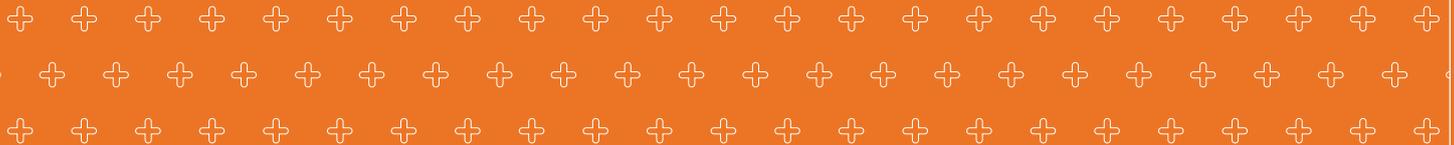




Approved Code of Practice for Cranes

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

3RD EDITION



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The Department would also like to acknowledge the time and effort of everyone who provided submissions and feedback during the development of this Code.

NOTICE OF ISSUE – THIRD EDITION

I have issued the third edition of 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.

A handwritten signature in black ink, appearing to read 'C Blake', with a horizontal line underneath it.

Christopher Blake
Secretary of Labour

FOREWORD

I have approved this amended statement of preferred work practices, which is an *approved code of practice*, 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 can show compliance with all of the matters which it covers, then a Court may consider that the employer has complied with the provisions of the Act.

A handwritten signature in blue ink that reads "Kate Wilkinson". The signature is written in a cursive style with a period at the end.

Hon Kate Wilkinson, MP
Minister of Labour

The approval and commencement date of this Approved Code of Practice is the **7th day of January 2010.**

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Picture 1: Crawler Crane

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 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
- requires 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, people gaining work experience and volunteers)
- the self-employed
- principals to contractors
- persons who control a place of work
- hirers, sellers and suppliers of plant.

Regulations (Section 21)

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, first aid, for employees to wash, a place to have meals 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 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 (Section 20)

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 of an employer or other duty holder having taken "all practicable steps" to meet the duty.

Note: For items covered in the inspection requirements for the various types of cranes, and Appendices (where applicable), the certificate of inspection for the crane shall be obtained before it can be used, in accordance with 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 (Section 6)

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 are 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 (Sections 7 to 10)

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:

- serious harm (defined in Schedule 1 of the Act), or
- 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
- 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:

- Where practicable, the hazard must be eliminated
- If elimination is not practicable, the hazard must be isolated
- 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:

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

Information for Employees and Health and Safety Representatives (Section 12)

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

- hazards they may be exposed to while at work
- hazards they may create which could harm other people
- how to minimise the likelihood of these hazards becoming a source of harm to themselves and others
- the location and correct use of safety equipment
- 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 (Section 13)

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, protective clothing and equipment that they are, or may be, required to use or handle.

Responsibility for Employees' Work Activities (Section 15)

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.

Persons in Control of a Place of Work (Section 16)

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.

Duties of the Self-Employed (Section 17)

Every self-employed person shall 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.

Duties of Principals (Section 18)

Principals engaging contractors 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 (Section 18A)

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 lend 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.

Duties of Employees (Section 19)

Every employee shall take all practicable steps to ensure:

- their own safety while at work (including using protective clothing and equipment); and
- 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. However, employees have an obligation to attempt to resolve the matter with their employer.

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.

Employers to Provide Opportunities for Employee Participation (Part 2A)

Employers must provide reasonable opportunities for employees to participate effectively in on-going processes for the improvement of health and safety in the place of work. Where there are more than 30 employees, or where an employee or union representing employees 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.

Accidents and Serious Harm Recording and Notification (Sections 25 and 26)

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

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

- any employee at work, or
- any person in a place of work controlled by the employer.

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 shall also be notified to the Secretary of Labour (in practice, the nearest Department of Labour office) as soon as possible after the occurrence becomes known to the employer.

In addition, the accident must also be reported in the prescribed form within seven days. (Forms are available from the Department of Labour website.)

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

- save the life of, prevent harm to or prevent suffering to, any person
- maintain public access for essential services, e.g. electricity, gas
- 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 distances from electrical conductors, operation of tower cranes and load-lifting gear are in the *Crane Safety Manual for Operators/Users*, 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/container
- Overhead travelling/gantry/monorail
- Pillar/column
- Truck (vehicle) loader type
- Derrick/post/jib
- Mobile (including crawler and rail)
- Tower (including self-erecting)

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 cranes, derricks or spreader beams on board ships. Such equipment (other than equipment on "fishing ships" used for lifting the catch) is covered by the *Maritime Rule Part 49 – Ships' Lifting Appliances*. Controllers of cranes on fishing ships are still required to meet their obligations under the Health and Safety in Employment Act 1992 and accordingly, compliance with this Approved Code of Practice is recommended.

1.3 Interpretation

“Should” and “may” indicate that the recommendation be adopted where practicable to comply with the requirement to “take all practicable steps” as required by the Act and Regulations.

“Shall” is used in places where there are legal obligations required by the Act and/or its Regulations that must be followed. It is used to alert the reader to the need for that recommendation to be implemented.

1.4 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 method of 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 competence: (in relation to the Health and Safety in Employment (Pressure Equipment, Cranes and Passenger Ropeways) Regulations 1999):

- (1) is a certificate issued by a qualification issuing agency or by the Secretary stating that the holder is suitably qualified to carry out a specified activity in relation to specified equipment.
- (2) A certificate of competence remains in force for the period specified in it any may be renewed from time to time.
- (3) The Secretary may cancel a certificate of competence, or suspend a certificate of competence for such period as he or she thinks fit, if, after giving the holder an opportunity to be heard, he or she is satisfied on reasonable grounds –
 - (a) That the holder has been so negligent in carrying out any task that the holder of the certificate could reasonably be expected to perform to a reasonable standard that the safety of any person has been or could have been endangered; or
 - (b) That the holder has shown himself or herself unfit to be the holder of the certificate by the improper manner in which he or she has carried out any task that the holder of the certificate could reasonably be expected to perform in a proper manner.

Certificate of inspection: means a certificate issued or renewed under regulation 32 of the PECPR Regulations that complies with regulation 33 of the PECPR Regulations. 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 (CPEng.): means a person who is registered and holds 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, sub lessee, or bailee of any equipment in a place of work.

Crane:

- (1) means a powered device-
 - (a) that is equipped with mechanical means for raising or lowering loads suspended by means of a hook or other load-handling device; and
 - (b) that can, by the movement of the whole device or of its boom, jib, trolley or other such part, re-position or move suspended loads both vertically and horizontally; and
- (2) includes all parts of the crane down to and including the hook or load-handling device, and all chains, rails, ropes, wires, or other devices used to move the hook or load-handling device;
- (3) includes the attachments, fittings, foundations, mountings and supports; but
- (4) does not include lifting gear that is not an integral part of the crane.

Crane rating chart/sheet: means a notice fitted on or attached to a crane stating the maximum safe working load for the crane in specified operating conditions. Crane rating charts or sheets may also be produced in a book format.

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

Design verifier: means a person who:

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

Dogman: means a person qualified to sling loads and direct the lifting and placing operations of a crane.

Electrical Inspector: has the same meaning as that defined in the Electricity Act 1992.

Equipment: means cranes, including the attachments, fittings, foundations, mountings and supports of cranes, and plant used in connection with cranes.

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, and
- (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 equipment,
 - (c) the period after the commissioning of equipment,
 - (d) the period after a repair or alteration to which regulation 11 of the PECPR Regulations apply,
 - (e) the period after maintenance, or an adjustment, alteration, or repair to which the regulation 13 of the PECPR 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 regulation 27 of the PECPR Regulations, and
- (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 in 2003.

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

Inspection body: means:

- (1) an organisation currently recognised under regulation 25 of the PECPR Regulations, and
- (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.

ITP: means Inspection and Test Plan.

Lifting gear: in relation to a crane:

- (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, and
- (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: in relation to a crane:

- (1) means a device:
 - (a) that is an integral part of the crane, and
 - (b) that may substitute for the hook, and
- (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.

Note: Load-handling devices include shipping container-lifting spreaders, telescopic spreaders, magnets, vacuum lifters, tongs, bulk material grabs, log and timber grapples, lifting forks etc.

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 (radius) 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 changing the elevation angle of the crane boom/jib.

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.

Mobile crane: means mobile mechanical plant which is able to be configured to lift or carry a suspended load. This definition includes "Fully", "Semi", "Portable" and "Truck" mobile cranes. For the purposes of this Approved Code of Practice, this definition also includes:

- (1) forklifts and reach stackers configured to lift shipping containers
- (2) telehandlers or forklifts lifting and carrying a suspended load
- (3) construction equipment, such as excavators configured with hooks or other lifting devices and used for purposes other than duties associated with the primary function of the machine (e.g. other than placing of pipes in a trench).

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

Must: where the word "must" is used, the particulars that are referred to are mandatory in relation to compliance with this Approved Code of Practice.

NDT: means Non-Destructive Testing.

New Zealand Gazette, The: means the official newspaper of the New Zealand government.

Operate: in relation to equipment:

- (1) means to use the equipment; and
- (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 operating instructions, 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.

Principal: (as defined under the Health and Safety in Employment Act 1992) means a person who or that engages any other person (otherwise than as an employee) to do any work for gain or reward.

Radius: means the horizontal distance from the reference line (e.g. centre of rotation of a slewing crane) to the load line (typically through the crane hook).

Rated-capacity indicator: see safe-load indicator.

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

Repair: means restoring equipment to a safe operating condition but does not include alterations, replacements or routine maintenance.

Safe-load indicator: means 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): means the maximum load the crane can safely lift, as defined by the crane rating sheet.

Secretary: means the Secretary of Labour.

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.

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.

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, and
- (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 integral lifting gear.

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

Truck (vehicle) loader crane: (also known "lorry loader" and "vehicle loader" cranes): means a combination of a load carrying vehicle (or truck) and an articulated or luffing/slewing/telescoping jib crane used for the handling of goods on or off the vehicle.

Truck loader-type crane: means a crane of the type that would normally be described as a truck loader crane but is used in an application other than fitted to a vehicle (or truck).

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

PART 2: APPLICATION OF THE PECPR 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.)

- (1) Meaning of "controller":
A "controller" of equipment is the person who is the owner, lessee, sub lessee or bailee of any equipment in a place of work.
- (2) Exemptions for controllers, designers, manufacturers or suppliers:
 - (a) Pursuant to regulation 5 of the PECPR Regulations, the Secretary may:
 - (i) grant an exemption to a controller, designer, manufacturer or supplier from a duty imposed by the PECPR Regulations, and
 - (ii) impose any condition that the Secretary thinks fit on an exemption.
 - (b) An exemption may be granted to:
 - (i) A controller, designer, manufacturer, or supplier specified in the exemption, or
 - (ii) All controllers, designers, manufacturers or suppliers of a kind specified in the exemption, or
 - (iii) All controllers, designers, manufacturers, or suppliers.
 - (c) Kinds of controllers, designers, manufacturers, or suppliers may be specified by reference to a kind of equipment controlled, designed, manufactured, or supplied by them.
 - (d) The Secretary shall publish a notice in the *New Zealand Gazette* indicating the extent and effect of an exemption granted to—
 - (i) All controllers, designers, manufacturers, or suppliers of a kind specified in the exemption, or
 - (ii) All controllers, designers, manufacturers, or suppliers.
 - (e) The Secretary may at any time decide to cancel an exemption, if satisfied that it is proper to do so, and must

then-

- (i) determine the date on which the cancellation takes effect, which must be a reasonable period after the date on which the decision is made, and
- (ii) publish a notice in the *New Zealand Gazette* indicating that the exemption is to be cancelled on the date specified in the notice.

(3) Exemptions for equipment

- (a) Pursuant to regulation 6 of the PECPR Regulations, the Secretary may:
 - (i) exempt equipment from any or all of the PECPR Regulations, and
 - (ii) impose any condition that the Secretary thinks fit on the exemption.
- (b) The Secretary shall publish a notice in the *New Zealand Gazette* specifying the equipment exempted.
- (c) The Secretary may, at any time, decide to cancel an exemption, if satisfied that it is proper to do so, and must then-
 - (i) Determine the date on which the cancellation takes effect, which must be a reasonable period after the date on which the decision is made, and
 - (ii) Publish a notice in the *New Zealand Gazette* indicating that the exemption is to be cancelled on the date specified in the notice.

(4) Relationship between the Act and PECPR Regulations

Except where an exemption is granted, a person on whom a duty is imposed by the PECPR 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) Every controller shall take all practicable steps in relation to equipment, to ensure that the following information is obtained from the designer, manufacturer, or supplier:
 - (i) information necessary to ensure that every activity involving the equipment can be carried out safely. This would include information such as catalogues, drawings, manuals or specifications;
 - (ii) information establishing compliance with the requirements of the PECPR Regulations relating to design, design verification, equipment inspection, installation and manufacture. This would include information such as drawings, manuals and test certificates.
- (b) Where the information noted in 2.2(1)(a)(i) or (ii) is not available from the designer, manufacturer or supplier, the controller shall

take all practicable steps to ensure that:

- (i) information to the same effect is obtained from another source, and
 - (ii) the information obtained is confirmed as adequate and appropriate under the controller's quality management system or, if the controller does not have such a system, by an inspection body.
- (c) The controller shall take all practicable steps, in relation to equipment, to ensure that the following information is readily accessible by any person, including an inspector, who wants to examine it:
- (i) every certificate of design verification, and
 - (ii) every current certificate of inspection, and
 - (iii) every report associated with those inspections, and
 - (iv) any other information that the controller has affecting the safety of the equipment. This could include-
 - documents and drawings referred to in certificates of design verification
 - test reports arising from the manufacturing, erection and commissioning of the equipment
 - erection and commissioning information required for the safe operation, maintenance and servicing of the equipment
 - the date, time, full description and the inspection and test reports for any repair or alteration
 - maintenance records
 - manufacturer's data reports including details of nominal wall thickness and corrosion allowances.

(2) Accident notification

Where any event occurs in a place of work that:

- (a) causes damage that affects the operational safety of equipment, or
- (b) causes damage to other property that may affect the safety of equipment, and
- (c) which might, in different circumstances, have caused a person to be seriously harmed;

every controller shall take all practicable steps to:

- (i) notify the Secretary as soon as possible (this initial notice may be provided by phoning the Department of Labour at 0800 20 90 20), and
- (ii) give the Secretary, within 7 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 other than that which issued the latest certificate of inspection for the equipment in question, or by a chartered professional engineer, independent of the controller.

(3) Duties in relation to operation

- (a) Every controller shall take all practicable steps to ensure that equipment-
 - (i) is safe, and
 - (ii) is operated safely, and
 - (iii) is operated within the limits that it was designed to operate within, and
 - (iv) is maintained in a safe condition.
- (b) Every controller shall take all practicable steps to ensure that no equipment is operated unless it has a current certificate of inspection.
- (c) Every controller shall take all practicable steps to ensure that equipment that has been:
 - (i) repaired or altered in a way affecting the operational safety of the equipment, or
 - (ii) adjusted, altered or repaired following an investigation pursuant to regulation 13 of the PECPR Regulations (potentially unsafe equipment) so that equipment inspection is necessary to ensure operational safety;
is not operated until a new certificate of inspection has been issued.

(4) Duties in relation to repairs or alterations

Every controller shall 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 the PECPR Regulations, and
- (b) design verification requirements for the design specified by the designer are complied with, and
- (c) the repaired or altered equipment is subject to equipment inspection in accordance with the PECPR Regulations.

2.3 Duties in Relation to Unsafe Equipment

(1) Employees' duty

Every employee of a controller who believes that an activity or equipment is unsafe shall, as soon as practicable, take all practicable steps to ensure that the controller is notified to that effect.

(2) Investigation of potentially unsafe equipment

- (a) Controllers shall take all practicable steps to ensure that, where they become aware that equipment may be unsafe, the equipment is investigated in a manner and to an extent that is appropriate, having regard to, in particular:
 - (i) the nature of the problem with the equipment, and
 - (ii) the degree of expertise likely to be required to deal with the problem, and
 - (iii) the degree of harm likely to arise from the problem.

- (b) If the investigation determines that the equipment is unsafe, the controller shall take all practicable steps to ensure that-
 - (i) the equipment is withdrawn from service and rendered inoperable, and
 - (ii) the equipment is clearly marked as withdrawn from service, and
 - (iii) a record is kept of the withdrawal of the equipment from service and of its location, and
 - (iv) the equipment is not returned to service until the controller is satisfied that the equipment has been the subject of satisfactory maintenance or a satisfactory adjustment, alteration, or repair, and
 - (v) the adjusted, altered, or repaired equipment is subject to equipment inspection in accordance with the PECPR Regulations, if equipment inspection is necessary to ensure operational safety, and
 - (vi) a record is kept of the testing carried out on the equipment to confirm that the maintenance, adjustment, alteration, or repair is satisfactory.

(3) Notification of type fault

If a controller believes that equipment may have a type fault, the controller shall take all practicable steps to ensure that, as soon as practicable, the manufacturer and supplier are given a detailed written notice to that effect. "Type fault" is defined under *section 1.4: Definitions*.

(4) Correction of type fault

- (a) A manufacturer or supplier who receives a notice under regulation 14 of the PECPR Regulations, or who otherwise becomes aware that equipment might have a type fault, must determine whether or not the equipment has a type fault and, if it does, ensure that-
 - (i) no more equipment with that type fault is manufactured, and
 - (ii) equipment with that type fault that has been manufactured or supplied is, at the manufacturer's or supplier's expense, recalled or withdrawn and, as the case requires, adjusted, altered, repaired or replaced.
- (b) Every manufacturer or supplier who determines that equipment has a type fault shall take all practicable steps to notify the Secretary of what the fault is and what measures the manufacturer or supplier is taking to correct it.

Where the type fault is an immediate risk to safety, the manufacturer or supplier shall advise the controller to withdraw the equipment from service.

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 ("HSE 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 HSE 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 HSE 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 HSE 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 documents containing standards relating to the operational safety of equipment and may impose any limit or condition thought appropriate on any recognition.

Such standards may relate to, for example:

- (i) load
 - (ii) pressure
 - (iii) temperature
 - (iv) operating life
 - (v) design verification and fabrication inspection
 - (vi) hazard levels
- (b) The Secretary may also withdraw recognition of any document containing 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 regulations 18, 19 and 20 of the PECPR Regulations, provided they have taken all practicable steps to comply 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 the issue of this code are available from the Secretary.

(3) Duties relating to design and design verification

- (a) Designers shall take all practicable steps to design equipment or any alterations to equipment in accordance with standards of generally accepted design practice 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: *Structural Design Actions - Earthquake Actions - New Zealand*.
- (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 take all practicable steps to ensure that equipment, or any alteration to equipment they design:
 - (i) is safe when used in accordance with its intended purpose
 - (ii) has its hazard level determined as appropriate and specified in the design documents
 - (iii) has its design life determined and specified in the design documents
 - (iv) has its design verification requirements determined and specified in the design documents
 - (v) has its manufacturing requirements specified in the design documents
 - (vi) has its fabrication inspection requirements determined and specified in the design documents.

(4) Duties relating to manufacture and fabrication inspection

- (a) Manufacturers shall take all practicable steps to ensure that if the equipment was designed in New Zealand, the designers of equipment they are to manufacture have complied with regulation 18.
- (b) Manufacturers of equipment shall take all practicable steps to ensure that any manufacturing is carried out in accordance with a verified design and the manufacturing requirements specified in the design.
- (c) Manufacturers shall take all practicable steps to ensure that any design changes to equipment during manufacture are approved by the designer and, where appropriate, design verified.
- (d) Manufacturers shall take all practicable steps to 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 take all practicable steps to 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) Before manufacturing equipment designed overseas, manufacturers shall take all practicable steps to 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 take all practicable steps to ensure that, before such equipment is supplied, the manufacturer has complied with regulation 19.
- (b) Suppliers of imported equipment shall take all practicable steps to ensure that it has been designed, design verified, manufactured, inspected and tested to standards that are equivalent to regulations 18 and 19.
- (c) Every supplier shall 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.
- (d) Section 18A of the HSE Act also requires persons selling or supplying plant (except that which is second-hand and is sold "as is") for use in a place of work to ensure that the plant is designed and made, and has been maintained so that it is safe for its known intended use or any use of that plant that the person could reasonably expect.
- (e) In addition, if a person hiring, selling or otherwise supplying to another person plant to be used in a place of work agrees to install or arrange the plant, the person shall take all practicable steps to install or arrange the plant so that it is safe for its intended use.

(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
 - (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 take all practicable steps to ensure that equipment is permanently marked with the design details crucial to its safe operation and any other details that enable its safe operation. This could 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 for inspection bodies and qualification issuing authorities, 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(7) inclusive.

- (b) The Secretary shall 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 *Gazette*.
- (d) Compliance with the requirements in a recognised document is sufficient to meet 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.

Note: Details of any changes to the list of recognised standards since the issue of this code are available from 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 or Australian inspection body, or
 - (ii) regulation 25(2) to an overseas inspection body that does not operate in New Zealand or Australia, 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) if 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) *Function of Inspection Bodies*

- (a) The functions that inspection bodies may be accredited to perform are to:
 - (i) perform design verification and the issue and cancellation of certificates of design verification on the recommendation of design verifiers,
 - (ii) perform equipment inspections 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 or engage design verifiers and/or equipment inspectors to perform the design verification and equipment inspection work in 2.5(3)(a).

(4) *Recognition of Inspection Bodies*

- (a) Inspection bodies operating in Australia and New Zealand may be recognised by the Secretary if satisfied that:
 - (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(s) 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 an appropriate qualification
 - (vi) they are likely to 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 impose requirements that are comparable to those imposed by the PECPR regulations.

(5) Design verifiers

Design verifiers perform design verification on behalf of an inspection body and make recommendations to the inspection body on the issue 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) A quality management system is one that is currently 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 assessment of the system carried out by the agency.

- (c) Controllers with a quality management system for equipment must take all practicable steps to comply 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 employs or engages people who are 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 qualification issuing agencies currently recognised by the Secretary and the occupational groups for which they issue qualifications include:

Table 2.1: Qualification Issuing Agencies categorised by Occupational Group

Occupational Group	Qualification Issuing Agency	
Equipment Inspectors	Certification Board for Inspection Personnel	(CBIP)
Chartered Professional Engineers (CPEng)	Institution of Professional Engineers New Zealand	(IPENZ)
Design Verifiers	Institution of Professional Engineers New Zealand	(IPENZ)

- (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 the design verifier has reasonable grounds to believe that it is safe.
- (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 designer, manufacturer, supplier or controller 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 of generally accepted design practice, codes, guidelines and so on to which the equipment conforms
 - (vii) the drawing numbers, included in the verification process
 - (viii) the principal design parameters, e.g. design life, safe working load etc.
 - (ix) the seismic coefficient
 - (x) the maximum permissible operating wind speed
 - (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 by an equipment inspector 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 upon passing the physical testing, even if 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 the first of the following events occur:
 - (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 cancelled 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 the equipment inspector has:
 - (i) visually examined the equipment, and
 - (ii) 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) 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 or renewed the certificate
 - (xii) the name and business address of the controller
 - (xiii) the title and location 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 must recommend to an inspection body that the current certificate of inspection 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 has been negligent or is unfit within the parameters of regulation 35 of the PECPR Regulations and 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.

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

- (a) Inspection bodies shall take all practicable steps to 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. Refer to *Appendix I: Effective Equipment Inspector Supervision* for further details.

PART 3: OPERATIONAL REQUIREMENTS FOR CONTROLLERS

The term “controller” means a person who is the owner, lessee, sub lessee 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

In accordance with section 13 of the HSE Act, every employer shall take all practicable steps to 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:

- (a) either –
 - (i). has; or
 - (ii). is so supervised, by a person who has – such knowledge and experience if similar places, and work, plant or substances of that kind, as to ensure that the employee doing the work, using the plant, or dealing with the substance, is not likely to cause harm to the employee or other people; and
- (b) is adequately trained in the safe use of all plant, objects, substances, and protective clothing and equipment that the employee is or may be required to use or handle.

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

- (1) supervise every crane function or 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 in

- accordance with *Table 4.1: Minimum Unit Standard Requirements*
- (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 etc, 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:Electrical Installations* (known as the Australian/New Zealand Wiring Rules). At first commissioning, either a CPEng is to certify the functional safety of the crane or the manufacturer is to supply such a certificate from an engineer holding a current annual practicing certificate and registered on the International Professional Engineers' Register. This certificate must cover points 8 to 13 of section 3.1 as appropriate. An Electrical Inspector must certify the electrical safety of the installation via a Certificate of Compliance. This certification should be repeated after any subsequent design alteration to the electrical installation or controls.

Note: Such electrical installation may also be subject to the requirements of the *AS 1418: Cranes, 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, wheels or buttons 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 possible for any function of the crane to inadvertently restart without operator interaction
 - (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 electro-magnetic lifting attachments are used and where there is any possibility of danger to persons or property as a result of a falling load, a backup system (e.g. a battery) is used in case power supply to the magnet fails
 - (13) 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.

Radio-controlled equipment

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

- (14) 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) suitable visual indication on the crane indicating when the crane is on radio control
- (15) ensure radio-controlled cranes operate such that when the transmitter range is exceeded the crane must come to rest with brakes applied as applicable.

Safe access and egress

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

- (16) ensure a means of safe and adequate access and egress is provided for operation, maintenance and inspection of the crane
- (17) ensure that safety lines, when fitted, comply with *AS/NZS 1891: Industrial Fall Arrest Systems and Devices*
- (18) 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:

- (19) ensure that any load-handling devices such as grapples, demolition balls, clamshells, piling hammers, magnets etc are maintained and operated in accordance with the manufacturer's recommendations and kept in a safe condition
- (20) ensure that no crane with a load is operated in a free-fall situation on any

site, other than clam shelling, draglining, pile driving, demolition and compaction.

Guarding

- (21) 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.

Overhead electric power lines

- (22) Every operator of a mobile crane working in the vicinity of live overhead electric power lines shall ensure that the distance between any live overhead electric line and any part of any mobile plant or load carried shall be at least 4.0 metres, unless the operator has received written consent from the overhead electric line owner allowing a reduced distance.
- (23) Mobile crane work carried out in the vicinity of overhead electric power lines shall be conducted in accordance with the Electricity Regulations 1997 (and any associated amendments) and *NZEC 34:2001 – the New Zealand Electrical Code of Practice for Electrical Safe Distances*.

3.2 Routine Checking

Every controller of a crane shall ensure that:

- (1) operators carry out appropriate checks to enable the crane to be operated safely, according to the controller's written procedures based on the manufacturer's instructions where available, 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 report or certificate of inspection must bear the name of the equipment inspector who either holds a current certificate appropriate for the type of crane, or is a trainee under the effective supervision of an equipment inspector who holds an appropriate current certificate of competence
- (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, factors affecting the remaining life, based on the actual conditions of use, are recorded at every inspection. Such factors may include, but are not limited to, operating hours, utilisation and service conditions (if variable)
- (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, or design verification. This documentation is to be made available to the inspection body. The alterations or repairs are to be carried out to the satisfaction of an equipment inspector and a new certificate of inspection may then be issued. Alterations or repairs carried out without involving an equipment inspector are likely to invalidate the certificate of inspection

Note: Such alterations or repairs should be designed by the manufacturer or a chartered professional engineer and must be design verified.

- (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 either be proposed by a New Zealand-certified welding engineer (NZCWE) or the repairer must demonstrate to the equipment inspector that appropriate alternatives are available. In all 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) all 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. The equipment inspector shall review the manufacturer's ITP 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 take all practicable steps to ensure that:

- (1) every crane is maintained in a safe condition and in accordance with the manufacturers 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

- (1) Every controller shall take all practicable steps to ensure that, if an event occurs in a place of work which;
 - (a) causes damage that affects the operational safety of equipment; or
 - (b) causes damage to other property that may affect the safety of equipment and might in different circumstances have caused a person to be seriously harmed.

Then:

- (c) the Secretary is notified as soon as possible after the event; and
- (d) within 7 days of the event occurring, the Secretary is given 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.

Further detail is available in the PECPR Regulations and 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:

- (1) regulation 18(c) requires designers to determine and specify in the design, the design life of the equipment
- (2) 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
- (3) regulation 10(c) requires controllers to operate equipment within the limits that it was designed to operate within.

As the end of the 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 inspection process.

This process may include but is not necessarily limited to:

- 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).

It is recognized however, that in many cases some of this evidence will not be available and hence the equipment inspector/ inspection body will need to assess information from different sources and exercise professional judgement in order to satisfy themselves as to the future safety of the crane.

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

PART 4: REQUIREMENTS FOR PERSONS OPERATING OR WORKING WITH CRANES

All persons operating or working with a crane must hold the following applicable Unit Standards as a minimum qualification and preferably hold the relevant National Certificate in Crane Operation.

Table 4.1: Minimum Unit Standard Requirements

* One or more of these unit standards must be held

Type of Crane	3789	3790	3794	3795	3800	3818	15757	16617	20208	20209	20526	23351	24511
Mobile crane operation	✓			✓									
Tower crane operation	✓		✓										
Crawler crane operation	✓										✓		
Self erecting tower crane operation	✓								✓				
Cab controlled overhead travelling crane operation		✓											
Pendant or remote controlled overhead travelling crane operation					✓								
Truck loader crane operation				✓*				✓*					
Erection of a self erecting tower crane										✓			
Erection, climbing or dismantling of other tower cranes						✓	✓*					✓*	
Slinging of regular loads	✓												
Non-slewing articulated crane e.g. tractor crane	✓												✓

Unit Standards

- 3789 – Sling regular loads and communicate during crane operations
- 3790 – Operate a cab controlled overhead crane and lift and place loads
- 3794 – Lift and place loads with a tower crane
- 3795 – Configure a mobile crane and lift and place loads
- 3800 – Operate a pendant controlled overhead crane and lift and place loads
- 3818 – Erect, climb and dismantle a tower crane
- 15757 – Employ fall arrest systems on building and construction sites
- 16617 – Operate a truck loader crane and lift and place loads
- 20208 – Describe types of self erecting tower cranes and lift and place loads
- 20209 – Erect, dismantle and reconfigure a self erecting tower crane
- 20526 – Configure a track crawler crane and lift and place loads
- 23351 – Describe, set up, and use, fall arrest and rescue system in a tower crane environment.
- 24511 - Configure a non-slewing articulated crane, and lift and place regular loads.

PART 5: REQUIREMENTS OF DESIGNERS

5.1 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) where applicable for the type of crane, the design includes calculations for seismic influences, ice, snow and wind loadings and design life
- (3) the design verification and fabrication inspection requirements, and safe working load are determined in accordance with the specific design standard for that particular crane and regulation 18 of the regulations, and the requirements of this code.

In addition it is recommended that:

- (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. 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 6: REQUIREMENTS OF DESIGN VERIFIERS

6.1 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.

6.2 Design Verification

Design verification is required for all models of crane.

Two options are available for this process:

(1) By document review

Document verification by document review may be used for cranes from manufacturers producing standard cranes, designed and built to acceptable engineering standards.

For proven standard production model cranes, 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.

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 (refer to *Appendix C: Reference Standards and Documents*) and any others that may be gazetted at a later date
- (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 showing all booms, jibs and towers with chord and lacing members specified (if appropriate) and typical mid-sections of each
 - (ii) a complete roping diagram showing all ropes, including details of the rope specifications
 - (iii) a copy of the manufacturer's applicable load radius chart
 - (iv) details of the safe load indicator required.

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

(2) By design analysis

Sufficient documentation shall 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 need not necessarily be provided in the first instance, as the verification is an independent check on the design, however, these may be required by the Design Verifier or the Inspection Body, and shall be provided if requested.

Drawings should specifically include but are not necessarily limited to:

- (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.

PART 7: REQUIREMENTS OF MANUFACTURERS

7.1 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) the Secretary and controllers are advised of type faults
- (3) 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 8: REQUIREMENTS OF SUPPLIERS AND IMPORTERS

8.1 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:
 - (i) regulation 18 Duties relating to design and design verification
 - (ii) regulation 19 Duties relating to manufacture and fabrication inspection
 - (iii) regulation 20 Duties relating to supply
 - (iv) regulation 21 Duties relating to provision of information.

Note: Section 18A of the Health and Safety in Employment Act 1992 also applies.

- (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 documentation identified in this Code for the particular type of crane is provided to the inspection body and the purchaser of the crane
- (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) this Part 8 must be read in conjunction with Part 7.

PART 9: FUNCTIONS OF EQUIPMENT INSPECTORS AND INSPECTION BODIES

9.1 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 a Non Destructive Testing ("NDT") inspection may 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 be advised of any equipment considered so unsafe that a certificate of inspection has been declined, cancelled or suspended
 - (e) formally advise their clients and the Department of Labour of cases where appropriate corrective action has not been taken following a matter specified in a written report.
- (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.

9.2 Inspections

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



Picture 2: Mobile Crane

PART 10: MOBILE CRANES

10.1 General

Mobile cranes require design verification by an inspection body in accordance with the PECPR Regulations and Parts 2 and 6 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 7, 8 and 9 of this code also apply.

A supplier, controller or manufacturer of such a mobile crane shall provide this documentation, as in Part 8.1, to the inspection body carrying out the design verification.

Safe load indicators:

- (1) For minimum load safety device requirements required on various crane types refer to *Appendix A: Load Safety Devices/Safe Load Indicators*.

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) The stability of a crane under static conditions shall be such that the rated capacity is not greater than the percentage of the tipping load that would need to be applied to tip the crane over. Rated capacity shall not exceed an upper limit of 78% of the tipping load for all cranes or such lesser limit as may be specified by the manufacturer. For free on wheels, it is to be not more than 66%.
- (2) The rope safety factor shall be the greater of 4.5 or that required by the design class of the crane for hoist, luffing and running ropes, 3.5 for standing (e.g. pendant ropes) and 3 for erection ropes, and ropes shall be the manufacturer's recommended rope types and construction for each application.
- (3) All rigging and boom options the crane is fitted for shall be shown in the cab.
- (4) An "anti-two-block" warning or cut-out device shall be fitted to cranes in accordance with *Appendix A*.

10.3 Inspections

- (1) 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 or hook block certificates
 - (c) operation of crane to be demonstrated
 - (d) general condition of crane structure including fastenings, chassis, outriggers and boom and fly jibs including where applicable, any interlocking system

- (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 manufacturers 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.



Picture 3: Tower Crane

PART 11: TOWER CRANES

11.1 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 6 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 7, 8 and 9 of this code also apply.

A supplier, controller or manufacturer of such a tower crane shall provide this documentation, as in Part 8.1, 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 D (*Seismic Requirements for the Design of Tower, Portal and High Pedestal Cranes*) and E (*Stability Requirements for the Design of Tower, Portal and High Pedestal Cranes under Seismic Loading*) 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 the version of *AS/NZS 1170.2 Structural Design Actions - Wind Actions* applicable at the time of submission for design verification in New Zealand, or equivalent standards.
- (2) For minimum load safety device requirements required on the various crane types, refer to *Appendix A: Load Safety Devices/Safe Load Indicators*.

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:

- (a) Electrically powered cranes should have phase failure protection so that, in the event of a phase failure, ALL phases are shut down
- (b) All new rope luffing tower cranes shall have a secondary brake on the luffing drive. This is not retrospective
- (c) Prior to initial erection in New Zealand, and thereafter annually whilst erected and in service an inspection shall be carried out by an equipment inspector of, but not limited to, the items listed in Appendix H of this code
- (d) 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 a competent person, duly authorised by the controller, at each and every erection or configuration change, or every 12 months whilst the crane is erected or in regular service.

Testing of the load limits is to be performed each week by the crane operator or a competent person whilst the crane is erected or in regular service.

- (e) A plan should be developed for dealing with any emergency.

11.3 Inspections

Inspection of new and existing tower cranes is to be in four distinct parts as follows:

Part 1: Tower Crane – Inspection at Erection and After Repairs (by an equipment inspector for certification)

Prior to erecting a tower crane the following certificates and documents must be provided:

- (a) Statement from the controller with details of the crane configuration, which must be within design verified parameters, including number of tower sections, jib length, counterweight weights certificate, rating sheet, rope certificates, planned changes in height with details of tie-ins, number of tower sections between tie-ins, details of any clash zones and load testing programmes
- (b) Foundation certificate from a CPEng, covering both design and construction
- (c) Certificate from an NDT company accredited by IANZ to perform the particular type of inspection required covering crack testing of all base anchors to be used. Irrespective of the results of any NDT reports, re-use of base anchors is not to exceed the recommendations of the manufacturer. The date of testing of all anchors is to be recorded
- (d) All pre-stressed high-tensile crane bolts operating in tension shall 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. Any bolts found with crack-like indications shall be removed from service and destroyed. Calibration Certificates for any bolt tensioning devices, such as torque wrenches, are required.

The following minimum checks shall be made by the equipment inspector:

- (e) Maintenance and repair records including any new rope certificates
- (f) General condition and proper identification of crane structure, fastenings, towers, boom sections, counter boom sections, counterweights (fixed or moving), A-frames, cab section, base section, climbing frame, rails
- (g) General wear and tear, protective coating condition etc.
- (h) Hydraulic systems, actuators and attachments
- (i) Condition of pendant ropes and bridles.

The following must be addressed either prior to or immediately after erection, as practicable:

- (j) Slew ring inspection and report are to manufacturer's specifications
- (k) Sheaves and bearings
- (l) Hoist, luffing and slew brakes and linings
- (m) Safety guarding
- (n) Hoist, luffing, trolley and counterweight ropes
- (o) Hooks, hook blocks and swivel bearings.

The following must be addressed immediately after erection:

- (p) Crane assembly and configuration
- (q) Statement from qualified erection supervisor (refer Table 4.1: *Requirements for Persons Operating or Working with Cranes*) that the crane has been erected in accordance with the manufacturer's recommendations, including the vertical alignment tolerances of the tower
- (r) Test weight certificates.

Inspection prior to testing is to include:

- (s) Crane access ladders and platforms
- (t) Tensile bolt installation
- (u) Rope anchors and dead ends
- (v) Pins washers, split pins and locking plates
- (w) Hydraulic installation
- (x) Electrical equipment, earthing and electrical Certificates of Compliance
- (y) Signage.

Testing is to include:

- (z) Crane operation
- (aa) Operator's cab and controls
- (bb) Hoist, trolley and boom limit switches
- (cc) Load-moment cutouts
- (dd) Hoist speed limiters
- (ee) Phase failure and rotation protection (where uncertified)
- (ff) Calibration and testing of load-moment cutouts, SLIs and load indicators where fitted (refer to *Appendix A*) in accordance with the manufacturer's instructions
- (gg) Free slew.

Refer to *Appendix H: Tower Crane Inspections Checklists (Informative)*.

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 11.2 as appropriate.

The mountings of any non-OEM signage hoardings, billboards and banners shall be approved by a CPEng. Flags (including hook-mounted flags) must be authorised by the manufacturer for the specific crane model and use and be 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 is in possession of a certificate of design verification and a foundation certificate.

Part 2: Tower Crane - Annual In-Service Inspection (by an equipment inspector for certification)

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

- (a) Inspection of all documents from last inspection, including log books
- (b) Maintenance and repair records including any new rope certificates
- (c) General wear and tear, protective coating condition etc.
- (d) Hydraulic systems, actuators and attachments
- (e) Condition of pendant ropes and bridles
- (f) Slew ring inspection and report are to manufacturer's specifications
- (g) Sheaves and bearings
- (h) Hoist, luffing and slew brakes and linings
- (i) Safety guarding
- (j) Hoist, luffing, trolley and counterweight ropes
- (k) Hooks, hook blocks and swivel bearings

Testing is to include:

- (l) Crane operation
- (m) Operator's cab and controls
- (n) Hoist, trolley and boom limit switches
- (o) Load-moment cutouts
- (p) Hoist speed limiters
- (q) Phase failure and rotation protection (where uncertified)
- (r) Calibration and testing of load-moment cutouts, SLIs and load indicators where fitted (refer to *Appendix A*) in accordance with the manufacturer's instructions.

Part 3: Tower Crane – In-Service Inspection and Testing at Alteration of Height and/or Jib Length (by an equipment inspector)

Inspections will cover (but are not limited to):

- (a) General inspection of crane condition
- (b) Inspection and identification of added tower sections and/or other components
- (c) Confirmation of the configuration of the tower system
- (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) Either a load test or statement of a satisfactory load test acceptable to the inspection body

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

- (g) Confirmation that rope length is suitable for the application.

Part 4: The inspection by an equipment inspector of climbing system components

- (a) Either annually or 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 a competent person. A record of this inspection shall be kept on file.



Picture 4: Self-Erecting Tower Crane

PART 12: SELF-ERECTING TOWER CRANES

12.1 General

Self-erecting tower cranes require design verification by an inspection body in accordance with the PECPR Regulations and Parts 2 and 6 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 7, 8 and 9 of this code also apply.

A supplier, manufacturer or controller of such a self-erecting tower crane shall provide this documentation, as in Part 7.2 and 8.1, 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 D and E 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 Cranes, Hoists and Winches – Tower Cranes* or an equivalent standard. The coefficient zone factor of 1.2 shall apply to all cranes. Wind forces are to be calculated as per the version of *AS/NZS 1170.2 Structural Design Actions: Wind Actions* applicable at the time of submission for design verification in New Zealand, or equivalent standards.
- (2) For minimum load safety device requirements required on the various crane types, refer to *Appendix A: Load Safety Devices/Safe Load Indicators*.
- (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.

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) Prior to initial erection in New Zealand, and thereafter annually (whilst erected or in regular use), an inspection shall be carried out by an equipment inspector of (but not necessarily limited to) the items listed in part 2 of 11.3 of this code. The inspection of these components is commonly referred to as a ground inspection.
- (2) A foundation certificate shall be provided by a chartered professional engineer stating that the foundations can withstand the crane manufacturers 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.

- (3) 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.
- (4) 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.
- (5) Whilst erected or in regular use, the crane shall be maintained and tested in accordance with the manufacturer's/designer's requirements, and records kept.
- (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) When a crane is to be operated in the same place for an extended period, consideration should be given to providing extra support or concrete footings to stop compaction.
- (10) 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 12.1(1).

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



Picture 5: Gantry Crane

PART 13: GANTRY CRANES

Note: Overhead travelling cranes, portal cranes, Goliath, semi-Goliath and straddle carriers etc. are referred to as Gantry Cranes in this Part.

13.1 General

These cranes require design verification by an inspection body in accordance with the PECPR Regulations and Parts 2 and 6 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 7, 8 and 9 of this code also apply.

A supplier, manufacturer, designer or controller of such a gantry crane shall provide this documentation, as in Part 6.2 and 8.1, to the inspection body carrying out the design verification and equipment inspection.

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) Where practicable, 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. 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 not specified by the manufacturer's documentation shall be design verified.
- (2) Welding is to be carried out in accordance with the requirements of the construction standard or *AS/NZS 1554: Structural Steel Welding* and *NZS 4711: Qualification Tests for Metal-Arc Welders*.
- (3) Suitable warning notices of any live conductors on gantries and access points.
- (4) Clearly marked electrical power isolation switches. Pendant controls and radio controls are to have an emergency stop/reset button fitted.
- (5) 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 controller of the crane. The means of access must be included in the design verification and certification of the crane by the inspection body.
- (6) 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.
- (7) 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.
- (8) Electrical installation shall comply with applicable Electrical Regulations and associated Standards.
 - (9) In all cases where two or more cranes or travelling hoists are on the same runway then proximity devices, which prevent contact between the cranes/hoists at other than very slow speed, must be fitted to all cranes/hoists in addition to shock absorbing buffers.
 - (10) 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 40m/m then proximity switches or devices are necessary.

13.3 Inspections

- (1) A visual inspection by an equipment inspector of the crane installation is required prior to testing.
- (2) The following tests are required after inspection:
 - (a) Load testing to manufacturing standard to 125% of the maximum SWL if the manufacturing standard is not available.
 - (b) 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.

- (c) Test the operation of the hoist brake with the power supply turned off and maximum SWL applied.
 - (d) Lowering of maximum safe working load by hand control with power off (where applicable).
- (3) 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 or devices are necessary
 - (c) load cells
 - (d) upper and lower hoist limits
 - (e) radio-control operation.

Note: Radio controls are to comply with *BS 466: Specification for Power Driven Overhead Travelling Cranes, Semi-Goliath and Goliath Cranes for General Use* section 31.7 or equivalent.

- (4) Any structural change to the crane or its components requires design verification.
- (5) Relocation of an existing crane is to be inspected by an equipment inspector for the issue of an inspection certificate and overload tested 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.

- (6) Upgrading 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.
- (7) Replacement parts must be to the manufacturer's specifications.
- (8) 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. *The 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's 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) operator 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) condition (paint, etc.)
- (x) lubrication

- (y) hooks
- (z) lifting spreaders etc. when used as a hook.

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

PART 14: TRUCK LOADER TYPE CRANES (INCLUDING KNUCKLE BOOM AND TELESCOPIC/STRAIGHT BOOM)



Picture 6: Truck Loader Crane

14.1 General

Truck loader type cranes (including knuckle boom and telescopic/straight boom) require design verification by an inspection body in accordance with the PECPR Regulations and Parts 2 and 6 of this code, prior to certification for use within New Zealand. This requirement does not apply to truck loader type cranes of lifting capacity less than 0.9 tonne metres (t-m)¹.

Parts 3, 4, 7, 8 and 9 of this code also apply.

A supplier, manufacturer or controller of such a crane shall provide the documentation specified in Part 6 to the inspection body carrying out the design verification.

- (1) For minimum load safety device requirements required on the various crane types, refer to *Appendix A: Load Safety Devices/Safe Load Indicators*.

¹ "Tonne-metre capacity" is the minimum radius at which the crane can lift a load multiplied by the SWL in tonnes at that radius.

- (2) For minimum load safety device and inspection requirements (including transitional requirements) for this class of crane, 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:

- (1) Suppliers shall provide:
- (a) manufacturer's rating chart
 - (b) manufacturer's recommended installation instructions
 - (c) operating and maintenance instructions in English
 - (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) In the case of cranes mounted to road vehicles requiring a Certificate of Fitness, a certificate from a New Zealand Transport Authority - approved HVEC engineer to certify that the crane installation/vehicle modification complies with the crane/vehicle manufacturer's recommendations as specified in appropriate land transport rules¹. This must include an assessment of suitability of the mounting to include crane loadings due to transport and operation under the crane's maximum safe working load.

Note: This Rule should be read in conjunction with *Land Transport Rule: Heavy Vehicles 2004* and subsequent amendments.

- (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 maximum load for any given radius with the crane boom at minimum operating angle and the vehicle on level ground in accordance with the crane manufacturer's recommendations. If the manufacturer's recommendations are not available then the requirements of *AS1418.11 Cranes Hoists and Winches: Vehicle-Loading Cranes* clause 2.7.3 "Stability" must be met. The stability test shall be conducted as per clause 3.2.5 of *AS1418.11*. When testing stability to *AS 1418:11* clause 3.2.5, up to half the wheel sets in only one axle group may lose contact with the ground. At least half the individually braked wheel sets shall stay in contact with 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.

¹ Where a truck loader type crane is not fitted to a heavy motor vehicle, this certificate is not required. A CPEng certificate for the installation may be required by the inspection body depending on the application. Likewise, a stability test may not be required/appropriate for non-vehicular applications.

14.3 Inspections

- (1) Annual visual and operational inspections by an equipment inspector or competent person as appropriate¹ (refer to *Appendix A: Load Safety Devices/Safe Load Indicators*) 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 operator 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) slew ring or post
 - (j) crane to truck chassis mounting
 - (k) demount mechanism on mounting 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 (secured with locknuts or self-locking fasteners)
 - (o) load radius rating chart affixed
 - (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
- (2) 0 – 0.9-t-m cranes shall:
 - (a) comply with 14.1, 14.2 and all parts of 14.3 except 14.3(3)
 - (b) have the initial inspection by an equipment inspector and

¹ Inspections by a competent person must be documented in a register held by the owner

subsequent annual inspections may be carried out by a competent person. Refer to Appendix A.

- (3) All cranes over 0.9 t-m shall:
 - (a) comply with 14.1, 14.2 and all parts of 14.3 except 14.3(2)
 - (b) if remote- or lever-controlled crane, have an emergency cut-off/reset button at each operating control station
 - (c) be fitted with load holding valves on main, outer and extension booms
 - (d) be fitted with a pilot-controlled double-check valve or a manual check/isolating valve on each stabiliser jack
 - (e) have an annual inspection carried out by an equipment inspector. Refer to *Appendix A*.
- (4) All certificates of inspection must be placed and visible in the vehicle cab (or on the crane, for non-vehicular applications).
- (5) When moving on the road, the crane boom must be either located in or on the parking mount if provided, or located or locked in a position such that the boom is secured within the vehicle dimensions.

PART 15: TRACTOR CRANES AND SIDE BOOM PIPE LAYERS

15.1 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 6 of this code, prior to certification for use within New Zealand.

Parts 3, 4, 7, 8 and 9 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 8.1, to the inspection body carrying out the design verification.

- (1) For minimum load safety device requirements required on the various crane types, refer to Appendix A.

15.2 Additional Requirements

In addition to the requirements in Part 15.1 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 16: OTHER CRANES OR EQUIPMENT USED AS CRANES

16.1 General

This Part includes but is not limited to:

- Monorails
- Pillar cranes
- Guy derricks
- Scotch derricks
- Jib cranes
- Dockside container cranes (all types)
- Mobile plant configured for lifting or carrying suspended loads.

All crane lifting gear shall be certified by a CPEng.



Picture 7: Telehandler

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 6 of this code, prior to certification for use within New Zealand.

Parts 4, 7, 8 and 9 of this code also apply.

- (1) For minimum load safety device requirements required on the various crane types, refer to *Appendix A: Load Safety Devices/Safe Load Indicators*.
- (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 D and E is required. The stability factor shall be as per *AS 1418.4: Cranes, Hoists and Winches – Tower Cranes* 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: Structural Design Actions - Wind Actions*. Refer to section 5.1.

All dockside container cranes must have an anemometer fitted.

16.2 Additional Requirements

In addition to the requirements in Part 16.1 and the relevant sections in Parts 3 and 13, the following are also required:

- (1)
 - (a) For cranes designed to *AS 1418.3: Cranes (Including Hoists and Winches) – Bridge, Gantry and Portal Cranes (Including Container Cranes)*, the maximum deflection for wall-mounted cranes is 1/300th of the jib length, and for non-wall-mounted cranes, the calculated deflection shall not exceed $L/300$ where L is the length of the jib plus length of freestanding post.
 - (b) For monorails designed to *BS 2853: Specification for the Design and Testing of Steel Overhead Runway Beams*, 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 13.2 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.
- (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 16.2(1) and 16.2(2). For this inspection the controller will also provide the equipment inspector with 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.
- (4) Telehandlers used as cranes have potential stability issues when travelling over sloping or undulating ground carrying a suspended load. 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 tasks they are to perform and the location they are intended to be used in. Where a telehandler is intended to lift freely suspended loads by a jib attachment or other means and is capable of slewing its boom through more than 5° then written confirmation that the machine complies with *AS 1418.5 (Cranes, Hoists and Winches – Mobile Cranes)* (or an equivalent standard) should be available onsite. *BS EN 1459: Safety of Industrial Trucks – Self-Propelled Variable Reach Trucks* **is not** an equivalent standard for the use of telehandlers as mobile cranes; the stability requirements of BS EN 1459 do not cover this configuration.

- (5) When mobile plant, for example a tractor, configured for lifting or carrying suspended loads is being used in a manner associated with its primary function, the plant is not regarded as a crane. For example, if a tractor is being used to dig a trench, then carry or lift drainage pipes into a hole, the tractor is NOT regarded as a crane. However, mobile plant configured for lifting or carrying suspended loads performing lifting duties not directly associated with their primary function is regarded as a crane and must have:
 - (a) Hose burst protection valves supplied or recommended by the equipment manufacturer fitted to all hydraulic lines supplying cylinders which support the load
 - (b) Lifting hooks or eyes rated equal to or greater than the maximum lifting capacity of the machine. These lifting hooks or eyes must be installed to the specification of a CPEng and tested by an equipment inspector before first use. In the case of excavators and similar machines it is recommended that hooks are of the fully enclosed type.
- (6) In all cases where two or more cranes or travelling hoists are on the same runway then proximity devices, which prevent contact between the cranes/hoists at other than very slow speed, must be fitted to all cranes/hoists in addition to shock absorbing buffers.
- (7) 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 40m/m then proximity switches or devices are necessary.

PART 17: CRANE-LIFTED WORK PLATFORMS

17.1 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.



Picture 8: Work Platform

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

- (1) All platforms shall be designed, manufactured and tested in accordance with approved standards using a minimum impact factor of 1.5, and then load tested to 1.5 times the Safe Working Load.

All platforms shall be designed/certified by a CPEng and inspected/tested by an authorised equipment inspector. The CPEng Design Certificate should state the design code, impact factor, class of utilisation and state of loading.

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: Vehicle-Mounted Elevating and Rotating Aerial Devices*. Insulated work platforms should be dried using a sponge before use. Platform gates, where fitted, shall be able to be secured in position and open inwards or slide 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.
- (6) Work platforms are to be inspected prior to first use in New Zealand to ensure compliance with these conditions. This initial inspection and subsequent annual inspections are to be carried out by a competent person, and a record kept of these inspections.
- (7) All cranes being used as a suspended work platform shall have power lowering capability. Free-fall capability shall be locked out.
- (8) Where a crane that is to be used with a suspended work platform 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 suspended or fixed/pendulum platforms shall operate at not more than 75% of their safe working load.
- (10) All cranes being used with suspended platforms shall have anti-two-block devices fitted, unless they have a fixed hook.
- (11) When operating suspended work platforms from the hook, all hook safety latches shall be fully operational.
- (12) Cranes with automatically-applied brakes to the hoist or twin-lever operated may operate with two hooks.
- (13) When a crane lifted work platform is in use, the crane operator shall be in attendance at all times and shall operate the crane within the manufacturer's recommendations.
- (14) The crane operator shall carry out appropriate inspections of equipment daily before use.
- (15) Persons working on the platform shall wear the appropriate safety harness at all times suitably attached via an approved lanyard. If the arrangement of harness anchor point and work platform means that it is at all possible for the attached person to move beyond the confines of the platform then the lanyard shall incorporate an energy/shock absorber. If movement beyond the confines of the platform is not possible then attachment via a suitable fixed-length lanyard is acceptable and may be preferable in some circumstances. 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 or the design otherwise precludes direct

attachment of the harness lanyard to the hook there shall be an appropriate number of harness anchor points incorporated in the structure. Such indirect harness anchor points shall meet the minimum strength requirements of Section 3 of *AS/NZS 1891.4: Industrial Fall Arrest Systems and Devices – Selection, Use and Maintenance* and be certified by a CPEng.

- (16) Appropriate personal protective equipment shall be worn at all times.
- (17) Persons working from the platform shall be able to communicate clearly with the crane operator at all times.
- (18) Truck loader type and other cranes using work platforms (personnel baskets/buckets) of the fixed or pendulum (vs. suspended) type must have a fixed boom connection between the crane and the work platform including the yoke. The inspection certificate issued will cover the crane and the work platform (including all work platform attachment components) for its intended use only.
- (19) 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 hazard 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.
- (20) In all other instances where it may be necessary to suspend one or more persons from a crane without the use of an approved work platform (e.g. in arboriculture operations), these arrangements must be in full compliance with the relevant Codes of Practice.

PART 18: 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.

18.1 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 at least 2 metres of chain which must have a minimum breaking load capacity no less than 10 times the weight of the ball.

18.2 Operator Protective Structures

- (1) Falling Object Protective Structure (FOPS): Cranes used specifically for demolition balling should be fitted with a CPEng-certified FOPS cab to meet or exceed the requirements of *ISO 8083: Machinery for Forestry - Falling-Object Protective Structures (FOPS) - Laboratory Tests and Performance Requirements*, and be adequate and safe for the purpose intended.
- (2) Side or roof intrusion: Operators are to be protected from debris by a CPEng-certified protective structure to meet or exceed the requirements of *ISO 8084: Machinery for Forestry - Operator Protective Structures - Laboratory Tests and Performance Requirements* and be adequate and safe for the purpose intended.

18.3 Demolition Balls

Safety rules for demolition balling:

- (1) All demolition is to be supervised by a competent person. Operators shall be competent and experienced.
- (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) The machine shall be in proper working order while in use. When the demolition ball is suspended, the operator shall be at the controls.
- (10) 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: LOAD SAFETY DEVICES/SAFE LOAD INDICATORS

Table A1: Minimum Load Safety Device Requirements: should be fitted, as a minimum, to the machine listed.

ACOP Part	Crane Type		Rating chart(s)	Radius or angle indicator ¹	Boom length indication	Anti two block devices ²		Load gauge or display	Safe load indicator (a minimum of one of ticked items)		Anemometers	
						Warning	Cutout		Safe load alarm/ cutout	Safe load indicator or load moment indicator		
10	Mobile	< 3 tonne	✓	✓	✓	✓ ³						
		> 3 tonne	✓	✓	✓	✓		✓	✓	✓		
11	Tower		✓	✓			✓	✓	✓	✓	✓	
12	Self-erecting tower		✓	✓			✓	✓	✓	✓	✓	
13	Overhead travelling/Monorail						✓					
14	Truck Loader Type	Knuckle boom	≤ 0.9 t-m	Refer to Table A2								
			0.9 - 15 t-m									
			≥ 15 t-m									
		Tele boom	≤ 0.9 t-m									
			0.9 - 15 t-m									
≥ 15 t-m												
15	Side boom pipe layer		✓	✓	✓							
	Tractor		✓	✓	✓	✓			✓	✓ ⁴		
16	Other cranes	Pillar, Jib ⁵		✓ ⁶	✓		✓					
		Scotch/Guy derrick		✓	✓							
		Container		✓	✓		✓	✓	✓	✓	✓	✓
		Mobile plant ⁷		✓	✓ ⁸							

¹ Radius and/or Angle Indicators are only required if the SWL varies with jib radius or angle.

² An anti-two block device may be removed during piling operations as it is possible it may be damaged or shaken loose and cause a further risk. Where an anti-two block warning or cut-out device is not available, then two block damage protection if fitted is acceptable.

³ If fitted with hoist.

⁴ Recommended.

⁵ Pillar cranes feature a fixed or slewing jib mounted off a fixed, free-standing column, post or pillar. A jib crane is a fixed or slewing jib mounted off a fixed structure such as a building frame.

⁶ The rating chart for pillar and jib cranes may simply be appropriate SWL indications clearly marked on the jib.

⁷ Any item of plant configured to list suspended loads and used for purposes other than duties directly associated with the primary function of the machine.

⁸ Where it is impracticable to fit a radius indicator to a mobile plant (e.g. excavators) it will be acceptable for the controller to demonstrate that his operator(s) is or are fully trained and assessed in the use of this plant as a crane.

Table A2: Minimum Load Safety Device and Inspection Requirements

The following table shows the type of equipment that should be fitted, as a minimum, to the machine listed.

ACOP Part	Crane Type		Load Safety Devices ¹							Inspection Requirements					
			Rating Chart(s)	Radius or Angle Indicator ²	Boom Length Indication	Anti Two Block Devices		Safe Load Indicator (a minimum of one of ticked items)		New or Retrofitted Crane ³			Annual Inspection		
						Warning	Cutout	Safe Load Alarm/Cutout	Safe Load Indicator or Load Moment Indicator	Design Verification	Stability Test (where applicable)	Inspection by Equipment Inspector	Inspection by Equipment Inspector	Inspection by Competent Person	
14	Truck loader-type	Knuckle boom	<0.9t-m	✓			✓ ⁴						✓		✓
			0.9-15t-m	✓			✓ ⁴		✓	✓	✓ ⁵	✓	✓	✓	
			>15t-m	✓			✓ ⁴	✓ ⁴	✓	✓	✓	✓	✓	✓	✓
	Tele boom	<0.9t-m	✓	✓	✓	✓							✓		✓
		0.9-15t-m	✓	✓	✓	✓			✓	✓	✓ ⁵	✓	✓	✓	
		>15t-m	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

¹ Truck loader-type cranes in service in New Zealand as of 1 February 2010 will not be required to be retrofitted with additional load safety devices. However, crane owners and operators may benefit from their fitment.

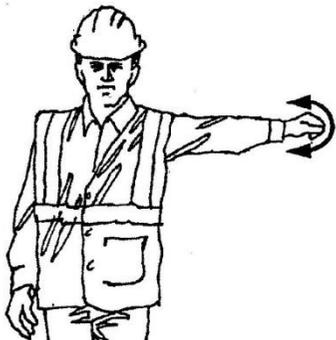
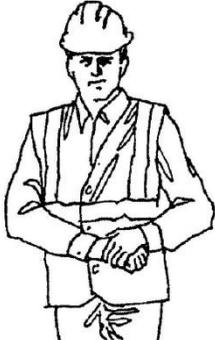
² Radius and/or Angle indicators are only required if the SWL varies with the jib radius or angle.

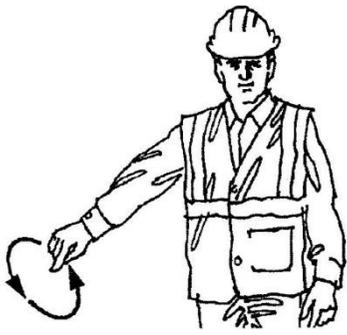
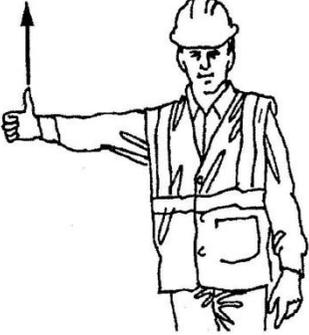
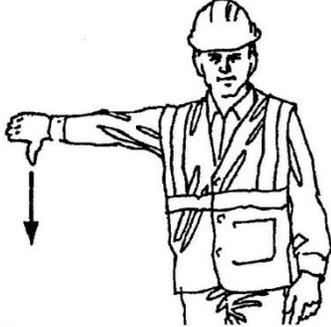
³ "New or refitted cranes" means new cranes fitted to a vehicle or other mounting for the first time, and used cranes fitted to a different vehicle or other mounting as of 1 February 2010.

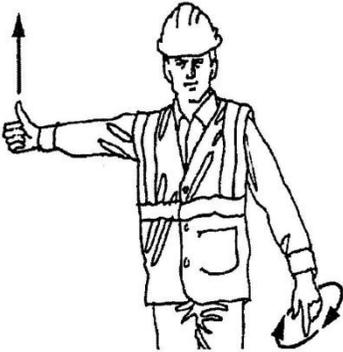
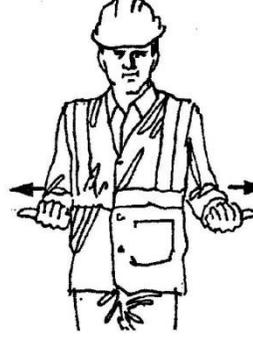
⁴ if fitted with hoist.

⁵ Design verification is not required for truck loader type cranes of SWL 0.9 – 15 t-m in service in New Zealand as of 1 February 2010.

APPENDIX B: HAND SIGNALS

				
<p>STOP Extend one arm and hold palm of hand vertical. Note: EMERGENCY STOP is indicated by holding both arms up.</p>	<p>STOP (B) Arm extended, palm down, move hand right and left. Usually for different level operations.</p>	<p>HOLD EVERYTHING Clasp hands in front of body.</p>	<p>MOVE SLOWLY Place one arm motionless across chest in conjunction with or before giving any other directional signal ("Hoist slowly" shown as example.)</p>	<p>HOIST With forearm vertical, forefinger pointing up, move hand in horizontal circles.</p>

				
<p style="text-align: center;">LOWER</p> <p>With arm extended downward, forefinger pointing down, move arm in horizontal circles.</p>	<p style="text-align: center;">USE MAIN HOIST</p> <p>Tap fist on head, then use regular signals.</p>	<p style="text-align: center;">USE FLYLINE (AUXILIARY HOIST)</p> <p>Tap elbow with one hand, then use regular signals.</p>	<p style="text-align: center;">RAISE BOOM (LUFF UP)</p> <p>Arm extended, fingers closed, thumb pointing upward.</p>	<p style="text-align: center;">LOWER BOOM (LUFF DOWN)</p> <p>Arm extended, fingers closed, thumb pointing downward.</p>

				
<p>SLEW Arm extended, point with finger in direction of swing of boom.</p> <p>OVERHEAD GANTRY CRANE – Arm extended, point with finger in the long-travel or cross-travel direction.</p>	<p>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.</p>	<p>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.</p>	<p>EXTEND HYDRAULIC BOOM OR TROLLEY OUT (TOWER CRANE) Both fists in front of body with thumbs pointing outward.</p>	<p>RETRACT HYDRAULIC BOOM OR TROLLEY IN (TOWER CRANE) Both fists in front of body with thumbs pointing towards each other.</p>

		
<p style="text-align: center;">TRAVEL Arms bent at the elbows, fists clenched, rotate both forearms around each other, then point in the direction of travel.</p>	<p style="text-align: center;">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 the circular motion of other fist rotated vertically in front of body.</p>	<p style="text-align: center;">FINISHED WITH CRANE Place arms above head and cross hands.</p>

APPENDIX C: REFERENCE STANDARDS AND DOCUMENTS

Table C1: Reference Standards and Documents (in addition to those specified in this Approved Code)

Reference Standard	Title	Reference Standard	Title
AS 1418 (set)	Cranes, Hoists and Winches	BS EN 12999	Cranes. Loader Cranes
AS 2550 (set)	Cranes, Hoists and Winches– Safe Use: corresponds to AS 1418 i.e. 2550.18 and AS 1418.18 deal with the same item of equipment	BS EN 1677.5	Components for Slings. Safety. Forged Steel Lifting Hooks with Latch. Grade 4
AS 4991	Lifting Devices	BS EN 13001. 1	Crane Safety. General Design. General Principles and Requirements
AS/NZS 1170.2	Structural Design Actions – Wind Actions	BS EN 13155	Cranes. Safety. Non-Fixed Load Lifting Attachments
AS/NZS 1554 (set)	Structural Steel Welding	BS EN 1459	Safety of Industrial Trucks. Self-Propelled Variable Reach Trucks
AS/NZS 1891.4	Industrial Fall-Arrest Systems and Devices - Selection, Use and Maintenance	BS ISO 1837	Lifting Hooks. Nomenclature
AS/NZS 3000	Electrical Installations	ISO 4309	Cranes - Wire Ropes - Care, Maintenance, Installation, Examination and Discard
BS 466	Specification for Power Driven Overhead Travelling Cranes, Semi-Goliath and Goliath Cranes for General Use	ISO 8083	Machinery for Forestry – Falling-Object Protective Structures (FOPS) – Laboratory Tests and Performance Requirements
BS 1757	Specification for Power-Driven Mobile Cranes	ISO 8084	Machinery for forestry – Operator protective structures – Laboratory tests and performance requirements
BS 2452	Specification for Electrically Driven Jib Cranes Mounted on a High Pedestal or Portal Carriage (High Pedestal or Portal Jib Cranes)	NZS 1170.5	Structural Design Actions – Earthquake Actions
BS 2853	Specification for the Design and Testing of Steel Overhead Runway Beams	NZS 4203	General Structural Design and Design Loadings for Buildings
BS 5744	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)	NZS 4711	Qualification Tests for Metal-Arc welders
BS 7121 (set)	Code of Practice for Safe Use of Cranes	NZS/AS 2359.1	Powered Industrial Trucks – General Requirements
BS 7262	Specification for automatic safe load indicators	NZS/BS 2573.1	Rules for the Design of Cranes - Specification for classification, stress calculations and design criteria for structures
BS 7333	Specification for Slewing Jib Cranes	NZS/BS 2573.2	Rules for the Design of Cranes - Specification for classification, stress calculations and design of mechanisms
CP 3010	Code of Practice for Safe Use of Cranes (Mobile Cranes, Tower Cranes and Derrick Cranes)		
FEM 1.007	Recommendation to maintain tower cranes in safe condition		
ISO 23814	Competency Requirements for Crane Inspectors		
ISO 9927-1	Cranes – Inspections – Part 1: General		
ISO 9927-3	Cranes – Inspections – Part 3: Tower Cranes		
			<ul style="list-style-type: none"> • Approved Code of Practice for Load-lifting Rigging • Approved Code of Practice for the Safe Handling, Transportation and Erection of Precast Concrete • Approved Code of Practice for Demolition • Crane Safety Manual for Operators/Users, available from the Crane Association Inc • Electricity Regulations 1997 and subsequent amendments • Lifting Equipment Engineers of New Zealand – Code of Practice for the Safe Use of Lifting Equipment • NZECP 34:2001 New Zealand Electrical Code of Practice for Electrical Safe Distances

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

D1 Design

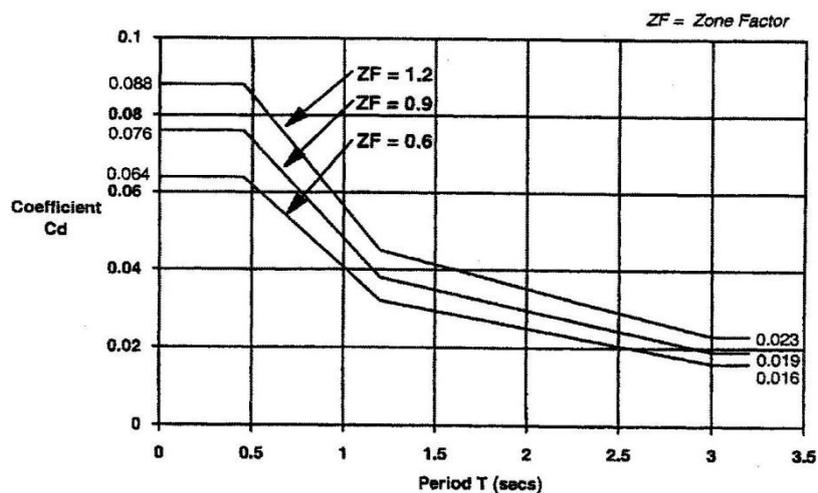
The computation of seismic load combinations is detailed as follows:

(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 D1: 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. $Wt = L1$.

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.

D2 Load and load combinations

1.0 L1 + 0.65 L2+E

0.9 L1 + E

D3 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.

D4 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 D1 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.

D5 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 specific minimum strength.

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

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

E1 Design

(1) Application

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

$$1.0 L1 + 0.665 L2 + E$$

$$0.9 L1 + E$$

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 D of this approved code of practice.

(2) Procedure

- (a) Divide the crane masses into a convenient number of sub masses and establish the centre of gravity of each of these.
- (b) Calculate the total moment due to dead weight of the sub masses 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 sub masses.
- (d) Calculate the deflections of each of the sub masses 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 F: PERSONAL PROTECTIVE EQUIPMENT

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

F1 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 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, 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 while working in an extraordinary or non-standing position.
- (2) Installations of fall-arrest equipment systems on cranes (eg. fixed safety lines along jibs and up ladders) need to be designed, certified and installed in accordance with AS/NZS 1891 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 (refer Table 4.1), 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 that 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.

F2 Footwear

- (1) Footwear in accordance with AS/NZS 2210 shall be worn at all times when working with cranes.

F3 *Hard hats*

- (1) Hard hats in accordance with AS/NZS 1801 or ANSI Z89.1 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 operator'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.

F4 *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.

F5 *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.

F6 *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
- (2) The crane dogman should be easily identifiable from other workers so that the crane operator can easily identify the dogman.

F7 *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 G: 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 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 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.

Hazard	Eliminate	Isolate	Minimise
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.
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.

Hazard	Eliminate	Isolate	Minimise
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.

Hazard	Eliminate	Isolate	Minimise
Load drop due to crane/ lifting gear problem	<p>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 certificates 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>.</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. No person to be under suspended loads. Crane operator to avoid lifting loads over personnel, accommodation or traffic.</p>	<p>The work process should be planned by experienced personnel. All work group parties should be involved in the planning process.</p>
Load drop due to crane/ lifting gear problem		<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. No person to be under suspended loads. Crane operator to avoid lifting loads over personnel, accommodation or traffic.</p>	<p>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.</p>

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.

Hazard	Eliminate	Isolate	Minimise
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.
Structural failure of crane due to incorrect erection sequence		The work process should be planned by experienced personnel. All work group parties should be involved in the planning process. 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.	Crane erection supervisors must be thoroughly trained and experienced with the type of crane being worked upon. A complete and specific crane manual, in English, must be available on site at all times. The work process should be planned by experienced personnel, and all work group parties should be involved in the planning process. No person to be under suspended loads. Crane operator to avoid lifting loads over personnel, accommodation or traffic.

Hazard	Eliminate	Isolate	Minimise
Crane endangered by high winds whilst prone in erection mode.	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.	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.	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. Developing weather conditions should be monitored throughout the full work process. Climbing equipment should be thoroughly inspected and tested for operation before commencing climbing sequences.
Communication breakdown – includes critical and non-critical operations			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. 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.

APPENDIX H: TOWER CRANE INSPECTIONS CHECKLISTS (INFORMATIVE)

Note: These inspection checklists are provided only for reference. Inspection Bodies may arrange and change the format to meet their own requirements.

Table H1: Guidelines for Tower Crane Inspections

Inspections will cover, but are not limited to:

1. Jib Configuration	2. Tower configuration	3. Undercarriage
Jib length	Number off	Undercarriage type
Self-erect version	Tower type	Gauge x wheel base
Hoist type	Length of towers	Identity
Counterweight	Identification checked	Central ballast weight
Counterweight blocks	1 st tie-in type Identification Location	Block arrangement
Job identification and insert order	2 nd tie-in type Identification Location	
Jib tie bar (ropes) lengths (in order from tower head)	3 rd tie-in type Identification Location etc	
Jib tie bar connection on jib/pennants/luff ropes/bridle connection		
Counterjib/insert identification and order		
Counterjib tie bar/rope identification		

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.

4. Documentation and Certificates	5. Undercarriage Inspection	6. Tower System
Manufacturer's certificate	Identity check	Identity check
Design approval certificate	Rail condition	Bolt identify and condition (if applicable)
Hoist rope certificate	Rail earthing	Bolt torque check
Trolley rope(s) or luff rope certificates	Rail clamps	Pin joints (if applicable)
Counterjib holding rope certificates (if applicable)	Limits set	Binding points
Jib holding rope certificates (if applicable)	Rail stops	Accessway
Other/counterweight rope certificates	Bogie/wheel condition	Rust
Hook certificate	Machinery guards	Tie-in assembly
Tower head bolts crack test certificate (if applicable)	Safe clearances	Tie-in supports
Slewing bolts crack test certificates (if applicable)	Central ballast check	Lattice condition
Tower bolts crack test certificates (if applicable)	Rust condition	Tower alignment
Slewing report	Split/safety pins	Cable support
Foundation/tracks certificates with drawing	Accessway	Earthing
Foundation anchor crack test certificates	Cable drum	Tower orientation
Tie-in supports engineering certificates	Motion check	
Erection certificate	Motion test	
Bolt spanner accuracy certificates	Limits function	
Test weight certificates	Brake function	
Counterballast weights weigh certificates	Cabling	
Central ballast weights weigh certificates	Switchboard safety	
Electrical certificate of compliance	Earthing	
Crane log book in cab	Prelimits	
Crane manual on site		
Radius/capacity in cab		
Clash zone procedure		

7. Cabin Section	8. Tower head/A-frame	9. Counterjib/machinery check
Identity check	Identity check	Identity check
Slewing report	Bolt identity and visual condition	Pin connects
Access	Bolt torque check	Split/safety pins
Slew brake condition	Overload mechanisms	Support system
Slew brake working	Pin connections	Hoist unit anchorage
Free slew check	Split/safety pins	Counterweight check
Rust	Rust	Counterweight security
Cab visibility	Lattice condition	Platforms; handrails
Cab safety	Accessway	Machinery safety
Deadman	Pulleys	Rust
Horn	Boom buffers	Hoist condition
Fire extinguisher	Anemometer	Hoist rope anchorage
Radius indication		Hoist rope inspection
Visual warnings		Hoist rope identity
Motion test		Motion test
Machinery safety		Hoist limits
Switchboard safety		Prelimits
Main switch function		Boom limits
Transformer mountings		Switchbox safety
Instrument operation		Cables (trip hazard)
Anemometer readout		

10. Phase failure protection	11. Jib	12. Hook
Tested as effective	Configuration check	Identity check
	Identification check	Safety catch
	Pin connections	Thrust bearing
	Tiebar/pennant configuration check	Rope guards
	Tiebar/pennant identification check	Pulley
	Lattice condition	General condition
	Rust general	Deformation measurements
	Rust in main chords	Wear measurements
	Split/safety pins	
	Accessway	13. Test and calibration weights
	Fall-arrest system	Maximum load
	Trolley gear condition	Load at maximum safe working load
	Trolley gear brake	Calibration
	Trolley rope inspection	Overload warnings working
	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	

1. TOWER CRANE CLIMBING FRAME INSPECTION 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:.....

"✓" means "Done"; "X" means "Concern !, - refer Notes";
 "NA" means "Not Applicable"; "Nothing" means "Inspection Uncompleted! "

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.....

*"✓" means "Done"; "X" means "Concern !, - refer Notes";
 "NA" means "Not Applicable"; "Nothing" means "Inspection Uncompleted! "*

2. SELF ERECTING TOWER CRANE INSPECTION WORKSHEET

For Completion by Certified Erector After Each and Every Erection.

IDENTIFICATION

Owner/Controller:		Site Address:	
Address:			
Crane Model:	Serial No:	File No:	
Other Identification:			

BASE CONFIGURATION

Jib Length:	Type: Luffed <input type="checkbox"/> Telescopic <input type="checkbox"/> Special Trolley Gear? <input type="checkbox"/>
Tower & Huh	Type: Folding <input type="checkbox"/> Telescopic <input type="checkbox"/> Added Tower Sections <input type="checkbox"/>

ADDED TOWER SECTIONS

No. off	Tower Type	Length ea.	Identification
X			
X			

UNDERCARRIAGE

Wheels	Support Pads	Tracks	Cable Drum
Certificate Requested?		Dunnage Base	

COMMENTS

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INSPECTION CHECKLIST

UNDERCARRIAGE INSPECTION

Brakes:	Rail Condition:	Rail Earthing:
Rail Clamps:	Travel Limits:	Rail Stops:
Bogie/Wheel Condition:	Machinery Guards:	Safe Clearances:
Central Ballast Check:	Rust Condition:	Split/Safety Pins:
Access Way:	Cable Drum:	Limits Function:
Travel Motion Test:	Ground Conditions under Pads/Rails:	

TOWER SYSTEM INSPECTION

Identity Check:	Bolt Visual:	Bolt Torque Check:
Pin Joints(If Appl.):	Rust:	Access:
Lattice Condition:	Capacity Chart:	Operator Stand:
Cabin:	Visibility:	

TOWER TOP INSPECTION

Pulleys	Pin Connects/Safety Pins:	Rust:
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HOOK

Rereeving Devices:	Safety Catch:	Thrust Bearing:
Rope Guards:	Pulley:	General:

"✓" means "Done"; "X" means "Concern !, - refer Notes";
 "NA" means "Not Applicable"; "Nothing" means "Inspection Uncompleted!"

MACHINERY PLATFORM INSPECTION

Security	Pin Connects:	Split/Safety Pins:
Support System:	Rope Anchorages:	C/weight Check:
C/weight Security:	Platforms;	Machinery Guards:
Rust:	Hoist Condition:	E/Rope Inspect
H/Rope Inspect:	H/Rope Ident:	Hoist Motion Test:
Hoist Limits	O/load Limits	Ballast Gear

SLEW INSPECTION

Slew Brake Condition:	Slew Brake Working:	"Out of Service" Check:
Rust:	Slew Motion Check	Power Line Check:

JIB INSPECTION

Config. Check:	Load Pin:	Pin Connects:
Tiebar/Pennant Check:	Rereeving Devices:	Trolley Buffers:
Lattice Condition:	Rust General:	Rust:
Split/Safety Pins:	Access:	Fall Arrest System:
Trolley Gear Cond:	Trolley Gear Brake:	Trolley Rope Inspect:
Limit(s):	Telescoping Mech.	Trolley Wheels:
Trolley Rope Tension:	Trolley Rope Pulleys:	Rope Anchorages:
Jib Folding Mech.	Motion(s) Test:	Limits:
Hydraulics	Hinges:	Hoist Sheaves:

CALIBRATION WEIGHTS

<i>Radius</i>	<i>Approved SWL</i>	<i>SWL +10%</i>
<i>Max:</i>		
<i>At Max. SWL:</i>		

OVERLOAD SAFETY DEVICE SETTINGS

	110% SWL Set	100% SWL Check
Max. Load		
Max Radius		

COMMENTS

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DOCUMENTATION

Annual COI:	Log Book:	Crane Manual:
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ERECTION STATEMENT

I,of.....hereby Certify that I hold Unit Standard 20209 (Erect, Dismantle and Reconfigure a Self Erecting Tower Crane) and that I have erected/supervised the erection of, this crane and set, calibrated and checked all the overload and other safety devices in full accordance with the manufacturer’s instructions and the Approved NZ Code of Practice for Cranes.

ERECTOR.....

DATE.....

"✓" means "Done"; "X" means "Concern !, - refer Notes";
 "NA" means "Not Applicable"; "Nothing" means "Inspection Uncompleted! "

3. TOWER CRANE INSPECTION TEST REPORT/WORKSHEET

Initial Erection/Reconfiguration

Proposed Erection Date:

Actual Erection Date:

KEY PERSONNEL

Erector:	Inspector:
Site/Plant Manager:	Foundation Engineer:

IDENTIFICATION

Owner/Controller:	Site Address:	
Address:		
Crane Model:	Serial No:	File No:
Other Identification:		

JIB CONFIGURATION

Jib Length:*	Self Erect Version?
Hoist Type:	
Counter Weight:	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:	
Counter Jib/Insert Identification and Order:	
Counterjib Tie Bar/ Rope Identification:	
Safety Line System:	

TOWER CONFIGURATION

No. off	Tower Type	Length ea.	Identification
×		*	
×		*	
×		*	
×		*	
1 st Tie-in Type:		Ident:	Location:
2 nd Tie-in Type:		Ident:	Location:
3 rd Tie-in Type:		Ident:	Location:
4 th Tie-in Type:		Ident:	Location:

UNDERCARRIAGE CONFIGURATION

Undercarriage Type:	Gauge X Wheel Base:*	Ident:
Central Ballast:	Block Arrangement:	

Above Configuration Must be Specifically Approved as in Accordance with the Approved Code of Practice for Cranes, Section 10.1 (1)

"✓" means "Done"; "X" means "Concern !, - refer Notes"; * means "measurement required

"NA" means "Not Applicable"; "Nothing" means "Inspection Uncompleted! "

DOCUMENTATION

Document	As Sighted	Guideline Reference
<i>Manufacturer's Certificate</i>		
<i>Design Approval Certificate</i>		
<i>Previous Inspection Report/Checksheet.</i>		
<i>Hoist Rope</i>		
<i>Trolley Rope(s) or Luff Ropes</i>		
<i>Counterjib Holding (If appl.)</i>		
<i>Jib Holding (if appl.)</i>		
<i>Other /Counterweight Rope</i>		
<i>Hook Cert. and previous inspection records</i>		
<i>Tower Head Bolts (if appl.)</i>		
<i>Slewing Bolts (if appl.)</i>		
<i>Tower Bolts (if appl.)</i>		
<i>Slewing Report</i>		
<i>Previous Slewing Reports</i>		
<i>Foundation/tracks with Drawing</i>		
<i>Foundation Anchor Crack Test</i>		
<i>Tie-in Supports</i>		
<i>Erection Certificate</i>		
<i>Bolt Spanner Accuracy</i>		
<i>Test Weights/Load Cell accuracy</i>		
<i>Counterballast Weights</i>		
<i>Central Ballast Weights</i>		
<i>Electrical Certificate of Compliance</i>		
<i>Radius/Capacity in Cab</i>		
<i>Crane Manual on Site</i>		
<i>Crane Log Book in Cab</i>		
<i>Clash Zone Procedure</i>		
<i>Safety Line Inspection Report</i>		
<i>Daily Maintenance Inspection Reports</i>		
<i>Weekly/Monthly Maintenance Inspection Reports</i>		
<i>Repair Records</i>		

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:
Access:	Cable Drum:	Motion Check:
Motion Test:	Limits Function:	Prelimits:
Switchboard Safety:	Brake Function:	
Comments:		

"✓" means "Done"; "X" means "Concern !, - refer Notes"; * means measurement required
"NA" means "Not Applicable"; "Nothing" means "Inspection Uncompleted! "

TOWER SYSTEM

Identity Check:	Bolt Ident. & Visual:	Bolt Torque Check:
Pin Joints(If Appl.):	Binding Points:	Access/Safety Line:
Rust:	Tie-in Assem:	Tie-in Supports:
Lattice Condition:	Alignment:	Orientation:
Earthing System:	Cable Support System	Signage:
Comments:		

CABIN SECTION

Identity Check:	Slewing Report:	Access:
Slew Brake Condition:	Slew Brake Working:	Free Slew Check:
Rust:	Cab Visibility:	Cab Safety:
Deadman:	Horn:	Radius Ind:
Visual Warnings:	Motion Test:	Machinery Safety
Fire Extinguisher:	Main Switch Function:	Instrument Operation
Anemometer Readout:	Load Gauge:	Transformer Mountings:
Comments:		

TOWER HEAD/A-FRAME

Identity Check:	Bolt Ident. & Visual:	Bolt Torque Check:
Overload Mech. Check:	Pin Connects:	Split/Safety Pins:
Rust:	Lattice Cond:	Access/Safety Line:
Sheaves:	Boom Buffers:	Anemometer:
Comments:		

COUNTERJIB

Identity Check:	Pin Connects:	Split/Safety Pins:
Support System:	Hoist Anchorage:	C/weight Check:
C/weight Security:	Platforms; H/rails:	Machinery Safety:
Rust:	Hoist Condition:	Rope Anchorage:
H/Rope Inspect:	H/Rope Ident:	Sheaves: (If Applic.)
Hoist Limits:	Prelimits:	Boom Limits
Switchbox Safety:	Cables(Trip Hazard):	Motion Test:
Signage/windsails:	Access/Safety Lines:	
Comments:		

PHASE FAILURE PROTECTION (To be tested, or manufacturer certified)

Tested:	Certified:
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"✓" means "Done"; "X" means "Concern !, - refer Notes"; * means measurement required

"NA" means "Not Applicable"; "Nothing" means "Inspection Uncompleted! "

JIB

Config. Check:	Ident. Check:	Pin Connections:
Tie bar/Pennant Config. Check:		Tie bar/Pennant Ident. Check:
Lattice Condition:	Rust General:	Rust in Main Chords:
Split/Safety Pins:	Access/Safety Line:	Fall-Arrest System:
Trolley Gear Cond:	Trolley Gear Brake:	Signage/Windsails:
Limit Mech:	Trolley Gen:	Trolley Rope Inspect:
Trolley Tension Set:	Trolley Rope Sheaves:	Trolley Wheels:
Hoist Rope Anchorage:	Motion Test:	Trolley Rope Anchorages:
C/Weight Sheaves:	C/Weight Rope Adj:	Limits:
Hoist Deflector:	Load Pin:	Hoist Sheaves:
		Boom Buffer Mounts:
Comments:		

HOOK

Ident. Check:	Safety Catch:	Axial Play:
Rope Guards:	Pulley:	General:
"y"(Deformation):*	"a" (Deformation):*	"h" (Mouth wear):*
Comments:		

TEST/CALIBRATION WEIGHTS

	Approved SWL	Calibration Checked	125% Overload	Witnessed
Max:				
At Max. Radius:				

Overload Testing only if Crane New to NZ or as Authorized by Manufacturer!

COMMENTS

Inspector Signature:.....

Date:.....

Site Manager Signature:.....

Date:.....

Erection Supervisor Signature:.....

Date:.....

"✓" means "Done"; "X" means "Concern !, - refer Notes"; * means measurement required

"NA" means "Not Applicable"; "Nothing" means "Inspection Uncompleted! "

APPENDIX I: EFFECTIVE EQUIPMENT INSPECTOR SUPERVISION

I1 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.

I2 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 I1 – 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 used.
- (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 type.

- (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.



Picture 9: Tower Cranes



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