment being manufactured or already manufactured
- (d) in relation to a supplier, refers to equipment being supplied or already supplied.

(5) Exemptions for controllers, designers, manufacturers or suppliers

- (a) The Secretary may grant an exemption from any duty imposed by the regulations on controllers, designers, manufacturers or suppliers.
- (b) The Secretary may impose any condition thought fit on an exemption and, in certain cases where it applies to ALL controllers, designers, manufacturers and suppliers, must publish details of an exemption in the *New Zealand Gazette*.
- (c) The Secretary may, at any time, cancel an exemption and must publish a notice in the *New Zealand Gazette* indicating that

an exemption is to be cancelled and the date on which the cancellation takes effect.

- (6) Exemptions for equipment
 - (a) The Secretary may exempt equipment from any or all of the regulations and impose any condition thought fit on the exemption. Details of the exemption will be published in the *New Zealand Gazette*.
 - (b) The Secretary may, at any time, cancel an exemption given to equipment and publish a notice in the *New Zealand Gazette* indicating that an exemption is to be cancelled and the date on which the cancellation takes effect.
- (7) Relationship between the Act and regulations

Except where an exemption is granted, a person on whom a duty is imposed by these regulations must comply with that duty even though the Health and Safety in Employment Act 1992 may impose the same, similar or additional duty.

2.2 Duties of controllers

- (1) Information to be held by the controller
 - (a) Controllers of cranes shall obtain from the manufacturer or supplier:
 - (i) any catalogues, drawings, manuals, specifications and other information required to ensure that all relevant activities can be carried out safely
 - (ii) drawings, manuals and other data including design verification, inspection and test certificates that are necessary to establish that the equipment has been designed, manufactured, erected and commissioned in accordance with the PECPR Regulations.
 - (b) Where the information noted in 2.2(1)(a)(i) or (ii) is not available from the manufacturer or supplier, it shall be obtained from some other source. This data shall comply with the requirements of any quality management system under which the equipment is operated, or confirmed as suitable for the equipment by an inspection body.
 - (c) The controller must keep all information that is necessary to demonstrate compliance with the PECPR Regulations at the place of work. This includes:
 - (i) certificates of design verification and the documents and drawings to which they refer
 - (ii) all certificates of inspection and test reports arising from manufacturing, erection and commissioning

- (iii) erection and commissioning information required for the safe operation, maintenance and servicing of the equipment
 - (iv) manufacturer's data reports including details of nominal wall thickness and corrosion allowances
 - (v) the date, time, full description and the inspection and test reports for any repair or alteration
 - (vi) **maintenance records**
 - (vii) documentation for all usage of the crane.
- (d) This data must be kept secure and be available to all persons requiring access to it, including equipment inspectors. It shall be kept available for reference until disposal of the equipment.
- (2) Accident notification

Controllers shall ensure that, where any event occurs in a place of work that:

- (a) causes damage that affects the safety of equipment, or
- (b) has the potential to affect the safety of equipment, and
- (c) which could have resulted in serious injury

they notify the Secretary as soon as possible. This initial notice may be provided by phoning 0800 20 90 20 and must, within seven days of the event occurring, be followed by a detailed report to the Secretary. The report must be in writing and be prepared by an inspection body – other than that which issued the latest certificate of inspection for the equipment in question – or a chartered professional engineer independent of the controller.

- (3) Duties in relation to operation

Controllers shall take all practicable steps to ensure, with respect to operating of equipment, that:

- (a) it is safe and operated safely within the limits for which it was designed and it is maintained in a safe condition
- (b) it is not operated if it does not have a current certificate of inspection
- (c) equipment that has been adjusted, altered or repaired is, where appropriate, inspected and issued with a new certificate of inspection before it is put back into operation.

- (4) Duties in relation to repairs or alterations

Every controller must take all practicable steps to ensure, in relation to a repair or alteration affecting the operational safety of the equipment repaired or altered, or any other equipment, that:

- (a) the repair or alteration is designed in accordance with these regulations

- (b) design verification requirements for the design specified by the designer are complied with
- (c) the repaired or altered equipment is subject to equipment inspection in accordance with these regulations.

2.3 Duties in relation to unsafe equipment

(1) Employees' duty

Employees of controllers shall take all practicable steps to advise the controller, as early as practicable, of any equipment or activity that they believe to be unsafe.

(2) Investigation of potentially unsafe equipment

- (a) Controllers shall ensure that, where they become aware of equipment that may be unsafe, the matter is investigated by a competent person in a manner that is both timely and appropriate for the circumstances.
- (b) Where equipment is determined to be unsafe, the controller shall:
 - (i) withdraw the equipment from service and render it inoperable
 - (ii) clearly mark the equipment as withdrawn from service
 - (iii) record details of the equipment withdrawn from service and its location
 - (iv) not return the equipment to service until it has been restored to a safe condition
 - (v) where appropriate, have the equipment inspected by an equipment inspector and issued with a new certificate of inspection
 - (vi) record details of any inspection and testing carried out to confirm that remedial work is satisfactory.

(3) Notification of type fault

If a controller believes that equipment may have a type fault, the controller shall, as soon as practicable, give the manufacturer and supplier written notice to this effect. "Type fault" is defined under 1.3 Definitions.

(4) Correction of type fault

- (a) Where a manufacturer or supplier is advised in writing of a type fault under regulation 14, or otherwise becomes aware of a possible type fault, they shall determine whether a type fault exists. If a type fault exists, then the manufacturer or supplier shall:

- (i) stop manufacture and supply of that equipment until the fault is corrected
 - (ii) advise controllers of that equipment of any precautionary measures that should be taken
 - (iii) if the type fault is an immediate risk to safety, advise the controller to withdraw the equipment from service
 - (iv) at their expense, arrange for any type fault to be corrected.
- (b) A manufacturer or supplier who determines that equipment has a type fault must advise the Secretary of details of the fault and what measures are being taken to correct it.

2.4 Duties of designers, manufacturers and suppliers

- (1) Relationship to duties in the Health and Safety in Employment Regulations 1995

The duties imposed on designers, manufacturers and suppliers under part 3 of the PECPR Regulations complement the duties imposed by part VII of the Health and Safety in Employment Regulations 1995.

This means, for example, that:

- (a) designers must comply with regulation 18 (see 2.4(3) below). This is in addition to the requirements of regulation 66(2) of the Health and Safety in Employment Regulations 1995.
 - (b) manufacturers must comply with regulation 19 (see 2.4(4) below). This is in addition to the requirements of regulation 67(1) of the Health and Safety in Employment Regulations 1995.
 - (c) manufacturers and suppliers must comply with regulation 21 (see 2.4(6) below). This is in addition to the requirements of regulations 67(3) and 67(4) of the Health and Safety in Employment Regulations 1995 and must comply with Section 18A of the Health and Safety in Employment Act 1992.
- (2) Sufficient compliance with duties in regulations 18 to 20
- (a) The Secretary may recognise standards and codes relating to the operational safety of equipment and may impose any limit or condition thought appropriate on any recognition.
Such standards and codes may relate to, for example:
 - (i) load
 - (ii) operating life
 - (iii) design verification and inspection.
 - (b) The Secretary may also withdraw recognition of standards.
 - (c) A notice must be published in the *New Zealand Gazette* of any recognition that has been granted or withdrawn. A recognition

notice must include details of any limits or conditions that have been imposed on the recognition.

- (d) Designers, manufacturers and suppliers will have complied with a duty relating to design, design verification, fabrication inspection, manufacture and supply which is placed on them by the PECPR Regulations, provided they have complied with a recognised standard that relates to that specific duty.

Note:

- (1) Standards recognised by the Secretary are listed in Appendix C: Reference standards and documents.
 - (2) Details of any changes to the list of recognised standards since issue of this code are available from the Secretary.
- (3) Duties relating to design and design verification
 - (a) Designers shall ensure that all equipment or any alterations to equipment are designed in accordance with the appropriate standards specified in Appendix C of this code, or otherwise recognised by the Secretary. This includes taking into account any seismic design requirements for the equipment as per NZS 1170.5:2004 *Structural design actions – Earthquake actions*.
 - (b) Where there are no recognised standards applicable to an item of equipment, then it shall be designed in accordance with the standards of generally-accepted industry practice.
 - (c) Designers shall ensure that equipment, or any alteration to equipment they design:
 - (i) is safe when used in accordance with its intended purpose
 - (ii) has its design life determined and specified in the design documents
 - (iii) has its design verification requirements determined and specified in the design documents
 - (iv) has its manufacturing requirements specified in the design documents
 - (v) has its fabrication inspection requirements determined and specified in the design documents.
 - (4) Duties relating to manufacture and fabrication inspection
 - (a) Manufacturers shall ensure that the designers of equipment they are to manufacture have complied with regulation 18.
 - (b) Manufacturers of equipment shall ensure that any manufacturing is carried out in accordance with a verified design and the manufacturing requirements specified in the design.

- (c) Manufacturers shall ensure that any design changes to equipment during manufacture are approved by the designer and, where appropriate, design verified.
- (d) Manufacturers shall ensure that equipment is inspected and tested by an inspection body in accordance with the requirements of the manufacturing standard, and any inspection and test plan (ITP) specified by the designer.
- (e) Manufacturers shall ensure that inspection reports are prepared by the equipment inspectors for the equipment they inspect. The manufacturer shall obtain copies of these inspection reports.
- (f) Manufacturers of equipment that has been designed overseas shall ensure that it has been designed and design verified to a standard that is equivalent to that required by regulation 18.

Note: Manufacturers who intend using a design from overseas are advised to seek the assistance of their inspection body before committing to manufacture.

(5) Duties relating to supply

- (a) Suppliers of cranes manufactured in New Zealand shall ensure that, before such equipment is supplied, the manufacturer has complied with regulation 19.
- (b) Suppliers of imported equipment shall ensure that it has been designed, design verified, manufactured, inspected and tested in accordance with regulations 18 and 19.
- (c) Every supplier must take all practicable steps to ensure, when importing, for supply, equipment manufactured in another country, that it has not already exceeded its designated design life.

(6) Duties relating to the provision of information

- (a) Designers, manufacturers and suppliers are to take all practicable steps to ensure they provide the following information for the use of purchasers or hirers of equipment:
 - (i) All data that is necessary to ensure that every activity involving the equipment can be carried out safely. This means general arrangement drawings, manuals and any other data relevant to the safe operation of the equipment. Where appropriate, this shall include records of previous use.
 - (ii) All documentation necessary to establish that the equipment has been designed, design verified, manufactured and inspected in accordance with this approved code of practice. This means certificates of design verification and certificates of inspection issued by an inspection body.
 - (iii) Records of previous use.

- (b) Manufacturers shall ensure that equipment is labelled with key data relevant to its safe operation. This should include:
 - (i) the name of the manufacturer, the year of manufacture and the unique identifier assigned by the inspection body
 - (ii) relevant operating parameters such as safe working loads, etc.

2.5 Administrative provisions

- (1) Sufficient compliance with functions in regulations 23 to 35
 - (a) The Secretary may, subject to any conditions thought necessary, grant recognition to standards, codes or other documents containing requirements relating to:
 - (i) recognition procedures, or
 - (ii) functions and recognition of inspection bodies, or
 - (iii) design verifiers and equipment inspectors, or
 - (iv) quality management systems, or
 - (v) qualification issuing agencies, or
 - (vi) design verification and inspection certificates, or
 - (vii) certificates of competence.

The clauses containing requirements relating to these matters are 2.5(2) to 2.5(8) and 2.6(1) to 2.6(6) inclusive.
 - (b) The Secretary must publish a notice in the *New Zealand Gazette* specifying details including any limits or conditions of the recognition that has been granted. The Secretary may also withdraw recognition of a document and must publish details of withdrawal of recognition in the *New Zealand Gazette*.
 - (c) Provided there is no other evidence to the contrary, a standard or code recognised by the Secretary remains recognised until notice of its withdrawal of recognition has been published in the *New Zealand Gazette*.
 - (d) Compliance with a recognised document meets the requirements of regulations 23 to 35 provided the document covers the subject matter of the regulations.
 - (e) Standards and codes listed in Appendix C: Reference standards and documents are recognised by the Secretary.
- (2) Recognition procedures
 - (a) The Secretary, on receipt of a written application, may grant recognition as described in:
 - (i) regulation 25(1) to a New Zealand inspection body, or

- (ii) regulation 25(2) to an overseas inspection body, or
 - (iii) regulation 29(2) to a qualifications issuing agency.
- (b) The Secretary must:
- (i) notify the applicant in writing of a grant of recognition
 - (ii) specify the period for which the recognition is current
 - (iii) specify any limits and conditions on the recognition.
- (c) The Secretary may also withdraw a condition of recognition:
- (i) if satisfied that a condition has not been observed, or
 - (ii) it would otherwise be in the interests of safety to do so, and
 - (iii) after giving an individual or organisation concerned an opportunity to be heard.

The Secretary must notify the individual or organisation concerned of the withdrawal of recognition.

(3) Inspection bodies: functions

- (a) The functions of inspection bodies are to:
- (i) perform design verification and the issuing and cancelling of certificates of design verification on the recommendation of design verifiers
 - (ii) perform equipment inspection and the issue, renewal, suspension and cancellation of certificates of inspection on the recommendation of equipment inspectors
 - (iii) suspend and cancel certificates of inspection, issued by other inspection bodies, on the recommendation of equipment inspectors
 - (iv) advise the Secretary of any equipment that is so unsafe that the inspection body, on the advice of equipment inspectors, has refused to issue or renew a certificate of inspection, or has suspended or cancelled its certificate of inspection
 - (v) provide a unique identifier for equipment when issuing its first certificate of inspection. This unique identifier must be permanently applied to the equipment by the equipment inspector, usually by hard stamping, at the time of the first inspection.
- (b) Inspection bodies, depending on the scope of their accreditation, employ design verifiers and/or equipment inspectors to perform the design verification and equipment inspection work in 2.5(3)(a).

(4) Inspection bodies: recognition

(a) Inspection bodies operating in Australia and New Zealand may be recognised by the Secretary provided:

- (i) they are accredited to ISO 17020 (EN 45004) by International Accreditation New Zealand (IANZ), or by the National Association of Testing Authorities, Australia (NATA)
- (ii) the Department of Labour has been given the opportunity to participate during the accreditation audit and subsequent surveillance audits of the inspection bodies
- (iii) they have procedures in place that ensure that persons employed as equipment inspectors or design verifiers have appropriate certificate of competence issued by the Certification Board for Inspection Personnel (CBIP), the Institution of Professional Engineers New Zealand (IPENZ), or the Secretary
- (iv) they have procedures in place that ensure that trainee design verifiers and trainee equipment inspectors hold appropriate qualifications, have the necessary experience and skills and are effectively supervised
- (v) they have procedures in place that ensure that design verification or equipment inspection is carried out by persons holding a relevant certificate of competence
- (vi) they carry out their work in an objective fashion that promotes safety and the public interest
- (vii) there is no reasonably foreseeable conflict of interest between their design verification and equipment inspection activities and any other work they may undertake.

(b) Inspection bodies operating outside Australia and New Zealand may also be recognised by the Secretary provided:

- (i) they are accredited to a recognised industry standard by an organisation that has a mutual recognition agreement with International Accreditation New Zealand, or
- (ii) they have the status of an inspection body under the law of the country in which they have their headquarters. The law must require accreditation or equivalent and impose requirements that are comparable to those imposed on New Zealand and Australian inspection bodies.

(5) Design verifiers

Design verifiers perform design verification on behalf of an inspection body and make recommendations to the inspection body on the issuing and cancellation of certificates of design verification.

- (6) Equipment inspectors
 - (a) Equipment inspectors perform equipment inspection on behalf of an inspection body and make recommendations to the inspection body on the issue, renewal, suspension or cancellation of certificates of inspection. These recommendations shall be made to the inspection body regardless of whether that inspection body was responsible for the issue of any current certificate of inspection.
 - (b) They must inform manufacturers and controllers on matters relating to the safety of the equipment that they inspect and on any action to be taken to make the equipment safe.
- (7) Quality management systems
 - (a) Quality management systems shall be certified to a recognised industry standard by an agency accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ).
 - (b) Controllers shall give the Department of Labour the opportunity to participate in the certification audit and subsequent surveillance audits.
 - (c) Controllers with a quality management system for equipment must conform with the requirements of that quality management system.
- (8) Qualification issuing agencies
 - (a) Qualification issuing agencies issue certificates of competence and advise applicants on the equivalence of qualifications obtained outside New Zealand.
 - (b) The Secretary may recognise an organisation as a qualification issuing agency if satisfied that it is competent to perform this function.
 - (c) A qualification may be issued by a qualification issuing agency only after it has determined by examination and/or assessment that the person seeking the qualification has the requisite training, skills, knowledge and experience.
 - (d) The relevant qualification issuing agencies recognised by the Secretary and the occupational groups for which they issue qualifications include:
 - (i) Certification Board for Inspection Personnel (CBIP) for equipment inspectors
 - (ii) Institution of Professional Engineers New Zealand (IPENZ) for design verifiers.
 - (e) The Secretary may request a qualification issuing agency to supply names of persons holding a particular certificate of competence.

2.6 Certificates

- (1) Certificates of design verification
 - (a) A design verifier may recommend to an inspection body that a certificate of design verification be issued for equipment, provided it has been design verified and found to be safe for its intended purpose.
 - (b) An inspection body must consider all documents submitted by the design verifier in support of a recommendation to issue a certificate of design verification. If the inspection body agrees with the recommendation, it must stamp the documents and issue a certificate of design verification.
- (2) Contents of a certificate of design verification
 - (a) A certificate of design verification must include the following information about the equipment that has been design verified:
 - (i) a brief description of the equipment
 - (ii) the name of the person or organisation seeking the certificate
 - (iii) the name of the inspection body
 - (iv) the name of the design verifier
 - (v) the date of issue
 - (vi) the standards, codes, guidelines and so on to which the equipment conforms
 - (vii) the drawings, identified by drawing number, and details of any other data, including ITPs, included in the design verification process
 - (viii) the principal design parameters, e.g. design life, safe working load and so on.
 - (ix) the seismic coefficient
 - (x) the maximum wind loading
 - (xi) any design alterations and other requirements that the design verifier specifies for the equipment
 - (xii) details of any other documents giving further information in relation to (i) to (xi) for the verified design that it is not practicable to include on the certificate of design verification.
 - (b) Certificates of design verification must be signed by the design verifier and:
 - (i) carry the logo of the accreditation body that accredited the inspection body issuing the certificate, or

- (ii) contain a statement noting that the inspection body is accredited by an accreditation body named on the certificate.
- (3) Issue and renewal of a certificate of inspection
 - (a) An equipment inspector may recommend to an inspection body that a certificate of inspection be issued or renewed for equipment for a specified period provided it has been inspected and the equipment inspector has reasonable grounds for believing it is safe and would remain safe during the recommended inspection period.
 - (b) An inspection body may issue or renew a certificate of inspection, on the recommendation of an equipment inspector, for the recommended inspection period. It may impose conditions on the certificate of inspection.
 - (c) Cranes that have an existing but expiring certificate of inspection may be issued with a new certificate of inspection if passing the physical testing, even though not meeting all the necessary documentation requirements of this code of practice.
- (4) Term and contents of a certificate of inspection
 - (a) A certificate of inspection remains in force until such time as:
 - (i) the period specified in the certificate expires, or
 - (ii) a new certificate of inspection is issued following an adjustment, repair or alteration of the equipment, or
 - (iii) the certificate is withdrawn or suspended by an inspection body.
 - (b) An equipment inspector may recommend to an inspection body that it extend, subject to any terms or conditions that the inspector thinks fit, the inspection period of a certificate of inspection that is about to expire. The equipment inspector shall only recommend an extension where:
 - (i) the equipment has been visually examined
 - (ii) the inspector has reasonable grounds for believing the equipment would be safe for the period of the extension.
 - (c) An inspection body may extend a certificate of inspection on one occasion only for a maximum period of three months. The extension shall be subject to any terms and conditions recommended by the equipment inspector.
 - (d) A certificate of inspection must include the following information about the equipment concerned:
 - (i) a brief description of the equipment

- (ii) the unique identifier issued to the equipment by the inspection body responsible for the first inspection
 - (iii) the purpose of the equipment as specified by the designer
 - (iv) the location of the equipment when inspected
 - (v) the name of the manufacturer
 - (vi) the safe working load
 - (vii) the name of the equipment inspector
 - (viii) a statement of the inspector's opinion that the equipment was safe at the date of inspection and will remain safe for the period of the certificate if operated and maintained properly
 - (ix) the date of the inspection
 - (x) the date of expiry of the certificate
 - (xi) the name of the inspection body that issued the certificate
 - (xii) the name and business address of the controller
 - (xiii) the title of any other document giving further details in relation to (i) to (xii) where it is impractical for these to be included on the certificate of inspection.
- (e) Certificates of inspection must:
- (i) carry the logo of the accreditation body that accredited the inspection body issuing the certificate, or
 - (ii) contain a statement noting that the inspection body is accredited by an accreditation body named on the certificate.
- (5) Suspension or cancellation of a certificate of inspection
- (a) An equipment inspector who is satisfied on reasonable grounds that equipment is unsafe or unfit for use may recommend to an inspection body that a current certificate of inspection should be suspended or cancelled, or that a new certificate not be issued. The inspection body, after giving the controller of the equipment concerned a suitable opportunity for comment:
 - (i) may cancel or suspend the certificate of inspection
 - (ii) must advise the controller of the action taken.
 - (b) The Secretary, where satisfied on reasonable grounds that equipment is unsafe or unfit for use, may, after giving the controller of the equipment concerned a suitable opportunity for comment, cancel or suspend a certificate of inspection. The Secretary must notify the controller of the action taken.

(6) Certificates of competence

- (a) A certificate of competence may only be issued by a qualification issuing agency or by the Secretary. This indicates that the certificate holder is qualified to carry out a specified activity relevant to the certification. Specified activities include equipment inspection and design verification.
- (b) A certificate of competence is valid for the period shown on the certificate, but may be suspended or cancelled by the Secretary if the Secretary is satisfied on reasonable grounds that the holder should no longer hold such a certificate. The Secretary must give the holder a suitable opportunity to comment before cancelling or suspending a certificate of competence.

Note: The qualification issuing agency is currently the Certification Board for Inspection Personnel (CBIP). For chartered professional engineers and design verifiers, the body is the Institution of Professional Engineers New Zealand (IPENZ).

(7) Duties of inspection bodies in relation to certificates of competence

- (a) Inspection bodies must ensure that any design verification or equipment inspection they carry out is performed by a holder of a relevant certificate of competence.
- (b) Inspection bodies may have trainees carry out design verification or equipment inspection, provided they are competent to carry out the tasks assigned to them and they work under the effective supervision of a holder of a relevant certificate of competence. Effective supervision requires the supervisor to be based at the same office or workplace as the trainee.

PART 3: OPERATIONAL REQUIREMENTS FOR CONTROLLERS

The term “controller” means a person who is the owner, lessee, sublessee or bailee of equipment in a place of work and is confined to equipment under the PECPR Regulations.

The controller of a crane is responsible for the safe testing, operation, inspection, repair and maintenance of that crane.

A principal has similar duties to a controller.

Evidence of competence

Both the Health and Safety in Employment Act 1992 and the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 require persons operating plant to be competent.

Increasingly, principals and others require proof of competence of persons entering their sites, in order to discharge their own responsibilities. Controllers and employers should, therefore, be able to provide evidence that their crane operators have the skills, knowledge and experience necessary to safely operate their cranes.

An appropriate qualification from an appropriate industry training organisation may provide such evidence.

3.1 Operations

Training and supervision

Every controller of a crane is to take all practicable steps to:

- (1) supervise every crane function or specified activity or delegate such powers as are required to enable the appointed competent person to carry out that function or activity and ensure that the name of the competent person is known to any other persons who carry out any related activity.
- (2) ensure that every crane is operated in a safe manner by a competent person within the limits of its design.
- (3) ensure that procedures relating to the operation of the crane in any condition/situation are developed and kept under regular review. For exclusion areas, refer to the sections for the crane user and the crane operator of the *Crane Safety Manual for Operators/Users* published by the Crane Association of New Zealand. This manual also covers rope examination, communications and interference zones.
- (4) ensure that all drawings, manuals, specifications, certificates, operational procedures, rating sheets, hand signal charts and so on, are maintained in current form and the operating manual is readily accessible to the crane operator.

- (5) ensure the means of securing ropes to a drum, hook block or structure of the crane are as specified by the manufacturer. Care is to be taken to ensure that anchorage points are securely fastened in accordance with instructions.
- (6) ensure that any crane that is considered unsafe is withdrawn from service or is made safe to the satisfaction of an equipment inspector before further use.

Electrical protection

Every controller of a crane is to take all practicable steps to:

- (7) ensure that the electrical installation of every crane is in accordance with the appropriate requirements of AS/NZS 3000:2000 *Electrical installations* (known as the Australian/New Zealand Wiring Rules). At first commissioning, a chartered professional engineer (electrical) is to certify that the electrical installation and control circuits are appropriate and also that points 9 to 12 and 13(b) below are covered. This certification should be repeated after any subsequent alteration or repair to the electrical installation or controls.

Note: Such electrical installation may also be subject to the requirements of the AS 1418 *Cranes (including hoists and winches)* series of standards or other requirements of the relevant regulatory authorities.

Controls

Every controller of a crane is to take all practicable steps to:

- (8) ensure that operating levers or wheels have clear markings, on or adjacent to them, to indicate their function and mode of operation. Control arrangements can be specifically designed for “joystick” control of two movements simultaneously, otherwise they shall be so designed that selection of one movement cannot cause any other movement unless it is for the operation of a safety device or interlock. Control valve systems shall be designed to return to the neutral position when released, except when operational characteristics dictate otherwise.
- (9) ensure that, on electrically powered cranes, if power is lost for any reason, it is not be possible to restart the drive on restoration of the supply unless the control device has first been returned to the “off” position.
- (10) ensure that the weight of any pendant control is supported independently of its electrical conductors. If a pendant control enclosure is made of metal, then it shall be earthed and the earth shall not depend on supporting chains for continuity.
- (11) ensure that the design of electrically operated overhead travelling cranes is such that all brakes will automatically apply in the event of power failure.

- (12) ensure that, when magnet attachments are used, a recommended backup system (e.g. a battery) is used in case power supply to the magnet fails.

Radio-controlled equipment

Every controller of a crane is to take all practicable steps to:

- (13) ensure that equipment that controls the operation of the crane by radio, induction or other non-conduct means includes:
 - (a) a key switch or equivalent security device on the transmitter that can be used to prevent unauthorised use of the transmitter. The transmitter should also be constructed so that it is capable of withstanding rough handling.
 - (b) an emergency stop device. The system used for this shall only be used for emergency stop where it introduces no additional inbuilt time delay and shall incorporate a reset device.
 - (c) suitable visual indication on the crane indicating when the crane is on radio control.
- (14) ensure radio-controlled cranes incorporate a controlled range feature that enables the operating range to be positively limited to a safe distance determined by the competent person responsible for safety. The practical effect of this is that, if the operator tries to send the crane beyond the controlled range, the main contactor of the crane will open automatically and the crane should come to rest under the action of its automatically operated progressive form of long and cross-travel brake.

Safe access and egress

Every controller of a crane is to take all practicable steps to:

- (15) ensure a means of safe and adequate access and egress is provided for operation, maintenance and inspection of the crane
- (16) ensure a system for emergency escape from the operator's cab is provided.

Load handling

Every controller of a crane is to take all practicable steps to:

- (17) ensure that any load-handling devices such as grapples, demolition balls, clamshells, piling hammers, magnets and so on are maintained and operated in accordance with the manufacturer's recommendations and kept in a safe condition.
- (18) ensure that no crane with a load (other than the hook and slings) is operated in a free-fall situation on any site, other than clamshelling, draglining, pile driving, demolition and compaction.

Guarding

- (19) Every controller of a crane is to take all practicable steps to ensure that moving parts and exposed equipment that may foreseeably cause injury are suitably guarded.

3.2 Routine checking

Every controller of a crane shall ensure that:

- (1) operators carry out daily and weekly checks to enable the crane to be operated safely, according to the controller's written procedures based on the manufacturer's instructions, and that the controller can demonstrate that the checks have been carried out
- (2) the controlled range feature, where fitted on radio-controlled cranes, is tested at suitable intervals, and that at the beginning of each shift, or where there is a change in the crane operator, the controlled range is checked to ensure that it is in accordance with the limits specified for its operation.

3.3 Inspection and certification

Every controller of a crane shall ensure that:

- (1) cranes are inspected by an equipment inspector and issued with a certificate of inspection by the inspection body at intervals not exceeding 12 months
- (2) records are kept of the date, time and results of any inspection carried out and the name of the inspection body involved
- (3) the inspection body engaged is currently an IANZ-accredited inspection body and the equipment inspector is an approved signatory for the relevant type of crane
- (4) the unique identifier assigned by the inspection body is permanently and clearly marked on every crane when it is issued with a certificate of inspection for the first time
- (5) **maintenance records** are made available to the equipment inspector
- (6) where practical, the remaining life, based on the actual conditions of use, is recorded at every inspection

Note: An industry working party is considering the matter of major inspections and when to apply them and this will cover the assessment of the remaining life of the crane and provide details of what is to be recorded.

- (7) non-destructive testing (NDT) reports are approved by a suitably qualified signatory working for an IANZ-accredited inspection body. The NDT report must be IANZ-endorsed.

3.4 Alterations and repairs

Every controller of a crane shall ensure that:

- (1) the date and results of any structural alterations or repairs are recorded in a register
- (2) alterations or repairs that require changes in the quality of the materials used on the crane or changes to the dimensions of components providing structural integrity are subject to the manufacturer's written approval. The repairs are to be carried out to the satisfaction of an equipment inspector, and a new certificate of inspection may then be issued. The documentation is to be made available to the inspection body. Alterations and repairs carried out without involving an equipment inspector are likely to invalidate the certificate of inspection

Note: Where a crane has been design verified originally by calculation, where the manufacturer is not available, the repair must be designed by a chartered professional engineer and design verified. Where the crane was originally design verified on the basis of a manufacturer's statement, the manufacturer's approval is mandatory.

- (3) any structural repair that requires welding is carried out by a qualified welder in accordance with the manufacturer's specific procedures. If a manufacturer's procedures cannot be obtained, procedures must be proposed by a New Zealand-certified welding engineer (NZCWE). In both cases, the repairs are to be carried out to the satisfaction of an equipment inspector, and a new certificate of inspection will be issued
- (4) locally manufactured equipment is inspected and tested by an inspection body in accordance with the requirements of the manufacturing standard, and any inspection and test plan (ITP) specified by the designer. Where the designer does not provide an ITP, the manufacturer shall prepare the ITP. On completion of fabrication inspection, the equipment inspector shall review the manufacturer's data report and, when satisfied, endorse it
- (5) adjustments or repairs to any safety device are carried out by a competent person
- (6) any tests required by the equipment inspector are carried out to the satisfaction of the equipment inspector in accordance with the standards listed in Appendix C: Reference standards and documents.

3.5 Maintenance

Every controller of a crane shall ensure that:

- (1) every crane is maintained in a safe condition and in accordance with the manufacturer's instructions at all times

- (2) a procedure is in place that ensures a safety-related fault is immediately repaired and recorded
- (3) all **maintenance records**, procedures, drawings, specifications and instructions are kept up to date.

3.6 Accident notification

Every controller of a crane shall:

- (1) take all practicable steps to ensure that, if an event of the kind described in sub-clause (2) occurs, the actions described in sub-clause (3) are carried out.
- (2) The event is one that:
 - (a) occurs in a place of work, and
 - (b) causes:
 - (i) damage that affects the operational safety of equipment, or
 - (ii) damage to other property that may affect the safety of equipment, and
 - (c) might, in different circumstances, have caused any person to be seriously harmed.
- (3) The actions are:
 - (a) notifying the Secretary within seven days after the event
 - (b) giving the Secretary, within 28 days of the event's occurrence, a detailed written report of an investigation of the circumstances of the event, carried out by an inspection body or by a chartered professional engineer independent of the controller and the inspection body that carried out the previous inspection
 - (c) including a record of the incidents in the **maintenance records**.

Further detail is available in the Health and Safety in Employment Act 1992.

3.7 Designated design life

A crane's design life may not be the same as its actual life and depends on such factors as its classification, usage and its operating environment.

In the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999:

- regulation 18(c) requires designers to determine and specify in the design, the design life of the equipment
- regulation 20(3) requires suppliers to take all practicable steps to ensure, when importing for supply, equipment manufactured in an overseas country, that it has not already exceeded its design life

- regulation 10(c) requires controllers to operate equipment within the limits that it was designed to operate within.

As the end of the notional design life of a crane approaches, at periodic intervals or when a second-hand crane is imported into New Zealand, inspection and testing shall be carried out in order to determine that the crane will remain safe for continued use. This is likely to be over and above the routine annual inspection process.

This process may include:

- reference to the design criteria and standards
- review of any manufacturer's recommendations for examination or periodic replacement of safety critical components
- identification of states of loading producing highest stress or using finite element analysis data
- review of crane usage records
- examination of **maintenance records**
- stripping down or dismantling inaccessible parts
- non-destructive testing (NDT).

If there is insufficient information to enable the equipment inspector to make a proper assessment of the condition of the crane, the inspection body shall not certify it.

Note: An industry working group has been set up in 2007 to consider these matters and to provide advice to assist suppliers, controllers, equipment inspectors and inspection bodies to adopt a consistent, risk-based and cost-effective approach to dealing with this important issue. Guidelines or other recommendations produced by the group will be incorporated into this approved code of practice.

PART 4: REQUIREMENTS OF DESIGNERS

4.1 Requirements

In addition to the relevant sections of part 3, designers of cranes shall also ensure that:

- (1) the crane is designed for the operating conditions to a standard listed in Appendix C: Reference standards and documents accepted for use in New Zealand in connection with cranes
- (2) the design includes calculations for seismic influences, ice, snow and wind loadings and design life (where applicable for the type of crane)
- (3) the design verification, fabrication inspection requirements and safe working load are determined in accordance with the specific design standard for that particular crane, regulation 18 of the regulations and the requirements of this code
- (4) where two or more ropes are used in a system, means are provided for ensuring that tensile forces in the ropes are distributed in the designed proportions. Arrangements entailing reverse bends shall be avoided as far as possible. A rope reeving diagram shall be provided with the crane.
- (5) derricking ropes are of sufficient length to permit the jib to be raised from or lowered to the horizontal position during the erection or inspection of the crane
- (6) where ropes are used to support a fixed offset fly jib, the distances between the support point centres are specified by the manufacturer to enable the fly jib offset to be correctly set under working conditions.

PART 5: REQUIREMENTS OF DESIGN VERIFIERS

5.1 Requirements

Design verifiers are to:

- (1) carry out design verification on behalf of an inspection body
- (2) make recommendations to the inspection body relating to the issue or cancellation of certificates of design verification in accordance with regulations 30 and 31.

5.2 Design verification

Design verification is required for all cranes including second-hand cranes brought into New Zealand.

Two options are available for this process:

- (1) By design certificate

Design verification by design certificate may be used for imported cranes from recognised manufacturers producing standard cranes, designed and built to an acceptable engineering standard.

In all cases, where proven standard production model cranes are produced by manufacturers of established repute, subject to the following requirements, the crane can be accepted for design verification and fabrication inspection purposes on the basis of the manufacturer's design statement.

Where a crane is being constructed to a design that has been previously design verified, the existing design verification can be re-used provided no changes are made to the design or design standard affecting the structural strength or safety

The documentation required for design verification includes:

- (a) a statement signed by the chief design engineer, or other person authorised (in writing) by the manufacturer to sign such documents, stating the standard that the crane was designed and built to and that an independent design verification has been carried out. This shall be to a standard acceptable to the Department of Labour, e.g. BS, AS, EN, ANSI, DIN, ISO, JIS, NZS and any others that may be gazetted at a later date (refer to Appendix C).
- (b) sufficient data, drawings, documents and other information to readily identify the crane and all of its major components and parts supplied by the manufacturer or replacement parts that are authorised and approved by the manufacturer. This should include:

- (i) a general arrangement drawing that, if necessary, is supplemented by other drawings and shows the main boom and fly jib with chord and lacing members specified and shows also a typical mid-section of both
- (ii) a complete roping diagram showing all ropes.

Manufacturers shall ensure that crane components and parts that are readily interchangeable, such as strut boom and fly jib sections, are permanently marked or can otherwise be readily identified by equipment inspectors.

Test certification for all hooks, hook blocks and the standing and running ropes shall also be available.

(2) By design analysis

Design verification by design analysis is to be used for all cranes that are not proven standard production models.

Sufficient documentation should be provided to the design verifier to enable a check to be carried out to establish that all structural, mechanical, hydraulic and electrical parts meet the specified code requirements with respect to stress, deflection, fatigue and seismic and wind loading. This documentation should be in the form of arrangement, schematic and detailed fabrication drawings. Calculations may be provided but are not necessary, as the verification is an independent check on the design.

Drawings should specifically include:

- (a) general arrangement giving all outline dimensions, crane capacity, classification, impact factors, wheel or foundation forces and design standard being used
- (b) structural detail drawings showing sizes of all members, material specifications, welding and bolting details
- (c) mechanical arrangement and detail drawings showing sizes of all components and material specifications
- (d) electrical schematic drawings showing protection devices fitted
- (e) hydraulic schematic drawings showing all safety valves and fittings.

All drawings should have the designer's name and contact details, be numbered for easy reference and be supplied in duplicate. The crane owner's name and location should also be included.

Where previously design verified standard components have been used in the design, details of the design verification should be provided.

The inspection body will require test certificates for hooks and wire ropes before testing the crane.

PART 6: REQUIREMENTS OF MANUFACTURERS

6.1 Requirements

Every manufacturer of a crane shall ensure that:

- (1) the manufacture is carried out to the verified design and in accordance with the nominated standard
- (2) any changes made to the design of the crane in the course of manufacture are approved by the designer, design verified and recorded, and the crane is then manufactured in accordance with the verified design
- (3) the Secretary and controllers are advised of type faults
- (4) the controller is supplied with the information to operate the crane safely in accordance with regulation 21.

Note: New Zealand-manufactured equipment is inspected and tested by an inspection body in accordance with the requirements of the manufacturing standard, and any inspection and test plan (ITP) specified by the designer. Where the designer does not provide an ITP, the manufacturer shall prepare the ITP.

All NDT reports must be approved by a suitably qualified signatory working for an IANZ-accredited inspection body. The NDT report must be IANZ endorsed.

PART 7: REQUIREMENTS OF SUPPLIERS AND IMPORTERS

7.1 Requirements

- (1) Every supplier or importer of a crane shall ensure that:
- (a) the crane complies with the following regulations of the PECPR Regulations and any subsequent amendments:
 - regulation 18 Duties relating to design and design verification
 - regulation 19 Duties relating to manufacture and fabrication inspection
 - regulation 20 Duties relating to supply
 - regulation 21 Duties relating to provision of information.
 - (b) the documentation for the crane is written in English and all dimensions used are in the metric system
 - (c) the Secretary and controllers are advised of type faults
 - (d) the proper documentation as per the requirements for the particular type of crane stated in this code are provided to the inspection body and the purchaser of the crane
- (2) With regard to imported second-hand cranes, the supplier must be aware that the inspection body cannot progress the design verification and certification unless the documentation listed in part 5.2(2) is supplied when the crane is imported into New Zealand.

Note: All NDT reports must be approved by a suitably qualified signatory working for an IANZ-accredited inspection body. The NDT report must be IANZ endorsed.

PART 8: FUNCTIONS OF EQUIPMENT INSPECTORS

8.1 Functions

- (1) The functions of an equipment inspector are to:
 - (a) carry out equipment inspections on behalf of an inspection body. If it is a new crane, all documentation, including the design verification, shall be checked.
 - (b) make recommendations to the inspection body relating to the issue, renewal, suspension, or cancellation of certificates of inspection
 - (c) consider whether further inspection is required, in which case an NDT inspection will be needed. It must be carried out by an NDT company that is accredited for that particular type of inspection, and the report must be endorsed by the company to identify the accreditation.
 - (d) recommend to the inspection body that the Secretary of Labour be advised of any equipment considered so unsafe that a certificate of inspection has been declined, cancelled or suspended.
- (2) An equipment inspector must inform the manufacturer or controller, as the case requires, of:
 - (a) safety issues relating to the equipment
 - (b) the action, if any, required to make the equipment safe.
- (3) A proof load test must be carried out and witnessed by an equipment inspector at the first inspection unless the manufacturer specifies it is impractical to do so.

8.2 Inspections

At all future in-service inspections, the operation, maintenance and repair records are to be checked.

PART 9: MOBILE CRANES

9.1 General

Mobile cranes (both new and second-hand) require design verification by an inspection body in accordance with the PECPR Regulations and parts 2 and 5 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 6, 7 and 8 of this code also apply.

A supplier, manufacturer or controller of such a mobile crane shall provide this documentation, as in part 5.2, to the inspection body carrying out the design verification.

- (1) For full details of the safe load indicators, radius indicators and so on, that are required on various crane types, refer to Appendix A.

9.2 Additional requirements

In addition to the requirements in part 9.1 and part 3: Operational requirements for controllers, the following are also required:

- (1) The stability of a crane under static conditions shall be such that the rated capacity is not greater than the appropriate percentage of the tipping load that has to be applied to tip the crane over. This is 75% of the tipping load for all cranes except those built to the Japanese standards which quote 78%. For free on wheels it is to be not more than 66%.
- (2) The rope safety factor shall be a minimum of 4.5 for running ropes, 3.5 for standing ropes, 3 for erection ropes and the manufacturer's recommended rope types and construction for each use.
- (3) All rigging and boom options the crane is fitted for shall be shown in the cab.
- (4) An "anti-two-block" warning device shall be fitted to cranes in accordance with Appendix A.: Safe load indicators.
- (5) Annual visual and operational inspections by an equipment inspector are required to assess the general condition for continued safe operation and certification. This should cover (but is not necessarily limited to):
 - (a) crane documentation including certified rating sheets marked with the crane unique identifier and serial number
 - (b) maintenance and repair records including any new rope hook and hook block certificates
 - (c) operation of crane to be demonstrated

- (d) general condition of crane structure including fastenings, chassis, outriggers, including where applicable, any interlocking system, and boom and fly jibs
- (e) coatings condition (paint, etc.), markings and labels
- (f) general wear and tear
- (g) conditions of welded joints
- (h) level indicator (if fitted)
- (i) tracks/tyres
- (j) slew ring/king post
- (k) boom arrestors and backstops
- (l) bridle
- (m) counterweight/ballast
- (n) sheaves and bearings
- (o) hoist, luffing and slew brakes including brake linings
- (p) safety guarding
- (q) drums and locking pawls
- (r) gearing
- (s) hydraulic system including rams and attachments
- (t) anti-two-block and other limit switches
- (u) test of safe load indicator with test load to confirm all functions are within manufacturer's recommendations
- (v) condition of hoist, luffing and pendant ropes
- (w) rope anchors and dead ends
- (x) hooks, hook blocks and swivel bearings
- (y) lifting spreaders when used in place of a hook
- (z) cab condition and controls (including safety latches).

Further detailed in-depth inspections may be required depending on the results of visual inspection.

Additional items may be identified by the crane owner for inspection.

PART 10: TOWER CRANES

10.1 General

Tower cranes (both new and second-hand) require design verification by an inspection body in accordance with the PECPR Regulations and parts 2 and 5 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 6, 7 and 8 of this code also apply.

A supplier, manufacturer or controller of such a tower crane shall provide this documentation, as in part 5.2, to the inspection body carrying out the design verification.

- (1) A statement to confirm that the seismic requirements and wind loadings for operating in New Zealand have been taken into account in the design calculations as per appendices E and F is required. The statement shall specify the maximum in-service and out-of-service design wind speeds. The zone factor (ZF) of 1.2 shall apply to all cranes. Wind forces are to be calculated as per AS/NZS 1170.2:2002 *Structural design actions – Wind actions*.
- (2) For full details of the safe load indicators, radius indicators and so on that are required on the various crane types, refer to Appendix A.

10.2 Additional requirements

In addition to the requirements in part 10.1 and part 3: Operational requirements for controllers, the following are also required:

- (1) Electrically powered cranes should have phase failure protection so that, in the event of a phase failure, ALL phases are shut down.
- (2) All new rope luffing tower cranes shall have a secondary brake on the luffing drive. This is not retrospective.
- (3) Initial inspection of used cranes and annual visual and operational inspections are required to assess the general condition for continued safe operation and certification.
- (4) All tower cranes should be overload tested to 125% SWL after design approval certification and before the first use in New Zealand. (This test may be performed outside New Zealand if witnessed by a properly authorised and approved testing/inspection authority.) Thereafter, cranes are not to be overloaded except where agreed by the inspection body and the manufacturer. Setting of the load limits is to be performed, in accordance with the manufacturer's instructions, by an adequately trained person, duly authorised by the controller, at each and every erection or configuration change, or every 12 months. Testing of the load limits is to be performed each week by the crane operator or a competent person.

- (5) A plan should be developed for dealing with any emergency
- (6) Inspection of new and existing tower cranes is to be in four distinct parts as follows:

Part 1: An inspection by an equipment inspector prior to erection together with inspection of any repairs found necessary

Inspections will cover (but are not limited to):

- (a) an inspection of all components shall be carried out on every occasion prior to a tower crane being erected. This is commonly referred to as a ground inspection.
- (b) maintenance and repair records including any new rope certificates
- (c) general condition of crane structure, fastenings, towers, boom sections, counter boom section, counterweights (fixed or moving), A-frames, cab section, base section, climbing frame, rails
- (d) all parts to ensure they are marked for identification purposes
- (e) slew ring inspection and report to manufacturer's recommendations
- (f) coatings condition (paint, etc.)
- (g) general wear and tear (including report on electrical equipment by an appropriately qualified person)
- (h) weld condition
- (i) counterweight section
- (j) sheaves and bearings
- (k) hoist, luffing, slew brakes and linings
- (l) safety guarding
- (m) winch drums
- (n) gearing
- (o) power pack
- (p) hydraulic system, rams and attachments
- (q) condition of hoist, luffing, trolley and pendant ropes and counterweight ropes
- (r) bridle
- (s) rope anchors and dead ends
- (t) hooks, hook blocks and swivel bearings
- (u) base anchors to be subject to magnetic particle inspection for cracks and the date of testing recorded

- (v) crane bolts operating in tension to be tested for defects by visual and magnetic particle inspection techniques upon each dismantling of the joints/connections or every five years, whichever occurs first, or earlier if recommended by the manufacturer. This includes slewing, tower and tower head bolts, if applicable.

Note: Any bolts found with crack-like indications shall be removed from service and destroyed. IANZ-endorsed NDT reports are required.

Further detailed in-depth inspections may be required depending on results of visual inspection.

Additional items may be identified by the crane owner for inspection.

All signage hoardings and advertising billboards or banners that in any way affect the wind forces acting on the crane, other than as originally provided for by the manufacturer, must be specifically authorised by the manufacturer for the specific crane model and use during both in-service and out-of-service conditions, in accordance with the requirements of clause 10.1(1) or 11.1(1) as appropriate.

The mountings of any non-manufacturer-original signage hoardings, billboards and banners shall be approved by a chartered professional engineer. Flags (including hook-mounted flags) must be authorised by the manufacturer for the specific crane model and use and attached to the crane only during in-service conditions.

Note: Tower cranes are not to be erected for the first time until the equipment inspector has been presented with the completed design verification.

Part 2: The inspection and testing of the tower crane after erection and annual inspection for recertification.

Inspections and testing will cover (but are not limited to) the following items.

The following documentation is to be provided by the controller to the equipment inspector prior to testing commencing:

- (a) Statement from the controller with details of crane configuration, which must be within design verified parameters, including number of towers, jib length, counterweight weights certificates, rating sheet, new rope certificates, planned changes in height with details of tie-ins and number of towers between tie-ins, details of any clash zones and load-testing programme.
- (b) Foundation certificate, covering design and construction, from a chartered professional engineer and crack testing results of base anchors. IANZ-endorsed NDT reports are required.
- (c) IANZ-endorsed NDT report of crack testing of tower bolts.

- (d) Statement from the erector, who needs to have obtained a nationally accepted qualification, that the crane has been erected in accordance with the manufacturer's recommendations, including the vertical tolerances of the tower.
- (e) Test weight certificates.
- (f) Torque wrench accuracy certificate.

Inspection prior to testing to include:

- (a) crane access
- (b) base section installation
- (c) tower bolts
- (d) rope anchors and dead ends
- (e) ladders and platforms
- (f) pins, washers, split pins, locking plates
- (g) boom sections
- (h) counterweight sections
- (i) hydraulics
- (j) general electrical equipment.
- (k) bolt torques (where applicable) to be checked in accordance with the manufacturer's recommendations.

Refer to Appendix I: Tower crane inspections – minimum requirements for a tower crane inspection checklist.

Testing to include:

- (a) crane operation
- (b) driver's cab and controls
- (c) hoist, trolley and boom limit switches
- (d) load moment cutouts
- (e) hoist speed limiters
- (f) phase failure and rotation protection
- (g) calibration and testing of load moment cutouts, SLIs and load indicators, where fitted, in accordance with the manufacturer's instructions.

Part 3: The inspection by an equipment inspector and testing of the tower crane at alteration of the height and/or jib length when installed on a site

Inspections will cover (but are not limited to):

- (a) general inspection of crane condition
- (b) inspection and identification of new tower sections

- (c) confirmation of the maximum number of towers between tie-ins
- (d) checking results of magnetic particle inspection report of tower bolts where applicable
- (e) inspection of tie-in collars and supports and documentation of manufacture
- (f) statement of a satisfactory load test by an independent inspection organisation

Note: After repairs have been carried out, the crane is to be tested to the figure provided by the manufacturer in the repair specification.

- (g) confirmation that rope length is able to reach the lowest point with three turns left on the drum.

Part 4: The inspection of climbing system components

- (a) Prior to use, all tower crane climbing components shall be subject to an inspection by an equipment inspector, and a record of the inspection shall be kept on file and reported.
- (b) Following the installation of the climbing system onto the tower crane and before being placed in service, all components must undergo a pre-operational inspection and systems check by the person in control of the climbing operation. A record of this inspection shall be kept on file.

PART 11: SELF-ERECTING TOWER CRANES

11.1 General

Self-erecting tower cranes (both new and second-hand) require design verification by an inspection body in accordance with the PECPR Regulations and parts 2 and 5 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 6, 7 and 8 of this code also apply.

A supplier, manufacturer or controller of such a self-erecting tower crane shall provide this documentation, as in part 5.2, to the inspection body carrying out the design verification.

- (1) A statement to confirm that the seismic requirements and wind loadings for operating in New Zealand have been taken into account in the design calculation as per appendices E and F is required. The zone factor (ZF) shall apply to all cranes. The statement shall specify the maximum in-service and out-of-service design wind speeds. The stability factor shall be as per AS 1418.4 or an equivalent standard. The coefficient zone factor of 1.2 shall apply to all cranes. Wind forces are to be calculated as per AS/NZS 1170.2:2002 *Structural design actions – Wind actions*.
- (2) For full details of the safe load indicators, radius indicators and so on, that are required on the various crane types, refer to Appendix A.
- (3) All self-erecting tower cranes shall be overload tested to 125% SWL after design approval certification and before the first use in New Zealand. (This test may be performed outside New Zealand, if witnessed by a properly authorised and approved testing/inspection authority.) Thereafter, cranes are not to be overloaded except where agreed by the inspection body and by the manufacturer. Setting of the load limits is to be performed, in accordance with the manufacturer's instructions, by an adequately trained person, duly authorised by the controller, at each and every erection or configuration change, or every 12 months.

Testing of the load limits is to be performed every week by the crane operator.

11.2 Additional requirements

In addition to the requirements in part 11.1 and part 3: Operational requirements for controllers, the following are also required.

- (1) Prior to initial erection in New Zealand, and thereafter annually, an inspection shall be carried out by an equipment inspector (but not necessarily limited to) the items listed in part 1 of 10.2(5) of this code.

The inspection of these components is commonly referred to as a ground inspection.

A foundation certificate shall be provided by a chartered professional engineer stating that the foundations can withstand the crane manufacturer's approved crane loadings, including seismic and wind forces. Special attention must be paid to the supporting ground with, for example, concrete footings or substantial support of some form.

Note: Self-erecting tower cranes are not to be erected for the first time until the equipment inspector has been presented with the completed design verification.

- (2) After every subsequent relocation and erection and prior to use, an inspection and functional test shall be carried out by an equipment inspector and will include:
 - (a) adherence to the manufacturer's/designer's requirements
 - (b) a report from an inspection body that the crane has been erected and commissioned in accordance with the manufacturer's recommendations.
- (3) Additional componentry (i.e. jib sections, vertical towers, etc.) that modify the configuration of the crane, shall be subject to ground inspection prior to initial use, and annually thereafter, by an equipment inspector.
- (4) Following erection, and prior to use, any crane using additional componentry (as in (3) above) shall be inspected and tested by an equipment inspector, as in 11.2(2).
- (5) During use, the crane shall be maintained and tested in accordance with the manufacturer's/designer's requirements.
- (6) The load moment limit device will be load tested weekly by the designated crane operator or competent person, using test weights on site for that purpose, and the results shall be documented.
- (7) Safety barriers shall be installed at the base of the crane, to deny unauthorised access to the swing area of the lower rotating components.
- (8) Should it prove necessary for a self-erecting tower crane to be mounted on a structure or building, a foundation/structural design drawing and a certificate from a chartered professional engineer must be produced prior to the erection taking place.
- (9) All signage hoardings and advertising billboards or banners that in any way affect the wind forces acting on the crane, other than as originally provided for by the manufacturer, must be specifically authorised by the manufacturer for the specific crane model and use during both in-service and out-of-service conditions.

The mountings of any non-manufacturer-original signage hoardings, billboards and banners shall be approved by a chartered professional engineer. Flags (including hook-mounted flags) must be authorised by the manufacturer for the specific crane model and use and attached to the crane only during in-service conditions.

PART 12: OVERHEAD TRAVELLING AND PORTAL CRANES

Note: Overhead travelling and portal cranes are referred to as gantry cranes in this part. This includes straddle carriers.

12.1 General

Gantry cranes require design verification by an inspection body in accordance with the PECPR Regulations and parts 2 and 5 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 6, 7 and 8 of this code also apply.

A supplier, manufacturer, designer or controller of such a gantry crane shall provide this documentation, as in part 5.2, to the inspection body carrying out the design verification and equipment inspection.

12.2 Additional requirements

In addition to the requirements in part 12.1 and part 3: Operational requirements for controllers, the following are also required:

- (1) Welding is to be carried out in accordance with the requirements of the construction standard or AS/NZS: 1554 *Structural steel welding*.
- (2) Cranes shall be designed and constructed to one entire standard (both mechanical and structural) when the mechanical and structural components are designed as a homogenous whole, i.e. mixing of standards is not acceptable. Exception is made in the case of purpose-built approved hoist units, utilising either chain or wire rope for lifting, when running on the crane beam as a separate unit. Any changes to the dimensions of the standard hoist runner shall be design verified.
- (3) A record of inspection of the crane during manufacture.
- (4) Suitable warning notices of any live conductors on gantries and access points.
- (5) Clearly marked electrical power isolation switches. Pendant controls and radio controls are to have an emergency stop/reset button fitted.
- (6) Safe and adequate means of access for inspection and maintenance purposes are mandatory. Where this physically cannot be provided, an alternative method must be agreed between the manufacturer, the supplier and the owner of the crane. The means of access must be included in the design verification and certification of the crane by the inspection body.
- (7) the crane supporting structure shall have a structural certificate covering the design and construction from a chartered professional engineer stating any load limitations or conditions. Where multiple

lifting units are fitted to the cross travel of the crane beam, the safe working load of each lifting unit and any limitations of loading shall be prominently displayed on the crane beam. Where foundations are required for a free-standing gantry crane, investigations are needed to confirm that the ground on which the crane will stand is not subject to any form of subsidence.

- (8) In the event of failure of wheels or axles, provision is to be made on the long and cross travel to prevent a crane or any working part of a crane from falling off the rails.
- (9) Electrical installation shall comply with the Electricity Regulations 1997.
- (10) A visual inspection by an equipment inspector of the crane installation prior to testing.
- (11) A performance test for the full length of travel, where practical, including (if fitted):
 - (a) end limit switches
 - (b) proximity limits. If not specified in the standard the crane was designed to, for crane speeds less than 40 m/min, buffers are acceptable. However, for speeds greater than 40 m/min then proximity switches are necessary
 - (c) in all cases where two or more cranes are on the same runway then proximity limits must be fitted to all cranes
 - (d) load cells
 - (e) upper and lower hoist limits
 - (f) radio-control operation.

Note: Radio controls are to comply with BS 466 section 31.7 or equivalent.

- (12) Load testing to manufacturing standard or 125% of the maximum SWL if the manufacturing standard is not available.
- (13) Deflection test to be carried out in accordance with the standard to which the crane was manufactured, or 1/750th of the span under maximum safe working load if the standard does not specify deflection.

Note: This DOES NOT apply to wharf container cranes.

- (14) Test the operation of the hoist brake with the power supply turned off and maximum SWL applied.
- (15) Lowering of maximum safe working load by hand control with power off (where applicable).
- (16) Long travel braking (where applicable).

- (17) Any structural change to the crane or its components requires design verification.
- (18) Relocation of an existing crane to be re-inspected by an equipment inspector for the renewal of certificate and an overload test as if it was a new crane. The crane supporting structure shall have a structural certificate covering design and construction from a chartered professional engineer together with any load limitations.
- (19) Uprating of the crane is to be approved by a crane designer and design verifier. Increased loading on the supporting structure is to be approved by a chartered professional engineer. Testing to be carried out as for a new crane.
- (20) Replacement parts must be to the manufacturer's specifications.
- (21) Annual visual and operational inspections by an equipment inspector are required to assess the general condition for continued safe operation and certification. This should cover (but is not limited to):
- (a) maintenance and repair records
 - (b) operation of the crane to be demonstrated
 - (c) condition of hoist ropes and/or chains
 - (d) brakes and linings
 - (e) operation of all limit switches, alarms and proximity sensors
 - (f) operation of radio control in all modes (if fitted)
 - (g) rope anchors and dead ends. *Approved Code of Practice for Load-Lifting Rigging*, parts 4 and 5.1 apply.
 - (h) sheaves and bearings
 - (i) crane nameplate and details
 - (j) general condition of electrical equipment including pendant controls and phase failure protection
 - (k) foundations and supports for any apparent signs of distress. Where this is considered necessary, a chartered professional engineer's report should be prepared on the condition of the foundations and supports.
 - (l) rails and securing attachments where access is practical.
- Note:** The full length of the long travel rails and securing attachments shall be inspected when the crane is installed, at the first annual inspection and thereafter every four years, unless the crane service or environment and so on requires more frequent inspection. Suitable temporary access to the full length of the rails must be provided, where practical, to permit close visual inspection.
- (m) driver controls (where fitted)

- (n) cab windows (where used as protection in steelworks etc.) and that the cab is securely attached to the crane structure
- (o) cross-travel trolley/crab
- (p) rope drums and wrap
- (q) couplings
- (r) handrails, ladders and guards
- (s) derailment catchers
- (t) end stops and buffers
- (u) wheels, including bearings and axles
- (v) crane structure and fastenings including welds, rivets and bolts, and cab to crane structure
- (w) coatings condition (paint, etc.)
- (x) lubrication
- (y) hooks
- (z) lifting spreaders when used as a hook.

Further detailed in-depth inspections may be required depending on results of visual inspection.

PART 13: VEHICLE-MOUNTED TRUCK LOADER CRANES (INCLUDING KNUCKLE BOOM AND TELESCOPIC/STRAIGHT BOOM)

13.1 General

Vehicle-mounted truck loader cranes (both new and second-hand and including knuckle boom and telescopic/straight boom) require design verification by an inspection body in accordance with the PECPR Regulations and parts 2 and 5 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 6, 7 and 8 of this code also apply.

A supplier, manufacturer or controller of such a crane shall provide the following documentation, as in part 5.2, to the inspection body carrying out the design verification. Where crane documentation is not available, the New Zealand agent for the crane manufacturer may be able to provide the documentation if the crane serial number is quoted.

- (1) For full details of the safe load indicators, radius indicators and so on that are required on the various crane types, refer to Appendix A.

13.2 Additional requirements

In addition to the requirements in part 13.1 and part 3: Operational requirements for controllers, the following are also required:

- (1) Suppliers shall provide:
 - (a) manufacturer's rating chart
 - (b) manufacturer's recommended installation instructions
 - (c) operating and maintenance instructions
 - (d) hook certificate
 - (e) hook block, sheave block and wire rope certificates, where appropriate.
- (2) Before putting a crane into service, there shall be:
 - (a) a certificate from a Land Transport New Zealand-approved HVEC engineer to certify that the crane installation/vehicle modification complies with the crane/vehicle manufacturer's recommendations as specified in Land Transport Rule: *Heavy Vehicles 2004* (Rule 31002). This includes an assessment of suitability of the mounting to include crane loading.

Note: This Rule should be read in conjunction with Land Transport Rule: *Heavy Vehicles Amendment 2005*.

- (b) a certificate of inspection from an inspection body before first use as a crane
 - (c) a stability test demonstrating the stability of the vehicle with the crane at a maximum load for any given radius, which must be carried out with the crane level and on level ground

Note: If a wheel does lift off the ground, a further test with a 10% overload may be carried out at 90° to the tipping line. If the vehicle remains with up to half the wheels in any one axle set off the ground and at least one braked wheel is loaded, the unit is deemed to be stable. (This is to clarify the definition for a dual wheel axle and a tandem axle set found on many trucks.) Note that trucks fitted with only a drive-line park brake will not have a braked wheel when one drive wheel is off the ground.
 - (d) a note in the form of an approved load chart on the crane where it is visible to the operator describing any area of potential instability and operating limitations of the crane.
- (3) Annual visual and operational inspections by an equipment inspector are required to assess the general condition for continued safe operation and certification. This should cover (but is not limited to):
- (a) all boom and extension pins and bushes
 - (b) stabiliser beams, pins and leg operation. A vehicle fitted with outriggers must either have a locking device that is able to be seen in a locked position when the outriggers are retracted, or a visual or audible alarm for the driver to be warned that the outriggers are not fully retracted
 - (c) extension cylinder guide blocks
 - (d) control rods and pins
 - (e) hook pin and safety latch
 - (f) valve bank mounting
 - (g) tank mounting
 - (h) hydraulic hoses
 - (i) column or slew ring
 - (j) crane to truck chassis mounting
 - (k) demount mechanism on truck and crane
 - (l) crane base stop blocks fitted to both sides of main beam
 - (m) chassis spacer fitted on mounting bolts
 - (n) mounting bolts tight with lock nut or nylock
 - (o) load radius rating chart fitted
 - (p) parking bolt and parking mount

- (q) operation of overload protection systems and load holding valves
 - (r) electrical emergency stop and radio compliance
 - (s) crane documentation including certified rating sheets marked with crane unique identifier and serial number
 - (t) maintenance and repair records including any new rope certificate
 - (u) general condition of crane structure, fastenings and chassis
 - (v) coatings condition (paint etc.), markings and labels
 - (w) condition of welded joints
 - (x) winch, sheaves, hook block and bearings (where fitted)
 - (y) condition of hoist ropes (where fitted)
 - (z) rope anchors and dead ends (where fitted)
 - (aa) hook block and swivel bearing
 - (bb) jib
 - (cc) manual extension
 - (dd) remote/radio controls to be tested, where applicable
- (4) Up to 15-tonne metre cranes shall:
- (a) comply with 13.1, 13.2(1) and 13.2(2) above
 - (b) be fitted with load holding valves on main, outer and extension booms
 - (c) be fitted with pilot-controlled double check valve on each stabiliser jack
 - (d) have an annual inspection carried out by an equipment inspector.
- (5) Over 15-tonne metre cranes:
- (a) Units in New Zealand as at the date of the release of this code shall:
 - (i) comply with 13.1, 13.2(1), 13.2(2) and Appendix A: Safe load indicators
 - (ii) after initial inspection, have an annual inspection carried out by an equipment inspector.
 - (b) Units imported into New Zealand after the release of this code shall:
 - (i) comply with 13.1, 13.2(1), 13.2(2) and Appendix A: Safe load indicators
 - (i) if remote- or lever-controlled crane, have an emergency cut-off/reset button at each operating control station

- (iii) be fitted with load holding valves on main, outer and extension booms
 - (iv) be fitted with a pilot-controlled double-check valve on each stabiliser jack
 - (v) have an annual inspection carried out by an equipment inspector.
- (6) All certificates of inspection must be placed and visible in the vehicle cab.
- (7) When moving on the road, the crane boom must be either located in or on the parking mount provided, or located or locked in a position such that the boom cannot move outside the vehicle dimensions.
- (8) If, at any time, a vehicle-mounted truck loader crane has a device fitted for the purpose of lifting personnel, it must also comply with the *Approved Code of Practice for Elevated Work Platforms*.

Note: "Tonne metre capacity" is the lifting capacity in tonnes multiplied by the minimum radius.

PART 14: TRACTOR CRANES AND SIDE BOOM PIPE LAYERS

14.1 General

Tractor cranes and side boom pipe layers (both new and second-hand) require design verification by an inspection body in accordance with the PECPR Regulations and parts 2 and 5 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 6, 7 and 8 of this code also apply.

A supplier, manufacturer or controller of such tractor cranes and side boom pipe layers, shall provide this documentation, as in 5.2, to the inspection body carrying out the design verification.

- (1) For full details of the safe load indicators, radius indicators and so on that are required on the various crane types, refer to Appendix A.

14.2 Additional requirements

In addition to the requirements in part 14.1 and part 3: Operational requirements for controllers, the following are also required:

These cranes normally have a limited boom length, and shall have:

- (1) an annual inspection carried out by an equipment inspector
- (2) the boom adequately marked to indicate boom length
- (3) a boom angle indicator fitted (if applicable).

PART 15: OTHER CRANES

15.1 General

This part includes but is not limited to:

monorails	scotch derricks
pillar cranes	jib cranes
guy derricks	dockside container cranes (all types)

These cranes (both new and second-hand) require design verification by an inspection body in accordance with the PECPR Regulations and parts 2, 3 and 5 of this code, prior to certification for use within New Zealand. This does not cover shipboard cranes and derricks.

Parts 3, 4, 6, 7 and 8 of this code also apply.

- (1) For full details of the safe load indicators, radius indicators and so on that are required on the various crane types, refer to Appendix A.
- (2) For dockside container cranes (all types), a statement to confirm that the seismic requirements and wind loadings for operating in New Zealand have been taken into account in the design calculations. as per appendices E and F is required. The stability factor shall be as per AS 1418.4 or an equivalent standard. It is expected that the coefficient zone factor of 1.2 will apply to all cranes. Wind forces are to be calculated as per AS/NZS 1170.2: 2002 *Structural design actions – Wind actions*.

All dockside container cranes must have an anemometer fitted.

15.2 Additional requirements

In addition to the requirements in part 15.1 and the relevant sections in parts 3 and 12, the following are also required:

- (1)
 - (a) For cranes designed to AS 1418.3, the deflection for wall-mounted cranes is 1/300th of the jib length, and for non-wall-mounted cranes, the deflection is 1/300th of the jib length plus the length of the free-standing post.
 - (b) For monorails designed to BS 2853, a deflection test under load to ensure a maximum deflection of no more than 1/500th of the monorail span.
- (2) Annual visual and functional inspections are required to assess the general condition for continued safe operation and certification. This should cover (but is not necessarily limited to) the items for gantry cranes (part 12.2(21) refers) but also taking into account any special design features that may be part of an individual crane installation.

- (a) In the case of Scotch derricks, visual inspection of the heel and top pins, backstays, bridle and sleepers shall be included.
 - (b) Scotch derricks are to be retested to 125% of the maximum SWL when dismantled and resited.
 - (c) For jibs and guy derricks, visual inspection of heel pins shall be included.
 - (d) For dockside container cranes, inspection of the personnel lift (if fitted) shall be included. Anemometers also need to be fitted.
- (3) Monorails, pillar and jib cranes, subject to the PECPR Regulations, with a SWL of 1 tonne or less, are to have design verification, followed by a first inspection by an equipment inspector as per 15.2(1) and 15.2(2). This will include a chartered professional engineer's report on the supporting structure being capable of carrying the load. After this first inspection, further inspections can be carried out by a competent person and documented in a register.

PART 16: EARTHMOVING AND FORESTRY EQUIPMENT (WHEN BEING USED AS A CRANE)

16.1 General

These machines should only be used when carrying out work associated with the primary function of the machine and shall have:

- (1) lifting hooks, eyes or other attachments, certified and rated by a chartered professional engineer and tested to BS 2573
- (2) a rating chart in the cab showing the various outreaches. (This will be obtained from the manufacturer's lifting data sheets.) The SWL is to be marked on the boom or where it can be easily seen.
- (3) hydraulic check valves fitted.

Notes:

These machines include high-duty cycle forestry production equipment.

Machines fitted with "quick hitch" couplings using a bucket with a lifting hook attached shall have a fail-safe quick-hitch locking device. Where machines have these couplings fitted, it is good practice to remove the bucket and have the certified hook fitted to the boom end.

These machines require regular inspections but not:

- (1) an annual inspection by an equipment inspector, or
- (2) a safe load indicator.

PART 17: FORKLIFTS AND TELEHANDLERS

17.1 General

- (1) Forklifts with provision for a suspended load, including containers.

Attachments fitted to forks or with forks removed and a permanent lifting attachment fitted:

- (a) shall be designed and constructed for the purposes of suspending a load



- (b) shall not exceed 80% of the moment obtained from the rated load applied at the specified load centre of the forklift, not the maximum lifting capacity of the forklift, as per NZS/AS 2359.1 *Powered industrial trucks – General requirements*.

Note: Forklifts with a permanent attachment must be inspected and certified by an equipment inspector.

- (2) Telehandlers

A telehandler is a versatile type of mobile lifting plant incorporating a telescopic boom fitted with a lifting attachment. The usual means of lifting is by forks, but telehandlers can be fitted with a variety of attachments for different load types. The range of attachments that can be used depends on the design of the particular machine and can often include a jib for lifting freely suspended loads.

Typically, telehandlers are used to travel with their load (pick and carry). When the load is supported on forks, it should be lowered as close to the ground as possible and the boom retracted during travel.

However, when the load is freely suspended, it may need to be elevated to prevent it snagging on the ground or other obstacles. This, coupled with the fact that the load can swing and exert additional dynamic forces on the machine, will adversely affect the machine's stability. When operating on sloping ground, instability is aggravated as the load swings further out from the centre of gravity.

A telehandler designed and intended to be used as a mobile crane, to pick and carry a freely suspended load, must have a stability ratio not greater than 66% in this mode; for static lifts, the ratio is 75%. This is the maximum allowable stability ratio specified in AS 1418.5 *Cranes, hoists and winches: Mobile cranes*.

Many telehandlers are designed to European standard EN 1459 *Safety for industrial trucks – Self-propelled variable reach trucks*.

This standard specifies the safety requirements for telehandlers used to lift loads rigidly supported by forks or other means. It explicitly excludes the design of machines used to lift freely suspended loads.

Owners of telehandlers and those responsible for their use should ensure they have all applicable information from the supplier of the machine, including the maximum operational slope and other limitations. They should also ensure the machines they have responsibility for have been designed to accommodate the required attachments and are suitable for the task they are to perform and the location they are intended to be used in.

Those machines that are designed to carry freely suspended loads are to be design verified and a certificate of inspection is to be issued to cover the use as a crane.

Those machines that are not designed to carry freely suspended loads (e.g. those designed to EN1459) do not require design verification or a certificate of inspection. They will be treated as above as per section 17.1(1).

All other equipment that may be fitted to the telehandler is to be certified for purpose by a chartered professional engineer or as supplied as proprietary attachments recommended and supplied by manufacturers and built to a recognised standard.

PART 18: CRANE-LIFTED WORK PLATFORMS

18.1 General

A crane-lifted work platform is the piece of equipment, from which personnel carry out their work, which is either attached to the crane's hook or the head of the crane's boom.

Conditions that apply to the use of a crane-lifted work platform:

- (1) All platforms shall be designed, manufactured and tested in accordance with BS 2573 (50% overload) or a standard that is acceptable to the Department of Labour. The work platform must have the safe working load visibly marked.
- (2) The platform is to be fitted with sidewalls or guardrails with midrails and toe-boards, or guardrails with any other suitable barrier such as expanded metal or chain mesh. The sidewalls or guardrails should be of a minimum height of 1 metre and be able to withstand, without obvious deflection, a horizontal force of 440 Newtons or a vertical force of 690 Newtons applied separately in any position.
- (3) The floor of the platform shall be slip-resistant and free draining. Electrically insulated platforms need not be free draining, but can be fitted with an insulated insert complying with ANSI 92.2. Insulated buckets should be dried using sponge and bucket before use. Platform gates, where fitted, shall be able to be secured in position and open inwards or slide sideways and be self-closing.
- (4) A safe means of access to the platform shall be provided. If access is by means of steps or a fixed ladder, the rise of steps or rungs shall be uniform and shall not exceed 300 mm. The steps or rungs shall be slip-resistant.
- (5) Machines designed for specific activities may have different platform and guardrail layouts provided an equivalent level of safety is afforded operators.
Note: Work platforms are to be inspected when first manufactured to ensure compliance with these conditions. This inspection is to be carried out by a chartered professional engineer or an equipment inspector. Subsequent inspections are to be carried out annually and a record kept of these inspections.
- (6) All cranes being used as a suspended work platform shall have power lowering capability. Free-fall capability shall be locked out.
- (7) If man-riding operations are to be undertaken then no other crane operations are to be carried out.

- (8) Where a crane that is to be used has multiple hoist drums and is fitted with a hoist system that allows either hook block to free fall, the hook block not in use shall be removed and the wire rope stowed.
- (9) Cranes operating swinging or fixed platforms shall operate at not more than 75% of their safe working load.
- (10) All cranes being used with swinging platforms shall have anti-two-block devices fitted, unless they have a fixed hook.
- (11) When operating swinging work platforms from the hook, all hook safety latches shall be fully operational.
- (12) When a work platform is suspended from a hook, the crane operator shall be in attendance at all times and shall operate the crane within the manufacturer's recommendations.
- (13) The crane operator shall carry out appropriate inspections of equipment daily before use.
- (14) Persons working on the platform shall wear the appropriate safety harness, incorporating an energy/shock absorber, at all times suitably attached. In the case of a platform suspended from the hook, all harnesses shall be independently attached to the hook. Where the platform has a roof or cover there shall be a harness anchor point incorporated in the structure under the roof.
- (15) Appropriate personal protective equipment shall be worn at all times.
- (16) Persons working from the platform shall be able to have appropriate communication with the crane operator at all times.
- (17) Truck loader cranes using personnel baskets must have a fixed boom connection between the crane and the basket including the yoke. (The yoke may swing to maintain a vertical position.) The certificate issued will cover the crane and the personnel basket (including personnel basket components) to be used as it was intended.
- (18) When operating a swing platform above water, persons in the platform may replace the safety harness and lanyard with an approved life jacket, provided a job-specific assessment has been undertaken taking into account the working environment and the hazards presented in that workplace, e.g. structures, changing water levels, currents and wind.
- (19) A plan should be developed for dealing with any emergency.

PART 19: DEMOLITION BALL OPERATIONS

The incorrect use of a demolition ball is hard on the machine. Crane operators shall be conversant with demolition balling, and the work shall be supervised by an experienced person.

19.1 Machines

Not all machines are robust enough to withstand the rigours of demolition ball work. Large capacity strut boom crawler cranes are the most suitable. Hydraulic boom cranes shall not be used for this type of work, as overstressing at the sliding points can occur. Because an uncontrolled demolition ball swings in all directions, slackness in the boom and slewing machinery will reduce control of the ball and make operating uncomfortable.

Precautions shall be taken to prevent the hoist rope from leaving the boom point sheave, as the slack rope condition, when the ball has fallen, allows the rope to jump off the sheave unless heavy duty rope guards are fitted. Damage is likely where the ball is attached to the hoist rope. Hoist ropes should not be fixed directly to the demolition ball. These should be joined by a minimum 16 mm chain section at least 2 metres long.

19.2 Falling object protective structures (FOPS)

Cranes used specifically for balling should be fitted with a FOPS cab that should be enclosed, strong and debris-proof. ISO 8083:2006 *Machinery for forestry – Falling-object protective structures (FOPS) – Laboratory tests and performance requirements* refers.

19.3 Demolition ball

Safety rules for balling:

- (1) ALL demolition is to be supervised by a competent person.
- (2) The boom angle when balling should not be more than 60° to the horizontal.
- (3) The top of the boom should not be less than 3 metres above the wall being knocked down.
- (4) The static weight of the demolition ball is to be not more than 33% of the machine's maximum rated safe working load.
- (5) The weight of the ball is not to exceed 10% of the hoist rope's minimum breaking load.
- (6) The boom and hoist rope are to be as short as possible.
- (7) The ball is to be securely attached to the chains from the hoist and drag ropes with a swivel coupling and inspected hourly.

- (8) Arrestors are to be fitted to prevent the boom whipping back over the machine should a rope or coupling fail, or an entangled ball break free.
- (9) Operators are to be protected from debris by a protective structure of metal mesh adequate and safe for the purpose intended. Operators shall be competent and experienced.
- (10) The machine shall be in proper working order while in use. When the demolition ball is suspended, the operator shall be at the controls.
- (11) Machine fatigue shall be watched for, and particular attention should be paid to fatigue failure at pendant rope sockets.

For further information on safe demolition practices, refer to the *Approved Code of Practice for Demolition* (published by the Department of Labour).

APPENDIX A: SAFE LOAD INDICATORS

The following table shows the type of equipment that should be fitted, as a minimum, to the machines listed. The chart also includes details of radius indicators, boom length indicators and anti-two-block devices, and so on, that should be fitted to appropriate items of plant.

Table A1: Safe load indicator use

Crane type	Radius or angle indicator	Boom length indication	Anti-two-block warning device	Anti-two-block cutout	Automatic SLI*	Safe load indicator	Load moment indicator	Load moment limiter or cutout	Load gauge or display	Anemometers
Mobile - up to 3 tonne - 3-10 tonne - over 10 tonne	M	M	R ^①		② or M	② or	R or	R or	R	
	M	M	M ^①				② or	②	②	
	M	M	M ^①							R
Tractor and industrial	M	M	R ^①		R	R	R	R	R	
Tower	M			M	⑥	R	R	M	R	M
Self-erecting tower	M	M		M		R	R	R ^③	M ^⑤	R
Gantry			Over-hoist limiter M							
			Under-hoist limiter R							
Truck loader - under 5-metre tonne - 5-15-metre tonne - over 15-metre tonne	M ^③	M ^③	R ^①				R	M		
	M ^③	M ^③	M ^①				R	M		
	M ^③	M ^③	M ^①				M ^⑤	M		
Side boom pipe layers		M								
Other cranes	R	R	R		④	④	④	④	④	⑦

Key

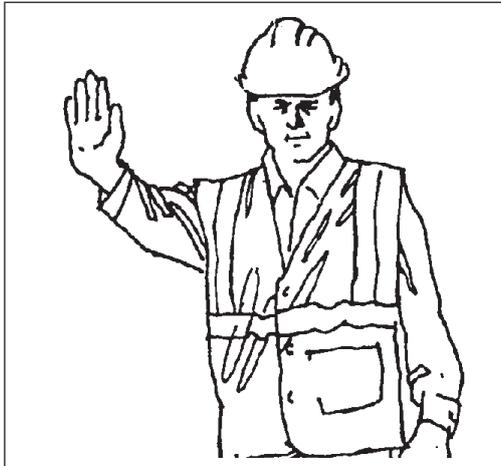
- ① Where the crane has a hoist winch.
- ② One of the safety features MUST be fitted.
- ③ For telescopic/straight boom cranes only. This **does not** apply to knuckle boom cranes.
- ④ One of the safety features SHOULD be fitted.
- ⑤ For new or imported truck loader cranes over 15-metre tonnes, overload protection to stop a load moment increasing function at 100% of the crane's rated load is mandatory and shall be fitted by the manufacturer or with the manufacturer's approval.
- ⑥ Where the load limiter or cutout cannot be provided other than with an automatic SLI, then

- ⑦ the SLI shall be mandatory.
- ⑧ Anemometers are mandatory on container cranes.
- ⑨ For self-erecting tower cranes, the split column shows if one column is M the other column is R.
- * SLI must have audible warning.
- M Mandatory for issue of certificate of inspection.
- R Recommended.

Notes

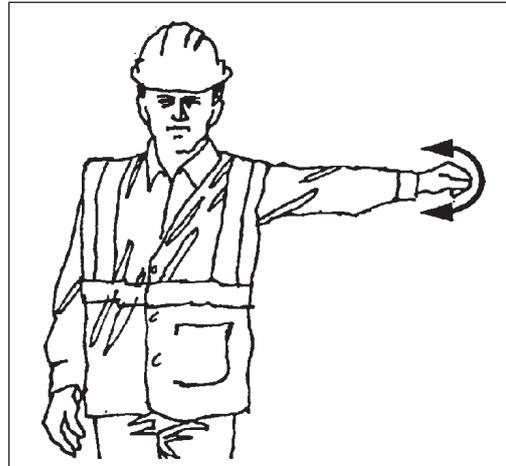
- 1. The anti-two-block device may be removed during piling operations as it is possible the device itself may be shaken loose and cause a further risk.
- 2. Where an anti-two-block warning device or cutout are not available then two-block damage protection, if fitted, is acceptable.
- 3. **Maintenance records** in accordance with manufacturer's recommendations must be produced for the issue of the certificate of inspection. This will apply one year after the next inspection following the issue of this code of practice.

APPENDIX B: HAND SIGNALS



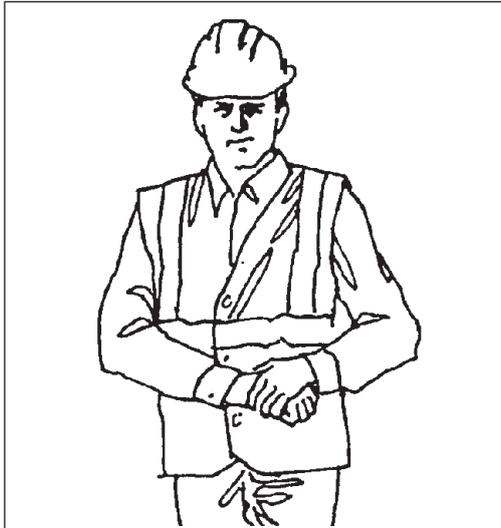
STOP

Extend one arm and hold palm of hand vertical.
Note: EMERGENCY STOP is indicated by holding both arms up.



STOP (B)

Arm extended, palm down, move hand right and left.
Usually for different level operations.



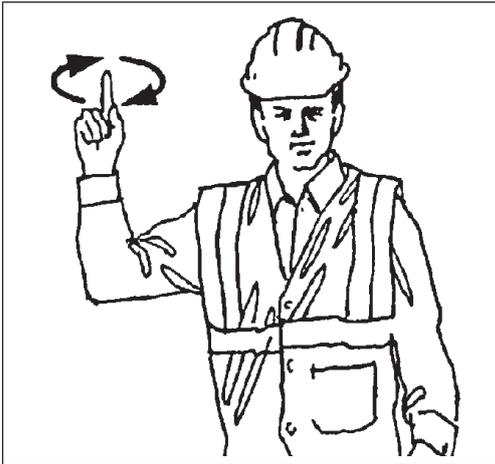
HOLD EVERYTHING

Clasp hands in front of body.



MOVE SLOWLY

Place one arm motionless across chest in conjunction with or before giving any other directional signal.
[“Hoist slowly” shown as example.]



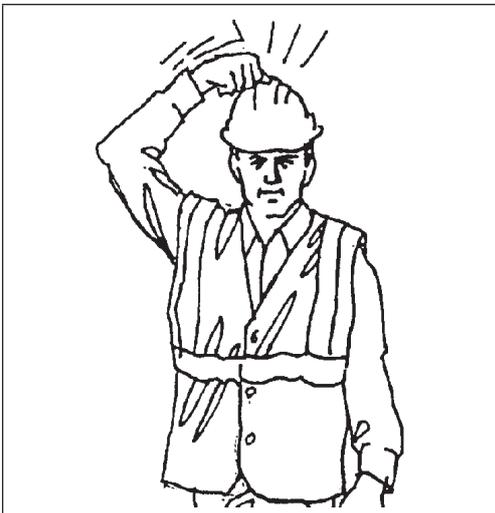
HOIST

With forearm vertical, forefinger pointing up, move hand in horizontal circles.



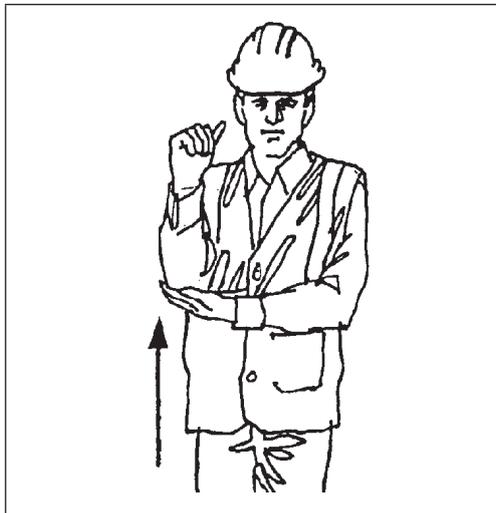
LOWER

With arm extended downward, forefinger pointing down, move arm in horizontal circles.



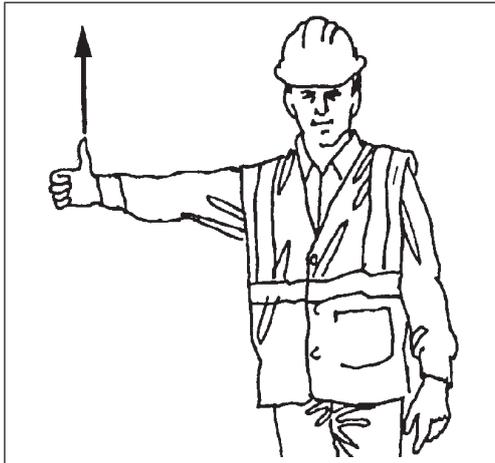
USE MAIN HOIST

Tap fist on head, then use regular signals.

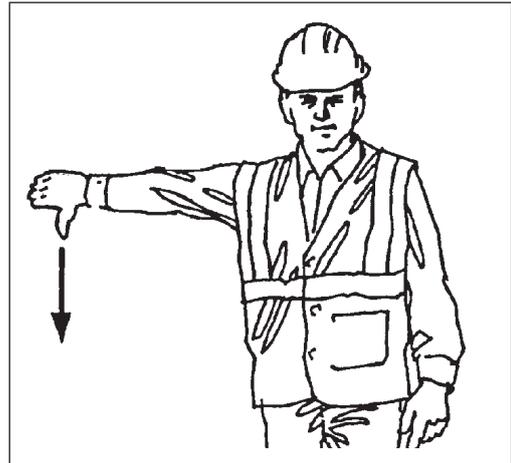


USE FLYLINE (AUXILIARY HOIST)

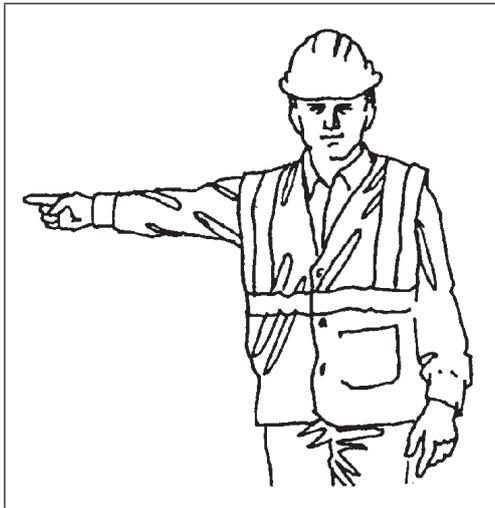
Tap elbow with one hand, then use regular signals.



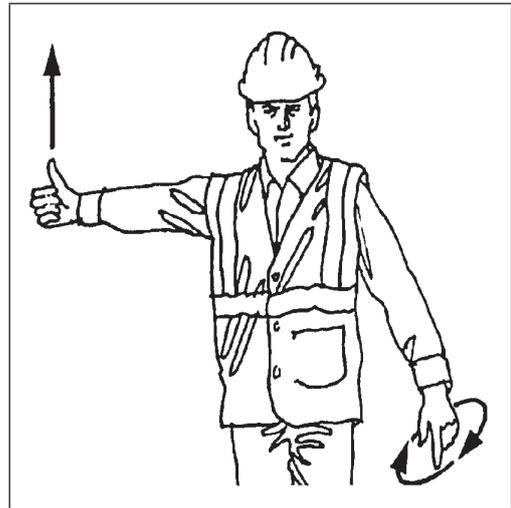
RAISE BOOM (LUFF UP)
 Arm extended, fingers closed, thumb pointing upward.



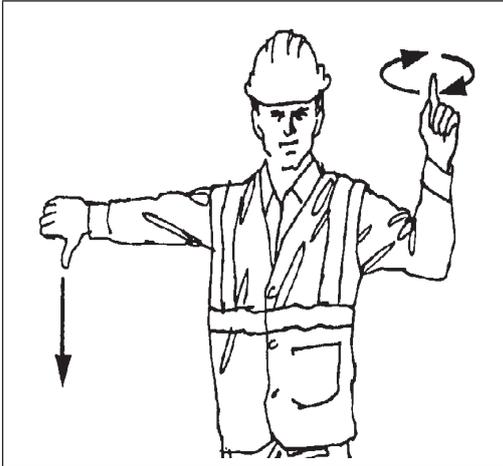
LOWER BOOM (LUFF DOWN)
 Arm extended, fingers closed, thumb pointing downward.



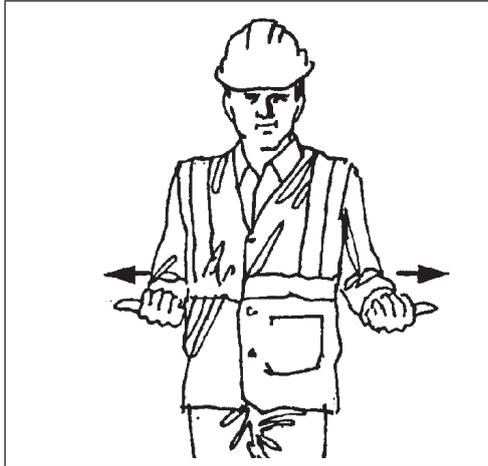
SLEW
 Arm extended, point with finger in direction of swing of boom.
OVERHEAD GANTRY CRANE - Arm extended, point with finger in the long-travel or cross-travel direction.



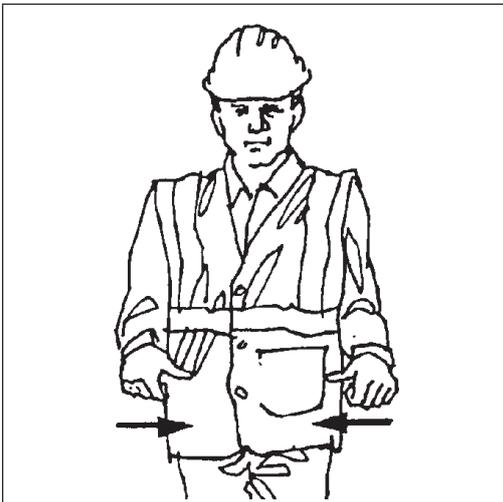
RAISE THE BOOM AND LOWER THE LOAD
 One arm extended, fingers closed, thumb pointing upward. Other arm extended downward with forefinger pointing down, move arm in horizontal circles.



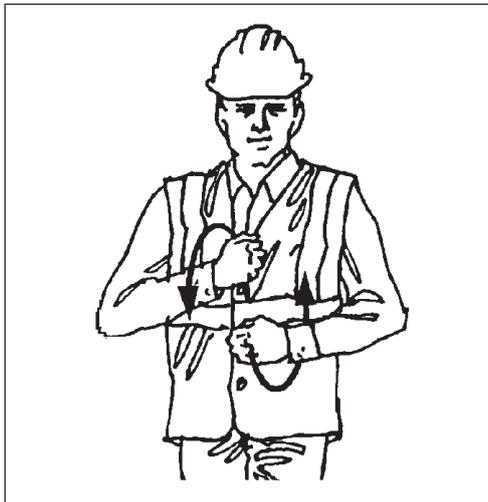
LOWER THE BOOM AND RAISE THE LOAD
 One arm extended, fingers closed, thumb pointing downward. Other arm vertical with forefinger pointing up, move arm in horizontal circles.



**EXTEND HYDRAULIC BOOM OR TROLLEY OUT
 (TOWER CRANE)**
 Both fists in front of body with thumbs pointing outward.



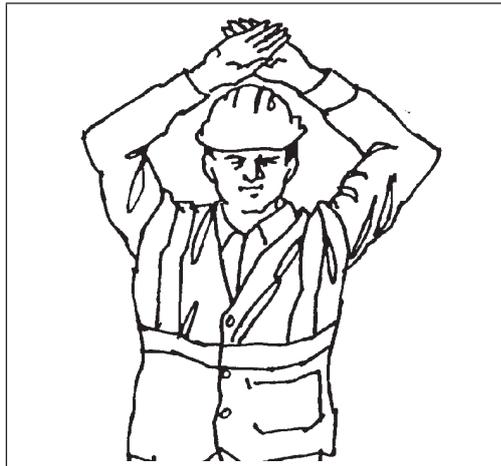
**RETRACT HYDRAULIC BOOM OR TROLLEY IN
 (TOWER CRANE)**
 Both fists in front of body with thumbs pointing toward each other.



TRAVEL
 Arms bent at the elbows, fists clenched, rotate both forearms around each other, then point in the direction of travel.



TRAVEL (ONE TRACK - CRAWLER CRANES ONLY)
Lock the track on the side indicated by the closed fist. Travel opposite track in the direction indicated by circular motion of other fist rotated vertically in front of body.



FINISHED WITH CRANE
Place arms above head and cross hands.

APPENDIX C: REFERENCE STANDARDS AND DOCUMENTS

AS 1418.1–2002	<i>Cranes, hoists and winches – General requirements</i>	BS 7333:1990	<i>Specification for slewing jib cranes</i>
AS 1418.2–1997	<i>Cranes (including hoists and winches) – Serial hoists and winches</i>	BS CP 3010:1972	<i>Code of practice for safe use of cranes (mobile cranes, tower cranes and derrick cranes)</i>
AS 1418.3–1997	<i>Cranes, hoists and winches – Bridge, gantry, portal (including container cranes) and jib cranes</i>	BS EN 12999:2002	<i>Cranes. Loader cranes</i>
AS 1418.4–2004	<i>Cranes, hoists and winches – Tower cranes</i>	BS EN 1677–5:2001	<i>Components for slings. Safety. Forged steel lifting hooks with latch. Grade 4</i>
AS 1418.5–2002	<i>Cranes, hoists and winches – Mobile cranes</i>	BS EN 13001–1:2004	<i>Crane safety. General design. General principles and requirements</i>
AS 1418.11–2004	<i>Cranes, hoists and winches – Vehicle-loading cranes</i>	BS EN 13155	<i>Cranes. Safety. Non-fixed load lifting attachments</i>
AS 1418.17–1996	<i>Cranes (including hoists and winches) – Design and construction of workboxes</i>	BS EN 1459:1999	<i>Safety of industrial trucks. Self-propelled variable reach trucks</i>
AS 1418.18–2001	<i>Cranes, hoists and winches – Crane runways and monorails</i>	BS ISO 1837:2003	<i>Lifting hooks. Nomenclature</i>
AS 2550 (set)	<i>Safe use of cranes, hoists and winches – corresponds to AS 1418 i.e. 2550.18 and AS 1418.18 deal with the same item of equipment.</i>	ISO 4309:2004	<i>Cranes. Wire ropes. Care, maintenance, installation, examination and discard</i>
AS/NZS 1170.2:2002	<i>Structural design actions – Wind actions</i>	ISO 8083:2006	<i>Machinery for forestry – Falling-object protective structures (FOPS) – Laboratory tests and performance requirements</i>
AS/NZS 1554.1-6 (set)	<i>Structural steel welding</i>	NZS 1170.2:2002	<i>Structural design actions – Wind actions</i>
AS/NZS 3000:2000	<i>Electrical installations</i>	NZS 1170.5:2004	<i>Structural design actions – Earthquake actions</i>
BS 466:1984	<i>Specification for power driven overhead travelling cranes, semi-goliath and goliath cranes for general use</i>	NZS 4203:1992	<i>General structural design and design loadings for buildings</i>
BS 1757	<i>Specification for power-driven mobile cranes</i>	NZS 4711:1984	<i>Qualification tests for metal-arc welders</i>
BS 2452:1954	<i>Specification for electrically driven jib cranes mounted on a high pedestal or portal carriage (high pedestal or portal jib cranes)</i>	NZS/AS 2359.1:1995	<i>Powered industrial trucks – General requirements</i>
BS 2853:1957	<i>Specification for the design and testing of steel overhead runway beams</i>	NZS/BS 2573–1:1983	<i>Rules for the design of cranes. Specification for classification, stress calculations and design criteria for structures</i>
BS 5744:1979	<i>Code of practice for safe use of cranes (overhead/underhung travelling and goliath cranes, high pedestal and portal jib dockside cranes, manually-operated and light cranes, container handling cranes and rail-mounted low carriage cranes)</i>	NZS/BS 2573–2:1980	<i>Rules for the design of cranes. Specification for classification, stress calculations and design of mechanisms</i>
BS 7121 (set)	<i>Safe use of cranes</i>		<i>Approved Code of Practice for Load-lifting Rigging</i>
BS 7262:1990	<i>Specification for automatic safe load indicators</i>		<i>Approved Code of Practice for the Safe Handling, Transportation and Erection of Precast Concrete</i>
			<i>Approved Code of Practice for Demolition</i>
			<i>Crane Safety Manual for Operators/Users, available from the Crane Association</i>
			<i>Electricity Regulations 1997</i>
			<i>Lifting Equipment. Engineers of New Zealand – Code of Practice for the Safe Use of Lifting Equipment</i>

APPENDIX D: FORM OF NOTICE

Where a controller has received a written report from an inspection body requiring corrective action as noted in 8.1(2) and has not taken appropriate action to remedy the matter within the period specified in the report, the inspection body should issue the following notice.

Client address

Date

Dear Sirs

Outstanding Corrective Action

Brief description and unique identifier of equipment

Inspection bodies have a general duty under the Health and Safety in Employment Act 1992 and a specific duty under regulation 24 of the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 to advise the Secretary of Labour of unsafe equipment.

We note from our files that the following matters in our report **reference and date** are still outstanding.

Brief details of corrective actions and/or outstanding certificates of inspection reported by the inspection body.

In accordance with the duties noted above, a copy of this notice has been forwarded to the Secretary of Labour.

Please contact us to make arrangements to complete this work.

Yours faithfully

**Signed by Technical Manager
Inspection Body**

cc Secretary of Labour
Department of Labour
PO Box 3705
Wellington

Attention: Safety Engineers

APPENDIX E: SEISMIC REQUIREMENTS FOR THE DESIGN OF TOWER, PORTAL AND HIGH PEDESTAL CRANES

E1 Design

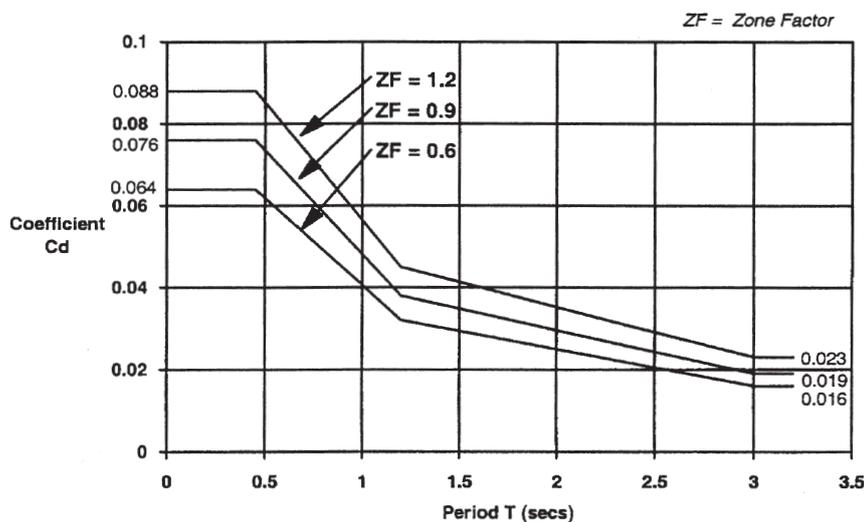
The computation of seismic load combinations are detailed as follows:

(1) Notation

C_d Seismic design coefficient for the appropriate seismic zone and fundamental period of the crane from Figure E1.

Note: If a crane is to be used in different seismic zones, then it must be designed for the highest intensity zone in which it will operate.

Figure E1: Seismic design coefficient (rigid and intermediate subsoils)



E Earthquake loads or their related internal moments.

Note: Lateral forces on the suspended load may be neglected in determining E, viz. $W_t = L_1$.

L1 Dead loads due to dead weight.

L2 Live loads including the hook load.

S Structural type factor:

Note: S is to be determined separately for each direction under consideration:

(i) Diagonal bracing members capable of plastic deformation in tension only,

$S = 2.5$ or by special study.

- (ii) Diagonal bracing capable of plastic deformation in both tension and compression,
S = 1.6 or by special study,
- (iii) Structures where the yielding mechanism under the action of lateral seismic forces is plastic hinge rotation,
S = 1.0.

T Fundamental period of vibration of the structure in the direction under consideration.

V Total horizontal seismic force or shear at the base in the direction under consideration.

Note: The structure shall be designed to withstand a total horizontal seismic force, $V = CdS (Wt)$ in each direction under consideration.

Wt Total reduced gravity load above the level of lateral ground restraint.

(2) Load and load combinations

1.0 L1 + 0.65 L2+E

0.9 L1 + E

(3) Moments

- (a) P-delta moments are the sum of the products of the vertical weights on the crane and the corresponding horizontal seismic deflections.
- (b) In calculating P-delta moments, the following conditions shall apply:
 - (i) The deflections shall be assumed to be four times those calculated due to the combination of seismic force and P-delta moments.
 - (ii) For all members, the loads or stresses resulting from P-delta moments calculated on this basis shall be no greater than 0.2 times the corresponding strength of the member.
- (c) Torsional moments need not be calculated for tower cranes.

(4) Explanatory notes

- (a) Structural type (S) factor:

Is intended to reflect the potential seismic performances of different structural systems, taking primarily into account the ability of the structural type concerned to dissipate energy in a number of deformation cycles into the inelastic range.

Frames that utilise diagonal members acting as ties, which are capable of plastic deformation in tension only develop load

displacement hysteresis loops of a very pinched nature, upon cyclic loading beyond yield level, because of the inability of the diagonals to sustain a significant compressive load. These pinched hysteresis loops result in a much lower level of energy dissipation than that provided by diagonals capable of plastic deformation in both compression and tension, where more stable hysteresis loops are formed. This results, in turn, in a higher S factor. In design of diagonally braced structures, care is necessary to avoid undesirable effects such as lateral buckling of diagonal struts or columns or chord member hinge mechanisms.

Where the yielding mechanism is of a flexural nature, involving plastic hinge rotation, buckling of compression flanges must be avoided.

(b) P-delta moments:

A P-delta moment is the bending moment that is developed when the point of application of a vertical gravity load is moved sideways by horizontal seismic deflections. The value of the P-delta moment is the product of the vertical load P and the corresponding horizontal movement of its point of application.

In flexible frames responding into the inelastic range, delta may reach large values, and P-delta moments can make up a large portion of the loading on the structure. The ultimate objective of these P-delta provisions is to provide an adequate margin of safety against the possibility of residual inelastic deflections tending to accumulate in one direction over a series of successive cycles of response until the total deflection becomes great enough to cause collapse. The maximum credible value for the accumulation of residual deflections has been assessed as 10 times the deflection caused by the design loading. The basis used in the code has been to limit the loads resulting from the P-delta moment in this situation to no more than half the strength of the members affected. Hence, for deflections assumed to be four times those given by the design loading, the loads resulting from the corresponding P-delta moments require to be no greater than 0.2 times the respective strengths of the loaded members.

(c) Seismic design coefficient (C_d):

Shall be taken from Figure E1 for the highest seismic level/zone in which the crane will operate. It is expected that the coefficient zone factor = 1.2 will apply for all except a few cranes designed for a specific function and permanent location in a zone of lower seismic level. The values given allow for the following:

- (i) Lower design seismic forces than would be applied to buildings of the same period, for the following reasons:

- Most cranes spend only a portion of their life in an erected condition, and they also have a shorter total life than buildings. This has the effect of reducing the level of earthquake intensity that has a given probability of occurrence during the erected life of a crane below the level that has the same probability of occurrence during the life of a building.
 - The risk to life resulting from collapse of a crane would be less than that resulting from collapse of an occupied building.
- (ii) A material factor of 0.8, assuming steel construction, which is incorporated in the figure.

(5) Design method

Structures will experience response accelerations greater than the values given by the design forces. This means that structures of cranes will have to be designed to withstand a series of cycles of response involving deflections substantially greater than yield deflection. The magnitude of the deflections to be provided for should be taken as a minimum of 5 divided by S.

Relative member strengths should be proportioned so that the inelastic yielding takes place in members that can develop a high level of ductility. In proportioning the relative strengths, account should be taken of the margin by which the actual strength of any member can exceed the specified minimum strength.

The foregoing outlines the minimum acceptable seismic design requirements. Higher values may be specified as required.

APPENDIX F: STABILITY REQUIREMENTS FOR THE DESIGN OF ELEVATED POWER CRANES UNDER SEISMIC LOADING

F1. Design

(1) Application

Every crane to which this code applies shall be designed to be stable under seismic loadings for the following load combinations:

$$1.0 L1 + 0.65 L2 + E$$

$$0.9 L1 + E$$

where,

L1 = dead loads due to dead weight

L2 = live loads including hook load and shall be taken as that which causes the maximum tipping moment

E = earthquake loads calculated in accordance with Appendix E of this approved code of practice.

(2) Procedure

- (a) Divide the crane masses into a convenient number of submasses and establish the centre of gravity of each of these.
- (b) Calculate the total moment due to dead weight of the submasses including the effects of the deflections due to these dead weights.
Note: Remember not to neglect the twisting moment at the top of the tower in consequence of the out-of-balance moments due to the masses of the jib, counter jib, counterweight, load (if applicable), ropes, pendants, etc.
- (c) Calculate the total overturning moment due to the individual seismic forces acting at the centre of gravity of each of the submasses.
- (d) Calculate the deflections of each of the submasses due to seismic loadings and compute the total moment due to ten times these deflections (i.e. ten times the P-delta moment due to seismic loads).
- (e) Add (b), (c) and (d) to obtain the total overturning moment tending to tip the crane.
- (f) Using the moment obtained in (e) against the righting moment due to self-weight and stabilising ballast at the crane base, determine whether the crane is stable.

- (g) A satisfactory degree of design stability under seismic loadings is achieved when the downward force due to the total mass of the crane and its stabilising ballast exceeds the uplifting force by 20 per cent.

APPENDIX G: PERSONAL PROTECTIVE EQUIPMENT

The equipment quoted here also covers other work sites as applicable.

G1 Fall-arrest equipment

As set out in the Health and Safety in Employment Act 1992, the hierarchy to be used in dealing with hazards is elimination, isolation and then minimisation. The first consideration when working at height is to eliminate the risk of a fall. If this is not practicable, the next consideration is to isolate the risk or, as a last resort, where these first two options aren't practicable, to use fall-arrest equipment.

- (1) Fall-arrest equipment systems, in accordance with AS/NZS 1891 parts 1-4: 1995 shall be installed and used at all times on tower cranes where the possibility of a fall exists for any personnel (includes, but not limited to, erection, operation, service and instructional personnel), except on the following areas:
 - (a) Where sloping ladders are provided, that are either mounted within the tower section or are enclosed by hoops and backstays, provided that the uninterrupted length of any one ladder section does not exceed 13 metres. Vertical ladders, sloping ladders outside of the tower, and sloping ladders not protected by backstays and hoops are NOT exempted from this requirement.
 - (b) On platforms provided with all round handrails/chains, or other such protection, on such areas as counter jibs, machinery decks, slew platforms, towerheads, A-frames and jibs. This exemption does NOT apply on moving trolley or boom head platforms, or where, in the opinion of the crane supervisor, there is a perceived danger of a person falling through the handrails whilst working in an extraordinary or non-standing position.
- (2) Installations of fall-arrest equipment systems on cranes (e.g. fixed safety lines along jibs and up ladders) need to be designed and installed in accordance with AS/NZS 1891 parts 1-4: 1995 and must include all necessary supports to achieve minimum deflection and shock absorption systems and anchorages, and consist of materials capable of maintaining their integrity over the life of the crane installation.

Staff must be trained to the appropriate unit standard for the particular task in hand, and there must be a minimum of two working personnel, fully trained in rescue recovery techniques, plus rescue recovery equipment available on site at all times fall-arrest equipment is being used.

Note: All platforms, ladders and accessways on a crane shall be kept clear, clean and free of obstructions, oil and grease.

G2 Footwear

- (1) Footwear in accordance with AS/NZS 2210 shall be worn at all times on tower and other cranes.

G3 Hard hats

- (1) Hard hats in accordance with AS/NZS 1801:1997 or ANSI Z89.1:1977; or EN 397, shall be worn at all times, on all construction sites where a hazard from falling objects occurs, or in accordance with the site safety plan, and as follows:

(a) Chin straps must be fitted to hard hats worn on tower cranes.

(b) Hard hats may be exempted from use whilst on a tower crane only where other approved provisions of head protection are provided (e.g. in the driver's cab) AND where no perceivable hazard from falling objects exists AND where wearing a hard hat is considered by the crane supervisor as being more hazardous than not wearing one.

Note: All personnel are alerted that perceptions of hazards may change and should be regularly reviewed.

G4 Hand, eye and ear protection

- (1) Hand, eye and ear protection shall be used, in accordance with usual work practices, when working on tower cranes.

G5 Personnel clearance zones

- (1) For all operations involving tower cranes clear zones under and around the work area, should be planned and executed in accordance with the site safety plan. Any work on or around a public roadway must be in accordance with an approved traffic management safety plan.

G6 High-visibility clothing

- (1) High-visibility clothing, in accordance with the site safety plan and/or the traffic management safety plan, shall be worn when working with tower cranes.

G7 Machinery safety

- (1) Machinery guards and other protective devices, such as lockouts, shall be used in accordance with normal work practices involving moving machinery. Overalls and other clothing shall be snug fitting, and long hair shall be tied back.

Note: Particular caution must be applied around moving machinery when using protective equipment such as fall-arrest harnesses with dangling lanyards or tooling.

APPENDIX H: COMMON HAZARDS ASSOCIATED WITH TOWER CRANE ERECTION, DISMANTLING AND CLIMBING WORK

Refer to site management for site-specific hazards.

The following table deals with common generic hazards only. Site-specific hazards must also be addressed, in full consultation with site management and all involved work group parties.

Hazard	Eliminate	Isolate	Minimise
Fall from height	Where tasks can alternatively be carried out at ground level, do so, rather than at height.	Maintain existing guardrails and ladder hoops to work and access areas. Erect guardrails or other isolation means to prevent falls e.g., open areas between crane tower and counter jib and open areas between tower unit members while accessing between crane tower and main jib or counter jib.	Approved safety harnesses with energy absorbers to be used where practicable when working at any height where the possibility of a fall exists and where there is no other means of fall protection. (Refer Crane Association Policy Guideline). As part of the work plan, where possible, adopt fall-restraint (work positioning) procedures with safety harnesses, to prevent a free fall, thus limiting the maximum fall distance to 600 mm.
Fall-arrest - isolation/ injury after fall from height with harness (suspension trauma)			Use approved safety harnesses with shock absorbers. Users of fall-arrest equipment and on-site rescue personnel must be trained in its proper use and recovery methods in the event of a fall. Wear only approved footwear and protective helmets. Rescue and retrieval equipment and trained personnel to always be on site whenever there is the need to use fall-arrest equipment on tower cranes. The helicopter rescue phone number is to be available on site.
Hit by falling object(s)	Tools are to be attached to tool belts worn by the individual where practicable and safe to do so, without creating a "snagging" danger.	All personnel to be made aware of hazard and the need to remain clear of crane operations and personnel working above. Tape off underside of work area and erect warning signs.	Only essential items to be taken up the tower crane. Safety helmets to be worn at all times other than when no danger above, or inside vehicles or other shelter. (Chin straps must be worn on helmets when up a tower crane.)
Tripping and falling over		N/A	Work areas and accessways to be kept clear of unnecessary materials and equipment.

Hazard	Eliminate	Isolate	Minimise
Electrocution (from crane power supply)		Ensure crane is properly earthed. Lockout devices should be used wherever practicable.	Only qualified and certified electricians to perform electrical work on tower cranes. Crane operator and supervisor to be informed of precisely when electrical workers are working with current-bearing cables.
Electrocution (from external supply)	Turn off power.	Limit crane operations.	Ensure crane is properly earthed. All personnel to be made aware of hazard. No part of crane or load to come within 4 metres of power lines unless authorised by power authority and where designed for.
Crane self movements/ loads striking worker		Lockout devices should be used wherever practicable.	All personnel to be made aware of hazard. Crane operator must be made aware of all work and personnel on the crane and only carry out functions as directed by a designated and authorised person who is aware of all work and personnel on the crane. Ensure that only authorised personnel are permitted on the crane and are working in accordance with an established work plan. Supervisors to be constantly aware of all work being performed on or around the crane at all times.
Injury from exposure to crane machinery		All protection guards are to be in place at all times except when being worked upon or when necessarily removed for erection procedures. Lockout devices should be used wherever practicable.	Ensure no loose clothing or long hair. Lanyards to be secured when not in use and not able to snag upon moving machinery etc. Check all moving machinery for snag points. Correct protective clothing and equipment to be used in accordance with the type of work being done. Only experienced or supervised staff to work on tower cranes.
Fire and burning	Smoking and other sources of ignition are not to be permitted when handling flammable materials, e.g. solvents, oils, diesel fuel.	Flammable materials to be correctly stored. Also refer to HSNO requirements.	Fire extinguishers to be mounted in all crane cabs and available on site.

Hazard	Eliminate	Isolate	Minimise
Load striking/ pushing personnel		All personnel not involved with the lifting operation to be kept clear of the area. The area should be taped off and warning signs erected.	The work process should be planned by experienced personnel. All work group parties should be involved in the planning process. Only appropriately trained, experienced and authorised personnel to operate and dog cranes. Radios to be used when lifting out of sight of operator. Where practicable, tag lines are to be used to control loads.
Load drop due to rigging problem	Only appropriately authorised personnel are to rig loads or otherwise participate in the crane operations. The crane operator may stop all proceedings if, in their opinion, safety is jeopardised by the actions of other personnel. All operations must be carried out in accordance with the Crane Association <i>Crane Safety Manual</i> and the <i>Approved Code of Practice for Rigging</i> .	All personnel not involved with the lifting operation to be kept clear of the area. The area should be taped off and warning signs erected. No person to be under suspended loads. Crane operator to avoid lifting loads over personnel, accommodation or traffic.	The work process should be planned by experienced personnel. All work group parties should be involved in the planning process.
Load drop due to crane/ lifting gear problem	All lifting gear to be certified and inspected prior to use. Only lifting gear suitable for the task to be used. Only authorised and qualified personnel are to rig and/or dog loads or otherwise participate in crane operations. Cranes must have up-to-date inspection certificate and be in proper working order in accordance with the <i>Approved Code of Practice for Cranes</i> and Crane Association <i>Crane Safety Manual</i> .	All personnel not involved with the lifting operation to be kept clear of the area. The area should be taped off and warning signs erected. No person to be under suspended loads. Crane operator to avoid lifting loads over personnel, accommodation or traffic.	The work process should be planned by experienced personnel. All work group parties should be involved in the planning process.
Load drop from support (mobile) crane due to operator error		All personnel not involved with the lifting operation to be kept clear of the area. The area should be taped off and warning signs erected. No person to be under suspended loads. Crane operator to avoid lifting loads over personnel, accommodation or traffic.	The work process should be planned by experienced personnel. All work group parties should be involved in the planning process. Mobile crane operators should be holders of the New Zealand National Certificate in Crane Operation (Mobile) or studying for this qualification, or under the supervision of such a qualified person. All tasks to be carefully planned by experienced personnel.

Hazard	Eliminate	Isolate	Minimise
Crane overloaded due to operator being unaware that limits were upset, or released for service purposes.	Crane operator and supervisor to be informed of precisely when limits are set, released and adjusted.	Limits must only be altered or adjusted by appropriately qualified personnel. Lockout devices should be used wherever practicable and warning signs are to be posted in the cab. All personnel not involved with the lifting operation to be kept clear of the area. The area should be taped off and warning signs erected.	No person to be under suspended loads. Crane operator to avoid lifting loads over personnel, accommodation or traffic.
Crane tip over		All personnel not involved with the lifting operation to be kept clear of the area. The area should be taped off and warning signs erected. No person to be under suspended loads. Crane operator to avoid lifting loads over personnel, accommodation or traffic.	The work process should be planned by experienced personnel. All work group parties should be involved in the planning process. Mobile crane operators should be holders of the National Certificate in Crane Operation (Mobile) or studying for this qualification, or under the direct supervision of such a qualified person. Detailed copies of the crane's capacity charts are to be available on site and in the operator's cab. All lifting tasks are to be carefully planned by experienced personnel.
Personnel struck by vehicles			A temporary traffic safety management plan should be in place and all personnel made aware of their duties within this plan. Approved high-viz clothing to be worn by personnel working in same areas as any vehicles.
Hearing damage from excessive noise			Hearing protection to be made available and used when performing noisy operations such as gunning bolts and/or hammering pins. Advise personnel about reality of hearing damage and how to use provided hearing protection.
Solar eye damage			Staff should be made aware of the problem and encouraged to wear appropriate eye protection.

Hazard	Eliminate	Isolate	Minimise
Structural failure of crane due to incorrect erection sequence		<p>The work process should be planned by experienced personnel. All work group parties should be involved in the planning process.</p> <p>All personnel not involved with the lifting operation to be kept clear of the area. The area should be taped off and warning signs erected.</p>	<p>Crane erection supervisors must be thoroughly trained and experienced with the type of crane being worked upon.</p> <p>A complete and specific crane manual, in English, must be available on site at all times.</p> <p>The work process should be planned by experienced personnel, and all work group parties should be involved in the planning process.</p> <p>No person to be under suspended loads.</p> <p>Crane operator to avoid lifting loads over personnel, accommodation or traffic.</p>
Crane endangered by high winds whilst prone in erection mode	<p>A comprehensive weather report specific to the locality and time should be sought prior to commencing erection, dismantling or climbing sequences. Adverse reports will result in the work not commencing or being suspended.</p>	<p>All personnel not involved with the lifting operation to be kept clear of the area. The area should be taped off and warning signs erected.</p>	<p>An emergency 'jib tie-off plan' should be established in the event of wind exceeding the maximum allowed for by the crane manufacturer, during erection sequences.</p> <p>Developing weather conditions should be monitored throughout the full work process.</p> <p>Climbing equipment should be thoroughly inspected and tested for operation before commencing climbing sequences.</p>
Communication breakdown –includes critical and non-critical operations			<p>All personnel shall be in direct contact with each other via two-way radios incorporating a base set and hand sets over an isolated but dedicated channel frequency. This is to ensure constant contact with each other, rather than relying on non-radio instructions being relayed from person-to-person.</p> <p>An observer will be stationed in such a position that they can see the operation being carried out. The role of that observer is to have control of the operation in progress, and be able to rapidly respond (initially by radio) to prevent an accident, or in the case of any emergency.</p>

APPENDIX I: TOWER CRANE INSPECTIONS – MINIMUM REQUIREMENTS

I1 Jib configuration

- Jib length
- Self-erect version?
- Hoist type
- Counterweight
- Counterweight blocks
- Jib identification and insert order
- Jib tie bar (ropes) lengths (in order from tower head)
- Jib tie bar connection on jib/pennants/luff ropes/bridle connection
- Counterjib/insert identification and order
- Counterjib tie bar/rope identification

I2 Tower configuration

- Number off
- Tower type
- Length of towers
- Identification checked
- 1st tie-in type
 - Identification
 - Location
- 2nd tie-in type
 - Identification
 - Location
- 3rd tie-in type
 - Identification
 - Location etc.

I3 Undercarriage

- Undercarriage type
- Gauge x wheel base

- Identity
- Central ballast weight
- Block arrangement

The configurations above must be certified as being in accordance with the requirements of the *Approved Code of Practice for Cranes* for wind and seismic conditions.

I4 Documentation and certificates

- Manufacturer's certificate
- Design approval certificate
- Hoist rope certificate
- Trolley rope(s) or luff ropes certificates
- Counterjib holding rope certificates (if applicable)
- Jib holding rope certificates (if applicable)
- Other/counterweight rope certificates
- Hook certificate
- Tower head bolts crack test certificates (if applicable)
- Slewing bolts crack test certificates (if applicable)
- Tower bolts crack test certificates (if applicable)
- Slewing report
- Foundation/tracks certificates with drawing
- Foundation anchor crack test certificates
- Tie-in supports engineering certificates
- Erection certificate
- Bolt spanner accuracy certificates
- Test weights certificates
- Counterballast weights weigh certificates
- Central ballast weights weigh certificates
- Electrical certificate of compliance
- Crane log book in cab
- Crane manual on site
- Radius/capacity in cab
- Clash zone procedure

I5 Undercarriage inspection

- Identity check
- Rail condition
- Rail earthing
- Rail clamps
- Limits set
- Rail stops
- Bogie/wheel condition
- Machinery guards
- Safe clearances
- Central ballast check
- Rust condition
- Split/safety pins
- Accessway
- Cable drum
- Motion check
- Motion test
- Limits function
- Brake function
- Cabling
- Switchboard safety
- Earthing
- Prelimits

I6 Tower system

- Identity check
- Bolt identity and condition (if applicable)
- Bolt torque check
- Pin joints (if applicable)
- Binding points
- Accessway
- Rust
- Tie-in assembly
- Tie-in supports

- Lattice condition
- Tower alignment
- Cable support
- Earthing
- Tower orientation

17 Cabin section

- Identity check
- Slewing report
- Access
- Slew brake condition
- Slew brake working
- Free slew check
- Rust
- Cab visibility
- Cab safety
- Deadman
- Horn
- Fire extinguisher
- Radius indication
- Visual warnings
- Motion test
- Machinery safety
- Switchboard safety
- Main switch function
- Transformer mountings
- Instrument operation
- Anemometer readout

18 Tower head/A-frame

- Identity check
- Bolt identity and visual condition
- Bolt torque check
- Overload mechanisms
- Pin connections

- Split/safety pins
- Rust
- Lattice condition
- Accessway
- Pulleys
- Boom buffers
- Anemometer

I9 Counterjib/machinery deck

- Identity check
- Pin connects
- Split/safety pins
- Support system
- Hoist unit anchorage
- Counterweight check
- Counterweight security
- Platforms; handrails
- Machinery safety
- Rust
- Hoist condition
- Hoist rope anchorage
- Hoist rope inspection
- Hoist rope identity
- Motion test
- Hoist limits
- Prelimits
- Boom limits
- Switchbox safety
- Cables (trip hazard)

I10 Phase failure protection

Tested as effective

I11 Jib

- Configuration check
- Identification check
- Pin connections
- Tiebar/pennant configuration check
- Tiebar/pennant identification check
- Lattice condition
- Rust general
- Rust in main chords
- Split/safety pins
- Accessway
- Fall-arrest system
- Trolley gear condition
- Trolley gear brake
- Trolley rope inspection
- Limit mechanisms
- Trolley general
- Trolley wheels
- Trolley tension set
- Trolley rope pulleys
- Trolley rope anchorages
- Hoist rope anchorage
- Motion test
- Limits
- Counterweight sheaves
- Counterweight rope adjustment
- Hoist sheaves
- Hoist deflector
- Load pin
- Boom buffer mounts

I12 Hook

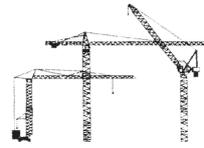
- Identity check
- Safety catch

- Thrust bearing
- Rope guards
- Pulley
- General condition

I13 Test and calibration weights

- Maximum load
- Load at maximum safe working load
- Calibration
- Overload warnings working.

i14 Tower crane climbing frame inspection and test report/worksheet



Proposed Ground Inspection Date: ___ / ___ / ___

KEY PERSONNEL

Crane Supervisor:	Inspector:
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IDENTIFICATION

Owner/Controller:	Site Address:		
Address:			
	Yard Address: (If appl)		
Climbing Frame Model:	Serial No:	File No.:	
Manufacturer:	Other Identification:		

GROUND INSPECTION (Inspection Valid for 12 months)

Structure:	Corrosion:
Pins:	Split Pins:
Bolts & Nuts:	Rollers:
Hydraulic Hoses and Fittings:	Hydraulic Cylinder & Ram:
Handrails:	Platforms:
Rails:	Rail Components/Wheels:
Elect. Plugs & Cables:	Hydraulic Fluid Level:
Pressure Gauges	Climbing Feet & Mechanicals:
Comments:	

Inspector Signature: _____ Date: ___ / ___ / ___

PRE-OPERATION INSPECTION 1. (Inspection valid for one climbing sequence only)

Correct Installation:	Handrails & Platforms:
Pins:	Split Pins
Bolts & Nuts:	Rollers:
Elect Plugs & Cables:	Rail Components/Wheels:
Hydraulic Fluid Level:	Hydraulic Tank Breather:
Power Supply:	Hydraulic Pump Rotation:
Hydraulic Hoses & Fittings:	Cylinder Operation:
Gauges Working:	Manual On Site:
Comments:	

Climbing Supervisor: _____ Date: ___ / ___ / ___

PRE-OPERATION INSPECTION 2. (Inspection valid for one climbing sequence only)

Correct Installation:	Handrails & Platforms:
Pins:	Split Pins
Bolts & Nuts:	Rollers:
Elect Plugs & Cables:	Rail Components/Wheels:
Hydraulic Fluid Level:	Hydraulic Tank Breather:
Power Supply:	Hydraulic Pump Rotation:
Hydraulic Hoses & Fittings:	Cylinder Operation:
Gauges Working:	Manual On Site:
Comments:	

Climbing Supervisor: _____ Date: ___ / ___ / ___

PRE-OPERATION INSPECTION 3. (Inspection valid for one climbing sequence only)

Correct Installation:	Handrails & Platforms:
Pins:	Split Pins
Bolts & Nuts:	Rollers:
Elect Plugs & Cables:	Rail Components/Wheels:
Hydraulic Fluid Level:	Hydraulic Tank Breather:
Power Supply:	Hydraulic Pump Rotation:
Hydraulic Hoses & Fittings:	Cylinder Operation:
Gauges Working:	Manual On Site:
Comments:	

Climbing Supervisor: _____ Date: ___ / ___ / ___

PRE-OPERATION INSPECTION 4. (Inspection valid for one climbing sequence only)

Correct Installation:	Handrails & Platforms:
Pins:	Split Pins
Bolts & Nuts:	Rollers:
Elect Plugs & Cables:	Rail Components/Wheels:
Hydraulic Fluid Level:	Hydraulic Tank Breather:
Power Supply:	Hydraulic Pump Rotation:
Hydraulic Hoses & Fittings:	Cylinder Operation:
Gauges Working:	Manual On Site:
Comments:	

Climbing Supervisor: _____ Date: ___ / ___ / ___

APPENDIX J: EFFECTIVE SUPERVISION

J1 Introduction

The term “effective supervision” is used in regulation 36(2) of the PECPR Regulations, but is not defined. An exemption from the regulations, which enables inspection bodies (subject to Department of Labour approval) to make greater use of trainee inspectors, also relies on effective supervision. For consistency of application of the regulation and exemption, it is necessary to have an agreed definition and policy for effective supervision.

The reasons for ensuring effective supervision from an inspection body’s perspective would be:

1. risk management – safety
2. utilisation of resources – profitability
3. client satisfaction – market security
4. personnel development – staff job satisfaction.

The reasons for requiring effective supervision from a Department of Labour perspective would be:

1. safety – the outcome should be as safe as if the inspection was performed by an equipment inspector
2. training – the attainment of sufficient skills and knowledge by the trainee to provide the inspection pool with a competent future equipment inspector.

J2 Definitions

Effective supervision: The overall management and general direction of a person in order to achieve a desired result.

Note: The above definition of “effective supervision” is reasonably broad and would permit a range of possibilities from “close and constant overseeing” to “overall task direction and readily communicated assistance”.

Equipment category: A group of equipment for which an inspector can gain signatory status.

Equipment subcategory: A convenient subset of an equipment category, determined by the inspection body. The equipment subcategory may, if appropriate, constitute the entire equipment category.

Level: A stage of trainee progression, the requirements for which must be fulfilled prior to advancement to the next level for a particular equipment subcategory. The number of levels is to be decided by the inspection body. The highest level should closely correspond to Level 3 in Table J1 and the

lowest level should closely correspond to Level 1 in Table J1 – therefore there must be at least two levels. (The labels “Level 1”, “Level 2”, and so on were chosen as neutral examples, and naming is at the discretion of the inspection body.)

Supervisor: An equipment inspector as defined in the PECPR Regulations, competent on the equipment under inspection during supervision, and meeting the experience requirements of Note 1 of the general notes below.

Trainee equipment inspector: A person employed or engaged by an inspection body, who is pursuing a documented course of training towards attainment of a certificate of competence and signatory status within a period of time specified by the inspection body. If warranted, the inspection body could permit an extension to the specified training period provided the circumstances and length of extension were recorded.

Table J1 – Effective supervision policy that applies to each equipment subcategory

The table should be read in conjunction with the general notes, which follow it (but are not restricted to it).

Trainee level	Nature of effective supervision
Level 1	<ul style="list-style-type: none"> • Full direction of activities (chosen work assignments) and constant direct overseeing of work. • Supervisor present at all times.
Level 2	<ul style="list-style-type: none"> • Assignment of activities by supervisor. • Supervisor present during a proportion of the inspections (proportion set and monitored by inspection body). • Supervisor to discuss all reports directly (face to face) with the trainee prior to signing off. • A plan must be in place to deal with unforeseen trainee inspection difficulties, which shall include the capability of the supervisor to intervene as required.
Level 3	<ul style="list-style-type: none"> • Assignment of activities by supervisor (can be more than one), combined with occasional overseeing of work as required. • The supervisor who assigned the work must check all reports. • The supervisor who assigned the work must be readily available for communication by an appropriate means. • A plan must be in place to deal with unforeseen trainee inspection difficulties.

General notes

1. The inspection body is to determine and enforce supervisor experience requirements in terms of time since gaining signatory status and number of certificates issued.
2. In each case, the supervising equipment inspector who will make the recommendation to issue a certificate, and whose name will appear on it, must review the appropriate trainee report.

3. Personnel will progress through the training process for each equipment subcategory that is necessary to gain a specific signatory status.
4. All entrants into inspection, other than those covered by note 5 below, shall commence at Level 1 for each equipment subcategory.
5. New inspection personnel, who up until engagement held current signatory status with another New Zealand inspection body, shall be trainees during the company induction period (until signatory status is again achieved). Such personnel may commence at an appropriate level for each equipment subcategory as determined by the inspection body.
6. Rate of advancement through training will depend on availability of the necessary types and complexity of equipment, nature of inspections to be performed, and the rate of acquisition of the appropriate skills and knowledge needed to demonstrate competence. A minimum number of closely related inspections will be stated, with regard to equipment and type of inspection, to be successfully completed before progressing beyond Level 1. This minimum number, to be determined by the inspection body, will be not less than the number of generic equipment types in the subcategory.
7. A trainee, even where all equipment subcategory requirements have been met, would continue under Level 3 effective supervision until attainment of the certificate of competence and gaining of signatory status.
8. Recorded audits by the supervisor (frequency to be predetermined on an individual trainee basis) will be used to demonstrate competency achievement.
9. To facilitate external assessments of the inspection body's operation of the training process, the inspection body would be expected to keep full records of trainees and supervision. These would provide such information as the amount of full supervision (inspections and time spent), the overall proportion of trainee inspections and how activities are assigned.