Key Requirement


# Working with Suspended Loads

Watercare
An Auckland Council Organisation

# Contents

# Purpose

The purpose of this Key Requirement is to set out Watercare's minimum controls for working with suspended loads and to provide tools to enable managers and contractors to reduce risks when working with those loads.

This process also applies to:

- mechanical lifting equipment (cranes, telehandlers, hiab cranes, forklift trucks, jacks, gantries, etc.)
- lifting tackle (strops, chains, wire ropes, hooks, shackles, etc.) used in rigging a load
- lifting attachment points (certified lifting points on the item of plant to be lifted)
- the load being lifted

All Watercare's managers must ensure that work is planned in accordance with these controls and ensure that the tools and resources that are referred to are used and made available to workers. All Watercare's workers must ensure that they follow the processes and controls for work with suspended loads, including using all equipment as required.

# Background

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, including equipment for lifting and suspending loads.

WorkSafe has published an Approved Code of Practice for Cranes and an Approved Code of Practice for Load-lifting Rigging.[1] This Key Requirement requires compliance with these Codes of Practice, and describes their specific application to Watercare's projects and operations.

Cranes are used extensively in Watercare's construction projects.

# Responsibilities

[1] Approved Code of Practice for Cranes http://www.worksafe.govt.nz/worksafe/information-guidance/all-guidance-items/acop-cranes/cranes-acop-2009.pdf and Approved Code of Practice for Load-lifting Rigging http://www.worksafe.govt.nz/worksafe/information-guidance/all-guidance-items/acop-load-lifting-rigging/rigging-load-lifting-acop.pdf

| | |
|---|---|
| Designers | Must ensure, so far as is reasonably practicable, that cranes and other lifting plant and equipment is without risks to workers' health and safety throughout the life of the plant (Among other things, designers must also provide specific information to the manufacturer. If the manufacturer advises the designer that there are safety issues with the design, the designer must revise the information to take account of these concerns or tell the manufacturer in writing the reasons why such revision is not necessary. Designers must also carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary to ensure the plant is safe and without risks to health and safety.) |
| Plant Manufacturers | Must ensure, so far as is reasonably practicable, that the lifting plant and equipment is manufactured to be without risks to workers throughout the life cycle of the plant |

| | |
|---|---|
| Importers and Suppliers | Must take all reasonable steps to obtain information from the manufacturer and then pass this information on when supplying the lifting plant, and if this is not available, must carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary to ensure, so far as is reasonably practicable, that the plant is without risks to the health and safety of any person (If design registration is required, the importer will also have duties to ensure that the design of plant is registered.)<br><br>Any imported plant must be inspected, having regard to information provided by the manufacturer. If this information requires the plant to be tested, then the importer must undertake this testing |
| Project Managers | Ensure that compliance with this Key Requirement is included in contracts for the construction of Watercare's assets |
| All Workers | • Attend training courses as required by Watercare or its contractors<br>• Comply with the specified controls for working with suspended loads as communicated in standard operating procedures, job safety analyses, and toolkit meetings<br>• Use protective equipment according to manufacturers' directions and controls imposed by Watercare<br>• Notify the crane controller if the crane or other lifting equipment is believed to be unsafe<br>• Report all unsafe conditions to the responsible supervisor |
| Supervisors | • Monitor workers to ensure they understand and comply with the risk controls for working with suspended loads as communicated in standard operating procedures, job safety analyses, and toolkit meetings |

| | |
|---|---|
| Crane Controller | A crane controller must be designated for every crane working on a Watercare asset. The controller has specific responsibilities with regard to crane documentation, verification and operations. The controller is required to ensure that information about the safe operation of the crane is obtained from the designer, manufacturer or supplier. The controller must also ensure that information is available with regard to establishing compliance with the crane regulations. The controller must ensure that all this information is readily accessible. The controller is also responsible for ensuring that a crane is operated safely and is properly repaired when required |
| Tier 4 Managers | • Ensure that the hierarchy of risk controls is used to determine if working with suspended loads can be eliminated<br>• For work with suspended loads that cannot be eliminated, ensure that workers are isolated from the hazard, as far as is reasonably practicable<br>• For work with suspended loads that cannot be eliminated or isolated, ensure that workers are provided with appropriate protective equipment, that safe methods of work are planned, communicated and implemented and that workers have been trained and understand the use of this equipment<br>• Monitor sites and projects to ensure that work is appropriately planned, that workers have adequate equipment and training and that work is being carried out in compliance with this Key Requirement |
| Tier 2 and Tier 3 Managers | • Monitor sites and projects to ensure that this Key Requirement is understood by Tier 4 managers, supervisors and workers |
| Health and Safety Advisors | • Assist Tier 4 managers to understand the controls in this Key Requirement<br>• Monitor sites and projects to ensure that work is appropriately planned, that workers have adequate equipment and training and that work is being carried out in compliance with this Key Requirement |
| Health and Safety Manager | • Monitor the implementation and effectiveness of this Key Requirement and report to the senior management health and safety committee<br>• Recommend any further actions or changes required to ensure adequate management of working with suspended loads and lifting equipment |
| Chief Executive Officer | • Review reports of the implementation and effectiveness of this Key Requirement and report to the Board |

# Planning

Watercare requires that careful consideration must be given to the hierarchy of controls when work involving lifting and suspended loads is being planned. This will apply to work carried out by both Watercare and to work contracted out to other PCBUs.

The steps that should be followed to ensure good health and safety outcomes when work is contracted out are:

- Scope the work to identify the key health and safety issues before the work is put out to tender or the contract is formalised
- Ensure that the tendering contractors are competent to safely complete the required work
- Negotiate health and safety requirements when the contractor is selected
- Set out health and safety expectations in the contract documents
- Monitor the contract to ensure that health and safety expectations are met
- Complete a review after the contract for any learning that can be applied to future contracted work

Careful consideration must be given to the hierarchy of controls when lifting work is being planned. Planning for possible work that requires suspending loads should first consider whether the work can be carried out without lifting loads. If this is not possible, a safe system of work must be developed before work starts to make sure the lift happens in the right location with the right plant and equipment and with competent workers.

The planning of individual **routine lifting operations** is the responsibility of those who carry them out (i.e. a lift co-ordinator, rigger/dogman or crane operator). Managers and operators must be competent and trained to carry out the planning. For straightforward, common lifting operations, a single initial generic plan is required (i.e. vehicle mounted Palfinger/Hiab), which could be part of the normal risk assessment for the activity. Routine lifting operations that are more complex are to be planned each time the lifting operation is carried out.

For more **critical lifting operations** (i.e. a tandem lift using multiple cranes), a lift plan must be developed by a person with significant and specific competencies – adequate training, knowledge, skills and expertise – suitable for the level of the task. This may require a mechanical engineer.

When positioning lifting equipment, care must be taken to avoid hazards arising from proximity; e.g.:

- coming into contact with overhead power lines, (including an induced voltage from proximity rather than direct contact) buildings or structures
- placing the lifting equipment or the outriggers too close to trenches, excavations or other operations
- placing the lifting equipment or the outriggers into contact with buried underground services, such as drains and sewers

Any load that is suspended above ground level is a hazard. It must be avoided having suspended loads above people. Loads must not be suspended over occupied areas. Where loads are suspended, the area below must be isolated and access prohibited.

Traffic must be managed while the work takes place with a temporary traffic management plan (TMP). All work on a

road or work that affects the normal operating condition of a road must have an approved TMP.

The TMP should show how the lifting area will be protected so work can go ahead safely for workers and others. The TMP should show how traffic (including cyclists and pedestrians) will negotiate the site, e.g. what lanes will be closed by the work and how.

# Risk controls

The following risk controls have been developed using the bow-tie method, (Appendix B)

| Top Events | Collapse of Excavation, Falling into Excavation, Service Strike | |
|---|---|---|
| Prevention controls | Engineering | • Positioning and installation<br>• Load-lifting rigging |
| | Administrative | • Crane records<br>• Crane certification inspections<br>• Crane operator competency<br>• Pre-operational planning and checks<br>• Supervision |
| Recovery controls | Administrative | • Rescue and emergency response plan and training for working with suspended loads in compliance with WorkSafe code of practice |
| Recovery controls | PPE | • Hearing protection, hand protection, eye protection, foot protection and high-visibility clothing |

# Prevention

## Engineering controls

Positioning and installation

Lifting equipment must be located on a solid foundation that will sustain the load of both the lifting equipment and the load and any forces applied due to the angle of the lift. If the ground conditions are not known, then this information must be obtained.

The lifting equipment must also be placed as close to the load as possible to increase the safety of the lifting operation. For a load to be swung into another position, the lifting equipment should be placed in the most efficient

(and where possible, central) position to the radius of the lift.

Load-lifting and rigging

When loads are rigged, riggers must ensure that:

- loads are well secured
- all equipment has visually been checked before the lift commences
- slings are adequate and appropriate for the task
- slings are rated for the load and within the specific test date
- all shackles, pins, beams, lifting eyes, etc. are certified and within the test date
- lifting eyes, such as eye bolts installed by the manufacturer, are inspected and documented
- the centre of gravity is directly below the hook or attachment point
- operating levers, wheels or buttons have clear markings on or next to them to indicate their function and mode of operation

Control arrangements should specifically be designed for 'joystick' control of two movements simultaneously, otherwise they must be 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 must be designed to return to the neutral position when released, except when operational characteristics dictate otherwise.

Engineering controls on cranes must also:

- 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
- ensure that the weight of any pendant control is supported independently of its electrical conductors and 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
- ensure that the design of electrically operated overhead travelling cranes is such that all brakes will automatically apply in the event of power failure
- 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 to the magnet fails
- ensure there is an emergency stop device that introduces no additional in-built time delay and incorporates a reset device
- ensure a means of safe and adequate access and egress is provided for operation, maintenance and inspection of the crane
- ensure that safety lines, when fitted, comply with *AS/NZS 1891: Industrial Fall Arrest Systems and Devices*
- ensure that moving parts and exposed equipment that may foreseeably cause injury are suitably guarded

# Administrative controls

## Crane records

The design verification certificate for the crane must be kept as part of the crane records and readily be available. The design verification certificate must be consistent with the current configuration of the crane. If the crane has

been modified since the original certificate was issued, then a new design verification certificate must be obtained.

The electrical installation of every crane must be in accordance with the appropriate requirements of *AS/NZS 3000: Electrical Installations* (known as the Australian/New Zealand Wiring Rules).

A register must be maintained for each crane. This register must contain information that includes the date and details of any structural alterations. Alterations or repairs that resulted in changes in the quality of the materials used on the crane or changes to the dimensions of components providing structural integrity must have design verification.

Records of the maintenance and service of the crane must be retained and readily be available in the crane register.

Records of the independent certification of the crane under the Health and Safety in Employment (Pressure Equipment, Cranes and Passenger Ropeways) Regulations 1999 must be readily available in the crane certifier.

## Crane certification inspections

Cranes must be inspected and be issued with a certificate of inspection according to the Health and Safety in Employment (Pressure Equipment, Cranes and Passenger Ropeways) Regulations 1999 by an IANZ accredited inspection body at intervals not exceeding 12 months.

Records must be kept of the date, with time and results of any inspection carried out and the name of the inspection body involved.

The report or certificate of inspection must contain the name of the equipment inspector who holds a current certificate appropriate for the type of crane.

The unique identifier assigned by the inspection body must permanently and clearly be marked on each crane when it is issued with a certificate of inspection for the first time.

Maintenance records must be made available to the equipment inspector.

## Crane operator competency

All crane operators, riggers and dogmen must hold the applicable New Zealand Qualification Authority unit standards required for their role.

Managers responsible for any mechanical lifting must be trained and competent in:

- the identification and use of the specific mechanical lifting device to be used
- the rigging process and the rigging equipment used to lift or secure the load (including the calculations of load spread, load balance, tackle limitations, lifting points etc.)
- defining and calculating the load, its weight and its balance (centre of gravity) for complex lifting
- identifying and managing the swing zone of a lift (radius)
- identifying and managing the potential drop zone of a lifted load

- dogging techniques and the communications to be used by the dogman to lift the load
- the development of a lift plan for the specific lift

Specific lifting operations training must be provided to workers working on rigging crane loads or in the vicinity of crane operations.

## Pre-operational planning and checks

Before any crane is put into operation, managers must:

- ensure that the work has been planned appropriately. A planned method for lifting work should be contained in:
  - a standard operating procedure for work that is routine and of low residual risk
  - a Take 5 for work that is non-routine and is of low residual risk
  - a permit to work and a job safety analysis for work that is moderate to high residual risk
- provide all workers who are to use plant and equipment with information, training, instruction or supervision to ensure compliance with the planned method of work
- ensure that all reasonably practicable steps to prevent harm from falling objects (tools, materials, lanyards, tool belts, PPE, etc.) have been taken

The lift plan for any lifting operation must address the foreseeable risks involved in the work and identify the appropriate resources (including people) necessary for the safe completion of the job. It must set out the actions involved at each step of the operation and identify the responsibilities of those involved. The degree of planning and complexity of the lift plan will vary and should be proportionate to the foreseeable risks involved in the work.

Factors to include are:

- ensuring there is no work under suspended loads
- visibility
- attaching, detaching and securing loads
- load weights
- environment, weather and ground conditions
- location
- controls to reduce the risk of lifting equipment overturning
- proximity hazards
- controls to prevent overload
- pre-start checks

Pre-start checks should ensure that equipment that controls the crane by radio, induction or other non-conduct means includes:

- 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.)
- visual indication on the crane indicating when the crane is on radio control
- a device to ensure that if radio-controlled cranes exceed the transmitter range, then the crane will come to

# Appendix A: Definitions

| Terminology | Description |
|---|---|
| Alteration | Changing the design of, adding to or taking elements away from a crane and includes the relocation of non-mobile equipment, but not including repairs, replacements, or routine maintenance |
| Automatic safe load indicator | A device fitted to a crane to provide the operator with automatic warning of approach to an overload situation |
| Certificate of inspection | A certificate issued or renewed under regulation 32 of the PECPR (Pressurised Equipment, Cranes and Passenger Ropeways) 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. http://www.worksafe.govt.nz/worksafe/information-guidance/all-guidance-items/pressure-equipment-cranes-and-passenger-ropeways-regulations-1999-a-general-guide-to-the-health-and-safety-in-employment |
| 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 | A powered device that is equipped with mechanical means for raising or lowering loads suspended by means of a hook or other load-handling device and 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:<br>• 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<br>• includes the attachments, fittings, foundations, mountings and supports but does not include lifting gear that is not an integral part of the crane |
| Crane rating chart/sheet | A notice fitted on or attached to a crane stating the maximum safe working load for the crane in specified operating conditions and may also be produced in a book format |
| Crane operator | A person who has acquired, through a combination of training, qualification or experience, the knowledge and skills to operate a particular type of crane |
| Critical lift | When the lift exceeds 100 tonnes, exceeds 85 percent of crane capacity, could result in load falling onto pipelines or vessels or process units with hazardous products, involves more than one crane, or passes over active work areas such as buildings or over public access ways (Notification to WorkSafe is required.) |

| | |
|---|---|
| Design verification | 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 it is referred to in those standards:<br>1. designs of equipment<br>2. alterations to designs affecting the structural strength or safety of equipment made in the course of manufacture<br>3. designs of a repair or alteration affecting the operational safety of the equipment repaired or altered or any other equipment<br>4. the fabrication inspection requirements specified by the designer |
| Design verifier | A person who:<br>1. is employed or engaged by an inspection body to carry out the functions referred to in the PECPR Regulations<br>2. is the holder of a relevant certificate of competence |
| Dogman/rigger | A person qualified to sling loads and direct the lifting and placing operations of a crane |
| Experiment inspection | An inspection carried out by an equipment inspector that:<br>1. is carried out to determine whether equipment is safe and is likely to remain safe<br>2. takes place in one or more of the following periods:<br>(a) the period in which the equipment, or its component parts, is manufactured<br>(b) the period after the manufacture and before the commissioning of equipment<br>(c) the period after the commissioning of equipment<br>(d) the period after a repair or alteration to which regulation 11 of the PECPR Regulations apply<br>(e) the period after maintenance or an adjustment, alteration or repair to which the regulation 13 of the PECPR Regulations apply |
| Equipment inspector | A person who:<br>1. is employed or engaged by an inspection body to carry out the functions referred to in regulation 27 of the PECPR Regulations<br>2. is the holder of a relevant certificate of competence |
| Hoist unit | A standard mass produced lifting unit providing powered vertical lifting capacity by either chain or wire, via a hook and block, with power possibly provided to a beam runner, if fitted, for horizontal travel |

| | |
|---|---|
| Lift co-ordinator | A worker with the necessary authority and who has sufficient understanding of lifting and using cranes and of safe system of work requirements to enable them to ensure Watercare's requirements are met, including correct documentation (A dogman, controller or crane operator may be the lift co-ordinator.) |
| Lift plan | The lift plan addresses the foreseeable risks involved in the work and identifies the appropriate resources necessary for the safe completion of the job – sets out clear actions involved at each step of the operation and identifies the responsibilities of those involved |
| Lifting gear | Means a device used:<br>• to attach the load to the hook or load-handling device, or<br>• to control the load independently of the hook or load-handling<br>• device, or<br>• as a container for the load, and<br>• includes lifting beams, lifting frames, spreader beams, shackles or similar devices that are not an integral part of the crane |
| Mechanical lifting | Mechanical lifting equipment is any equipment whose principal purpose is to lift or lower loads, including attachments used for anchoring, fixing or supporting it |
| Mobile crane | Mobile mechanical plant that is able to be configured to lift or carry a suspended load and includes 'fully', 'semi', 'portable' and 'truck' mobile cranes and also includes:<br>• forklifts and reach stackers configured to lift shipping containers<br>• telehandlers or forklifts lifting and carrying a suspended load<br>• construction equipment, such as excavators configured with hooks or other lifting devices and used for purposes other than the primary function of the machine (e.g. placing of pipes in a trench – is a mobile crane) |
| Outriggers | Structural members used to provide stability during crane operations |
| Rigging | Involves:<br>• securing the load onto or into the lifting device<br>• identifying and utilising the most appropriate lifting tackle<br>• ensuring the load is balanced and appropriately secured against falling when being lifted<br>• ensuring the lifting tackle is appropriate to the weight of the load to be lifted<br>• connecting the lifting tackle to the lifting device (crane, telehandler, digger, etc.) |
| Safe working load (SWL) | • The maximum load the crane or item of tackle can safely lift, as defined by the crane rating sheet |

# Appendix B: Working with suspended loads bowties

# Appendix C: References

Standards New Zealand (1996). Cranes – Safe Use – Vehicle hoists. AS/NZS 2550. https://shop.standards.govt.nz/catalog/2550.9%3A1996(AS%7CNZS)/view

Standards New Zealand (2007). Industrial Fall Arrest Systems and Devices. AS/NZS 1891. https://shop.standards.govt.nz/catalog/1891.1:2007(AS%7CNZS)/scope

Standards New Zealand (2011). Cranes, Hoists and Winches. AS/NZS 1418. https://shop.standards.govt.nz/catalog/1418.10:2011(AS%7CNZS)/scope

WorkSafe (2009). Approved Code of Practice for Cranes http://www.worksafe.govt.nz/worksafe/information-guidance/all-guidance-items/acop-cranes/cranes-acop-2009.pdf

WorkSafe (2012). Approved Code of Practice for Load-lifting Rigging http://www.worksafe.govt.nz/worksafe/information-guidance/all-guidance-items/acop-load-lifting-rigging/rigging-load-lifting-acop.pdf

WorkSafe (2014). Crane Safety For Construction Site Managers/Supervisors http://www.worksafe.govt.nz/worksafe/information-guidance/all-guidance-items/crane-safety-factsheet/crane-safety-site-managers-supervisors-factsheet