

This General Guide provides information on how to manage the risks of cranes at a workplace. It is supported by specific guides on tower cranes, mobile cranes, inspecting and maintaining cranes, and information sheets on:

- Bridge and gantry cranes
- Vehicle loading cranes
- Vessel-mounted cranes
- Crane-lifted work boxes
- Using other powered mobile plant as a crane, and
- Quick-hitches for earthmoving machinery.



What is a crane?

A **crane** is an item of plant intended for raising or lowering a load and moving it horizontally including the supporting structure of the crane and its foundations.

There are a range of 'fixed' (tower, bridge, gantry, portal boom, vessel-mounted) and 'mobile' (slewing, non-slewing, vehicle loading) cranes.

A range of multi-purpose powered mobile plant including multi-purpose tool carriers and telescopic handlers may be classed as cranes in some operating configurations.

Further crane related definitions are in Appendix A.



Who should use this Guide?

You should use this guide if you own, hire, lease, handle, store, transport, maintain or manage the use of a crane in the workplace.



Who has duties under the law?

Everyone in the workplace has a work health and safety duty. A range of people have specific responsibilities for cranes including the:

- crane designer, manufacturer, importer and/or supplier
- crane owner and other persons with management or control of the crane or the workplace where a crane will operate
- competent person who inspects cranes, and
- crane operator.

The main duties are set out in Table 1.



Table 1 Duty holders and their obligations

Who	Duties
<p>A person conducting a business or undertaking</p>	<p>A person conducting a business or undertaking has the primary duty to ensure, so far as is reasonably practicable, workers and other people are not exposed to health and safety risks arising from the business or undertaking.</p> <p>This duty requires the person to manage risks by eliminating health and safety risks so far as is reasonably practicable, and if it is not reasonably practicable to eliminate the risks, by minimising those risks so far as is reasonably practicable. It also includes ensuring so far as is reasonably practicable the:</p> <ul style="list-style-type: none"> ■ provision and maintenance of safe plant including cranes, and ■ safe use, handling, storage and transport of plant. <p>The Work Health and Safety (WHS) Regulations include specific duties for a person conducting a business or undertaking with management or control of plant, powered mobile plant and plant that lifts or suspends loads.</p> <p>If you own a crane you are the person with management or control of that plant.</p> <p>If you hire or lease a crane, you have management or control of that plant for the period you have hired it. Both you and the person you have hired or leased it from will have duties to eliminate or minimise the risks associated with the plant, so far as is reasonably practicable.</p>
<p>Designers, manufacturers, suppliers and importers</p>	<p>Designers, manufacturers, suppliers and importers of plant must ensure, so far as is reasonably practicable, the plant they design, manufacture, import or supply is without risks to health and safety. This duty includes carrying out analysis, testing or an examination and providing specific information about the plant. Information must, so far as is reasonably practicable, be passed on from the designer through to the manufacturer and supplier to the end user.</p> <p>Suppliers must provide a purchaser of a crane which requires plant design registration with the design registration number.</p>
<p>Officers</p>	<p>Officers, such as company directors, have a duty to exercise due diligence to ensure the business or undertaking complies with the WHS Act and Regulations. This includes taking reasonable steps to ensure the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks from plant.</p>
<p>Workers and others</p>	<p>Workers and other people at the workplace must take reasonable care for their own health and safety, co-operate with reasonable policies, procedures and instructions and not adversely affect other people's health and safety.</p>

Further information on the duties relating to cranes is in the [Code of Practice: Managing the risks of plant in the workplace](#).



How can risks be managed?

Use the following steps to ensure, so far as is reasonably practicable, workers and other people are not exposed to health and safety risks:

#1 Identify hazards



1. **Find out what could cause harm.** The following can help you identify potential hazards:

- Observe the workplace to identify areas where cranes operate and how they interact with other vehicles, pedestrians and fixed structures like overhead electric lines.
- Ask the crane operator, crane crew, and others about problems they encounter at the workplace including with operation, inspection, maintenance, repair, transport and storage requirements.
- Review your inspection, test and maintenance records e.g. log books, and incident and injury records including near misses.

#2 Assess risks



2. **Assess the risk.** In many cases the risks and related control measures will be well known. In other cases you may need to carry out a risk assessment to identify the likelihood of somebody being harmed by the hazard and how serious the harm could be.

People who work with or near cranes are most at risk. Some of the risks when using a crane include:

- structural failure, overturning, or collapse of the crane
- contact or collision of the crane or its load with people or other plant and structures, and
- falling objects.

A risk assessment can help you determine what action you should take to control the risk and how urgently the action needs to be taken.

#3 Control risks



3. **Take action to control the risk.** The WHS laws require a business or undertaking do everything reasonably practicable to eliminate or minimise risks.

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest. This ranking is known as the hierarchy of risk control. You must work through this hierarchy to manage risks.

You need to consider possible control measures and make a decision about which are reasonably practicable for your workplace. Deciding what is reasonably practicable includes the availability and suitability of control measures, with a preference for using substitution, isolation or engineering controls to minimise risks before using administrative controls or personal protective equipment (PPE). Cost may also be relevant, but you can only consider this after an effective review of all reasonably practicable control measures.

The first thing to consider is whether crane related hazards can be completely removed from the workplace. For example, designing items of a size, shape and weight so they can be delivered, handled or assembled at the location where they will be used without the need for a crane.

If it is not reasonably practicable to completely eliminate the risk then consider the following options in the order they appear below to minimise risks, so far as is reasonably practicable:

- substitute the hazard for something safer e.g. replace a crane operating cabin with a restricted field of vision with one that has a clear field of vision or use a remote control, for example a pendant control
- isolate the hazard from people e.g. use concrete barriers to create an exclusion zone to separate crane operations from workers and powered mobile plant, and
- use engineering controls e.g. enclosing the operator with a falling objects protective structure (FOPS) to minimise the risk of the operator being hit by a falling object.

#4
Review
control
measures

If after implementing the above control measures a risk still remains, consider the following controls in the order below to minimise the remaining risk, so far as is reasonably practicable:

- use administrative controls e.g. schedule crane operations to avoid or reduce the need for pedestrians and vehicles to interact with the crane in the area of operation, and
- use PPE e.g. gloves, hard hats, high visibility vests, ear plugs/muffs and eye protection.

4. Check your control measures. Control measures need to be regularly reviewed to make sure they remain effective, taking into consideration changes, the nature and duration of work and that the system is working as planned.



Further information on the risk management process is in the [Code of Practice: How to manage work health and safety risks](#).



Who is involved?

You must consult your workers and their health and safety representatives, if any, when deciding how to manage the risks of using a crane in the workplace.

If there is more than one business or undertaking involved at your workplace you must consult them to find out who is doing what and work together so risks are eliminated or minimised so far as is reasonably practicable.

This may involve discussing site-specific requirements including the type of crane to use, operator training and traffic management.



Further information on consultation requirements is in the [Code of Practice: Work health and safety consultation, co-operation and co-ordination](#).

BEFORE USING A CRANE

The person with management or control of plant at a workplace must ensure, so far as is reasonably practicable, the plant used is specifically designed to lift or suspend the load. A crane is one type of plant generally designed to specially lift and suspend loads.

The type of work you will be doing, how it will be done and who will be involved should be planned and discussed between the people involved in the work before deciding what type of crane will be used.

This includes people directly, for example crane operators and other workers and indirectly, for example suppliers, designers and crane hirers involved with the work.



Choosing a crane

Before you choose a crane you should discuss your workplace needs with suppliers and identify cranes most suited to the workplace and the work for which it will be used. Take into consideration the complete life cycle of the crane, how long you are likely to keep the crane, how often the crane is likely to be used, the conditions under which it will be used and the maximum loads the crane is likely to bear.

A second-hand crane is more likely to have out-dated or missing safety features. Suppliers of second-hand cranes must do what is reasonably practicable to supply equipment that is safe to use at work and where practicable, fit safety features.

Some of the things to look for when choosing a crane are:

- safe access points e.g. ladders, footholds, steps and grab rails
- seat design e.g. comfort and back support
- visibility e.g. mirror, window and windscreen design, and
- environmental controls e.g. temperature control units to avoid worker heat stress.

Hiring a crane

Anyone hiring or leasing a crane to others has duties as both a supplier of the crane and as a person with management or control of the crane at the workplace. They must check the crane is safe to use and properly maintained and provide specific information with the crane including instructions on how to operate it safely.

Before you hire a crane you should check it is suitable for its intended use. You should also consider whether you need to hire a crane only or a crane with a trained and licensed crane crew.

If you do not have the knowledge or expertise about crane specifications, limitations and operational requirements, you should talk to the crane supplier and provide relevant information about the work to be done, the workplace and the type of lifts to be completed so the supplier can provide a suitable crane.

Registering a crane

Some cranes must be registered before they can be used in the workplace. Cranes that are registrable plant must be design registered before they are supplied and used. Further information on registration requirements can be provided by the regulator.



More information on registrable plant including cranes is in the [Code of Practice: Managing the risks of plant in the workplace](#).

Inspection and pre-use safety checks

Inspecting and testing for cranes must include the:

- major inspection required for registrable mobile and tower cranes
- regular inspection and testing required for plant, and
- inspection and testing for plant item re-registration.



Further information on crane inspection and maintenance is in the [Guide to inspecting and maintaining cranes](#).

Before a crane is used, tests, inspections and specific adjustments must be undertaken to ensure the crane can be used safely. This includes:

- workplace factors including ground load bearing capacity, wet or windy conditions are taken into account
- to confirm the crane will not adversely affect or be affected by other plant and structures in the area
- installation and commissioning activities are supervised by a competent person
- the components are assembled in the correct sequence using the right tools and equipment
- limit switches and load indication devices are functioning and correctly calibrated
- the crane has been installed and commissioned to the designer's or manufacturer's instructions and specified technical standards
- the crane is stable, and
- safe entry to and exit from the crane—including in an emergency.



Emergency plan

An emergency plan must be prepared for each workplace where the crane will operate. The plan must be tested in the workplace and include emergency procedures like effective response and evacuation, notifying emergency services and medical treatment. Emergency procedure training must be provided to workers.

Contact numbers for emergency services should be easily seen or found. Workers should know what system is in place to contact emergency services and how to use it.

Rescue equipment should be available and easily accessible so an injured worker including the crane operator can be removed quickly.

Signs displaying evacuation locations should be placed where they are easily seen by workers and others at the workplace.

The emergency plan should also include how these procedures will apply to people who are near the crane as well as those people who are operating the crane (e.g. procedures for evacuating the workplace).

SETTING UP AND OPERATING A CRANE



Documentation and markings

Load charts

A crane of variable radius, for example a tower or mobile crane, will have a crane-specific load chart (also known as a 'rated capacity chart') setting out how the crane lifting capacity varies depending on how the crane is set up i.e. how far the boom is extended and the angle of the boom. Using the load chart correctly is critical to ensure the crane is used safely.

Where the crane has one main load chart it should be fixed in the operator's cabin in a place that is easy to see and read. Where the crane has more than one load chart, for example for different boom and fly jib configurations, the charts should be easily accessible for the operator to verify the crane will not be overloaded. The charts may be kept electronically or in hard copy.

The lifting capacity of a crane is generally limited by:

- the structural strength when the working radius is small, and
- stability when the working radius is greater.

However there are structural limits at both the minimum and maximum working radius. If a crane is overloaded, a structural or mechanical component of the crane may fail or the crane may overturn.

The lifting capacities specified on a load chart should not be exceeded except during testing of the crane by a competent person under controlled conditions.

Each load chart should include enough information to identify the crane configuration it applies to.

For example:

- the safe working zone
- the counterweight mass
- whether a fly jib is fitted, in use, in place or stowed
- outrigger extension or pick-and-carry mode
- maximum speed for mobilising a load
- rope and reeving details, including number of falls of rope in the hook block
- main or auxiliary hoist in use, and
- whether the hook block is included or excluded.

Some important factors which are often overlooked when reading load charts are:

- Subtracting the mass of the hook block and lifting slings from the capacity of the crane at the particular radius. This should be noted on the load chart. For example, if the load chart states the crane can lift 20 tonnes at a given radius but the hook and lifting gear have a combined mass of 1 tonne, the load to be lifted cannot be more than 19 tonnes. This issue is critical for heavier hook blocks and lifting gear, for example spreader beams.

- Subtracting the mass of the fly jib (adjustment mass) from the capacity of the main hook when lifting from the main hook on the main boom with a fly jib attached to the boom head. This adjustment mass should be noted on the load chart—there may be two different masses for some cranes with swing around fly jibs—one for the fly jib in place and another for the stowed position. Capacities of the main boom are generally based on the fly jib being removed. If this issue is ignored, the crane is likely to overturn.
- The increased maximum working radius that may result when using a fly jib.

Limiting and indicating devices

Limiting and indicating devices, for example rated capacity limiters, motion limiting devices, load indicators and radius indicators are intended to prevent a crane moving beyond its safe operating limits or to aid crane operators. The devices should not be relied on in place of using the crane's load chart and operating instructions. Sole reliance on these devices, especially indicating devices, in place of safe operating practices may cause an incident.

Where limiting and indicating devices are to be installed on a crane the safety circuits of these devices should generally meet either:

- a reliability level of Category 4 under AS 4024.1-2006: *Safety of machinery*, or
- a safety integrity level (SIL) of 3 under AS 61508-2011: *Functional safety of electrical/electronic/programmable electronic safety-related systems*.

These categories of reliability level and SIL are related to the concept of 'fail safe'.

Free fall lock-out

When a crane is fitted with a free fall facility this function should be able to be positively locked out and not able to be unintentionally activated.

Operator protective devices

Suitable operator protective devices must, so far as reasonably practicable, be provided for powered mobile plant including cranes. Typically these include FOPS and operator restraints e.g. seat belts. A roll-over protective structure (ROPS) may also be an appropriate device for some types of cranes.



Setting up the crane

Siting the crane

You should choose where to site a crane during the planning phase after considering relevant factors including:

- the risk of the crane overturning or collapsing from the:
 - foundations or supporting structure failing, and
 - crane and foundations/supporting structure combination not being able to withstand the forces likely to be imposed on it
- the risk of the crane colliding with other plant, structures or objects at the workplace, and
- the loads and lift paths including the load pickup and drop off or installation locations.

Crane standing area

The crane standing design should conform to the crane manufacturer's instructions or a competent person's recommendations, for example an engineer. The crane standing should be designed to withstand the forces likely to be imposed on it by the crane while in-service, out-of-service and during erecting and dismantling. These forces include:

- the dead weight of the crane
- the dead weight of the load and lifting attachments

- dynamic forces caused from the crane moving
- bearing pressure being applied by the crane's outriggers and/or tyres/tracks
- wind loadings, and
- other loads identified by the designer of the crane standing area.

When a crane is to be supported on, or tied to a permanent or temporary structure, the design of the structure should be capable of withstanding the forces designed to be imposed on it by the crane. Precautions should also be taken to ensure the stability of the crane when the crane will be sited near underground services, excavations or embankments.



Further information on ground conditions and crane support is in the [Guide to mobile cranes](#).

Collision between the crane and other plant and structures

If there is a possibility of cranes colliding with other plant or structures you should position the crane so the clearance between the crane and its load and other plant, structures and workers minimises the risk of collision.

Where cranes are operating near one another they may share the same air space. The people in each work area should consult and develop safe systems of work to make sure there is enough space between the cranes and where they work. Each work area should nominate a person to implement the safe system of work.

A safety observer (also known as a 'spotter') should be used where a collision between a crane and other plant or structures may occur.

Where cranes are set up in or near flight paths, you should contact the local airport operator to find out where these are in the area where the crane is operating. Where necessary, aircraft warning lights should be fitted to the highest part of the crane.

Working near electric lines

You must ensure, so far as is reasonably practicable, no person or crane at the workplace comes within an unsafe distance of an overhead or underground electric line.

If this is not reasonably practicable then you must carry out a risk assessment and implement control measures to manage the risks. The control measures must be consistent with requirements of the Electricity Supply Authority.

A safety observer should be used when the crane, its load, or anyone working from the plant are in motion and likely to enter a restricted work zone established around electric lines.

Electric lines can have significant risks including electrocution, arcing, explosion or fire causing burns, unpredictable cable whiplash and other objects being electrified like signs, poles, trees or branches. Contact with energised overhead or underground electric lines can be fatal regardless of the voltage they carry. It is not necessary to touch an overhead electric line to be electrocuted. A 'flashover' or 'arc' can electrocute you when you are close to a line conductor.

Most risks can be controlled by observing safe working distances for people and cranes working near electric lines. Safe working distances will depend on the type of work being carried out and the voltage of the electric lines. You should contact the relevant Electricity Supply Authority to determine the type of control measures required. This may include isolating the electric line for the duration of the work.

Contact with energised overhead electric lines may have an impact on parts of the crane for example tyres, hydraulic and electrical systems. If contact occurs, the crane should be immediately placed out-of-service until it has been inspected by a competent person and proven to be safe to resume normal operation.



Further information about electrical safety is in the [Guide for operating cranes and mobile plant near overhead electric lines or from your Electricity Regulator](#).

Working at height

People installing, erecting and dismantling some types of cranes may be exposed to the risk of falling when working at height. An activity carried out in relation to construction work where a person could fall more than 2 metres is defined as high risk construction work and requires a safe work method statement (SWMS).



Further guidance on SWMS is in the [Code of Practice: Construction work](#).

To minimise the risk of workers falling from a height control measures may include:

- temporary work platforms e.g. an elevating work platform
- travel restraint systems
- fall-arrest harness systems, and
- edge protection systems.



Further guidance on controlling the risk of falls is in the [Code of Practice: Managing the risk of falls at workplaces](#).

Pick and carry

Pick and carry activities occur when a mobile crane carrying a suspended load travels with the load (also known as mobiling). Pick and carry activities are only to be carried out with cranes designed for this purpose and in accordance with the manufacturer's instructions.

The rated lifting capacity of pick and carry cranes is de-rated by design to take into account the reduced stability when the crane moves across various terrain types. Pick and carry crane manufacturers may also provide a de-rating chart to help determine a crane's rated lifting capacity when working on specified side slopes.

Operational risks such as ground conditions, intended travel pathway, and wind speeds also need to be considered.

Unless otherwise specified by the manufacturer, cranes designed to remain in one location during the lift, for example vehicle loading cranes, are not to be used in a pick and carry mode.

When plant, for example earthmoving equipment or telescopic handlers are used for pick and carry activities, the manufacturer's instructions or those of a competent person must be followed.



Further information on the safe operation of pick and carry cranes is in the [Guide to mobile cranes](#).

Crane stability

Failure to maintain stability is one of the key factors associated with serious crane incidents. Things to consider are:

- crane operation parameters resulting in an overturning moment greater than the stabilising moment of the crane—the crane counterweight generally provides the primary stabilising moment
- the ground conditions and means of supporting the outrigger pads or the crane tyres
- the slope of the ground including both the side slope and the slope of the ground in the direction of the crane travel if the crane has mobile ratings.
- wind conditions—will vary depending on the size and shape of the suspended load and crane boom, and
- the way loads are lifted or moved e.g. a sudden stop when mobiling a load may cause the load to swing and destabilise the crane.

If the crane moves unexpectedly while mobiling or slewing, the load may swing unexpectedly. Cranes should only be sited and operated on stable surfaces, designed by a competent person where applicable, with the correct bearing pressure and without significant holes or indentations that may cause the crane and load to move unexpectedly from being unstable.



Further information on crane stability is in the [Guide to mobile cranes](#).

Wind conditions

Winds impose extra loads on a crane and affect the crane's stability. Where wind speeds are greater than those recommended by the manufacturer, crane operations should be stopped and if necessary, the crane should be stowed.

The design wind speed for the crane should be listed in the manufacturer's instructions and marked on the load chart(s).

Crane operators should recognise that dependent on the boom length and luffing angle, the wind speed may be greater at the height of the load compared to the wind speed at the height of the crane's cabin. Also wind gusts have a different effect on the crane than a constant wind.

Given these variables, crane operators should make their decision to conduct a lift based on the information provided by the crane manufacturer, advice provided by competent people like an engineer, dogger or rigger.

If the crane operator considers it is unsafe to lift the load it should not be lifted until:

- a written authorisation is provided by a competent person confirming the load is safe to lift and how it is to be lifted, or
- the conditions change and the crane operator decides it is safe to make the lift.



Licences to operate cranes

Appendix B lists the types of plant including cranes where the operator must hold a high risk work licence.

A person who operates a crane does not need to be licensed if the work carried out is:

- as a trainee being supervised by a licensed crane operator
- solely for manufacturing, testing, trialling, installing, commissioning, maintaining, servicing, repairing, altering or disposing of the crane
- solely for moving the crane in the workplace where the crane is operated or used without a load except when standard weights with predetermined fixing points are used for calibration and other testing
- limited to setting up or dismantling the crane and the person carrying out the work holds a high risk work licence for rigging which qualifies the person to carry out the work, or
- limited to loading or unloading plant from a vehicle or equipment used to move plant.

The person that slings a load, including selecting and inspecting the lifting gear, and/or directs the crane operator in the movement of a load when it is out of the crane operator's view must hold a dogging or rigging licence (excepting for a licensed vehicle loading, bridge or gantry crane operator who can sling loads for the type of crane they are licensed to operate).



For further information see the [Information Sheet: Vehicle loading cranes](#).

Regular refresher training is important to ensure licensed crane operators, doggers and riggers maintain the competencies gained when they undertook their high risk work licence and understand the cranes they are working with. Refresher training should be conducted as often as necessary to ensure the crane crew continues to work safely.



Further information on licensing requirements for crane activities is available in the information sheets on:

- [High risk work licensing for vehicle loading cranes](#)
- [High risk work licensing for bridge and gantry cranes](#), and
- [High risk work licensing for dogging](#).

Driver's licence requirements

A mobile crane may be a registered vehicle under state and territory road laws. Like a truck driver, a person must hold a current driver's licence for the class of vehicle before driving a mobile crane on a public road.



Operating and lifting procedures

Documenting operating and lifting procedures can help define responsibilities and manage crane activities in a logical and systematic way. This means the crane operation is more likely to be carried out safely. Lifting procedures should be prepared to suit the crane, the work and the working conditions. A SWMS will be required for crane work, including work defined as high risk construction work.

Documented lifting procedures may include:

- hazards and risk controls to be applied e.g. for electric lines
- the type of crane or cranes to be used
- the loads to be lifted including the mass of the lifting equipment e.g. slings and spreader beams
- verification that the crane standing will support the maximum ground bearing pressure to be imposed by the crane during operations
- the position of the crane, loads to be lifted and where e.g. a diagram showing a plan view of the site
- the maximum wind speed for the crane and lower wind speeds for specified loads e.g. where the load has a large surface area, for example large pressure vessels and tanks
- the load working radius range with confirmation the loads are within the crane's capacity at the maximum radius
- allowance for the factors that may require de-rating of the crane e.g. for multiple crane lifts, extra radius caused by tilting of tilt-up panels
- when a spotter is needed e.g. to prevent a collision or contact with overhead electric lines—the tasks required, who is responsible for performing them and what communication system is to be used should also be documented
- the slinging and lifting sequence, and
- the rigging requirements of the job.

Communication

Lack of reliable communication between a crane operator and dogger or rigger may lead to unsafe crane operations and contribute to injury to people from dropped loads and collision with other plant and structures.

Only one dogger should give signals at a time. Signals may be visual, audible or a combination of both. When more than one dogger is involved in a lift, each dogger should understand when responsibility for their part of the lifting operation should be handed over to another dogger.

Effective communication is particularly important where the crane operator cannot:

- see the load, the load's landing area or the path of travel of the load or the crane
- make an accurate judgement of distance, and
- see if the crane or the load may contact overhead electric lines or other obstacles.

People using radio equipment should be familiar with the manufacturer's operating instructions. A secure dedicated radio frequency should be selected for the duration of the crane operations to prevent interference with other radio equipment being used in the vicinity of the crane. A constant talk method should be used so the people involved are aware of the progress of the lifting operations. Work should stop immediately if there is a loss of radio communication.

Where radio communication cannot be used other ways to communicate including hand signals, bell, buzzer and whistle signals should be used. Mobile phones should not be used for directing mobile crane operations.

Lifting gear

Lifting gear should be checked before and after use and inspected regularly by a competent person to determine whether it is suitable to keep using. Checks should ensure:

- the lifting gear is tagged and relevant information listed e.g. relevant information for a chain sling includes grade of chain, rated capacity, manufacturer, chain size and the relevant Australian Standard marking
- lifting hooks are provided with operable safety latches unless a safety latch would increase the risk e.g. a hook on a tea pot ladle at a smelter
- shackles used as terminal fittings are prevented from unscrewing e.g. mousing or similar
- lifting eyes and inserts are compatible
- lifting slings are not damaged e.g. excessive wear, damaged strands, cracks, deformation or severe corrosion, and
- the sling is suitable for the load being lifted including capacity and protection from sharp edges.

The manufacturer's requirements for lifting gear should be followed including using protective sleeves and corner pieces. Although the edges of the load may not appear sharp a sling may be damaged when it is placed under tension.

Lifting materials

Crane-lifted loads should be slung and secured so the load or part of it cannot fall.

Tag lines or similar control devices should be used to control loads while being lifted or suspended.

Material boxes

Material boxes should:

- have the tare mass and working load limit (WLL) clearly marked
- be suitable for the material being lifted and be engineer-designed and certified
- have four slings—one in each corner—attached during lifting
- have enclosed sides or robust mesh with openings less than the minimum size of materials being lifted (specifically designed material boxes should be used to lift smaller components)
- be inspected and maintained and inspection records kept
- have loads secured against movement, and
- not have materials stacked higher than the side of the material box unless they are secured—but at no time should the material box become top heavy.

General lifting

The following principles should be observed when using cranes for general lifting work:

- Formwork frames should be either tied together, secured in a lifting frame, or lifting slings should be wrapped around the load.
- Loads of pipes, joists, timber or sheeting should be strapped together and lifted in a flat position to prevent individual items slipping.
- Sheets of plasterboard may be lifted in a specifically designed material box. If a material box is not used then the lifting system should:
 - be certified by an engineer or a person who holds an intermediate or advanced rigging licence
 - specify the minimum and maximum number of sheets
 - specify the number and locations of lifting slings, and
 - specify the capacity of lifting slings.

- Tag lines should be used as needed to control loads.
- Loads should be supported where possible with dunnage and with the load distributed over the supporting surface.
- Wherever basket hitches are used the sling needs to be positively restrained from sliding along the load.

Lifting people

Except where exempted by the WHS Regulations, people should only be lifted by plant designed specifically to lift people, for example elevating work platforms. If it is not reasonably practicable to use plant specifically designed to lift people, a crane-lifted work box may be used to lift workers to perform minor work for a short amount of time in an elevated work area.



For further information on the safe use of work boxes see the [Information Sheet: Crane-lifted work boxes](#).

Crane overload

A crane should never be overloaded. The crane operator or dogger should:

- verify if the marked load mass is correct and not lift a load in excess of the crane's rated capacity
- verify the correct counterweight is correctly mounted and the outrigger settings are in accordance with the load chart being used, and
- control crane movement including mobiling to stop excessive load swing that may overload the crane.

Before lifting a load, the crane operator or dogger should check the hoist rope hangs vertically over the load. Care should be taken to stop the load swinging when lifting the load. The crane operator should always have the load under control when lowering loads or when the load is suspended.

Falling objects

The risk of falling objects causing injury to workers and other people must be eliminated, or minimised, so far as reasonably practicable including preventing objects from falling freely, or providing a system to arrest the fall of the object.

Loads should not be lifted over public access areas including footpaths, roads, highways, railways, waterways and buildings. If there is a risk of people being hit by falling objects control measures like exclusion zones or suitably designed gantries should be used to prevent people being hit by falling objects during lifting operations.

Where possible, site access should be restricted to people who are directly involved with crane activities. Movement of people and mobile plant at the workplace should be minimised while lifting is taking place.

Exclusion zones

Exclusion zones should be established around cranes and adjoining areas to stop people entering the area and risk being injured by the crane or falling objects. The size of the exclusion zone should be based on a risk assessment.

Where the exclusion zone crosses a public footpath or roadway that needs to be closed or an overhead protective structure erected you should seek approval from the relevant authority. People should be safely directed to an alternative footpath. Lane closures and other operations requiring barricades and signs to be erected should meet local road authority, local government authorities and relevant building or local laws.

Single crane multiple winch lifts

Some single cranes are designed to lift a load using both the main and auxiliary winches. Single crane multiple winch lifts can be undertaken on these cranes in accordance with the manufacturer's instructions. This can occur for example, to rotate a prefabricated concrete panel into its vertical position from a horizontal storage or transport position by using two hoist ropes. Even though the concrete panel will be suspended by two hoist ropes, each rope usually needs to support more than 50 per cent of the load during the rotation and one rope will have to support the full weight. Therefore unless each hoist is capable of supporting the full load it is important to use the main hoist to support the full load. The actual load to be carried by each winch and rope should be calculated and documented by a competent person before the lift commences. Where a single crane is used for mid-air rotation you should:

- use a crane designed and manufactured for simultaneous multiple winch use
- follow the crane manufacturer's instructions
- if needed, reconfigured the crane before it can be used in this way
- make sure the main winch and auxiliary winch drives are independent
- not exceed the rigging maximum design fleet angle
- rotate as near as possible in line with the plane of the boom to prevent side loading the sheaves
- monitor the load on the main and auxiliary winches separately and simultaneously to avoid overloading either rope and to make sure the combined load of both ropes does not exceed the rated capacity
- not exceed by more than 10 degrees, or as determined by the manufacturer or a competent person, the included angle between the main hoist rope and auxiliary hoist rope unless otherwise specified by the manufacturer, and
- rotate with enough clearance to make sure the load does not strike the ground, crane or other objects.

A competent person, for example an engineer should confirm the minimum required capacity of each hoist rope, that is the maximum load placed on each rope during the rotation. Sometimes the auxiliary winch line passes over the 'rooster sheave' which is the name given to the sheave mounted on a short boom extension. Do not overload the rooster sheave as some are not rated for the full line pull of the auxiliary winch and are not suitable for this purpose. Rooster sheaves and the associated rigging on the boom head should be designed and certified by an engineer.

Multiple crane lifts

Lifting a load with two or more cranes requires detailed planning and supervision because the movement of the load between the cranes may create extra loadings on the cranes, the load and the lifting gear. The design capacity of a crane will not be the maximum rated capacity but the de-rated capacity relevant to the multi-crane lift to be carried out. The cranes to be used in the lift will need to be de-rated.

No load should be lifted simultaneously by more than one crane unless a single crane lift is not practical and the multiple crane lifting method ensures the load placed on each crane does not exceed its de-rated design capacity.

Where multi-crane lifts are carried out, a documented lift plan and procedure should be prepared by a competent person, for example an engineer, and followed. The crane de-ratings for each of the cranes used for the multi-crane lift should be identified in the plan.

Where it is necessary to lift a load using more than one crane the person in control of the lift must hold at least an intermediate rigging high risk work licence.

Cranes used for demolition

Cranes should not be used for demolition (or wrecking) ball work.

If a crane is used for demolition ball work it should be thoroughly inspected and verified by a competent person after the work is complete as being in a satisfactory condition before it is used for general lifting. The results of the inspection must be recorded in the crane's service logbook.

Cranes used for demolition work must be fitted with suitable operator protective devices, for example a FOPS, to protect the crane operator.

The hoist rope should be prevented from leaving the boom point sheave. This may include fitting heavy duty rope guards to the sheave to control the slack rope condition that may occur as the ball falls—damage is likely where the demolition ball is attached to the hoist rope. Hoist ropes should not be fixed directly to the demolition ball. A length of chain should be used to join the hoist rope to the demolition ball. The chain should be at least 16 mm and at least 2 metres in length.



Further guidance on demolition is in the [Code of Practice: Demolition work](#).

Cranes not in use

A crane may not be in use if it is unattended, parked or stored. You must make sure, so far as is reasonably practicable, a crane that is not in use is left in a state that does not create a risk to the health or safety of a person.

Except in an emergency due to fire or other life threatening reason, the crane operator should never leave the crane cabin or controls while a load is suspended from the crane. A crane should not be left unattended unless:

- loads are removed from the hook or lifting device
- the hook has been secured or raised to a position where it is clear of other operations
- powered movements have been disabled, and
- the keys removed or the starting device locked out.

When leaving a mobile crane unattended for a period of time ensure the crane's boom is retracted and lowered as far as possible.

Where there is no risk of a tower crane boom contacting other structures, the crane should be left to weathervane when unattended according to the crane manufacturer's instructions.

Where it is necessary to restrict the movement of the boom of a tower crane the method of tethering, that is securing the boom to prevent slewing, should be according to the crane manufacturer's instructions or as determined by an engineer.

If a crane is to be stored it should be prepared to be left unattended and:

- the manufacturer's storage instructions followed
- remote control equipment isolated
- the power supply and controls isolated and locked off
- storm anchors applied, if fitted, and
- doors and windows locked to prevent unauthorised access.

Decommissioning and dismantling

A crane must be decommissioned or dismantled by a competent person and inspections must be undertaken during the process. A crane should be decommissioned and dismantled according to the manufacturer's instructions or where not available, using recommendations prepared by a competent person.

Record keeping

Records of tests, inspections, maintenance, commissioning, decommissions, dismantling, and alterations must be kept for registered cranes and made available for examination as required. The records must be kept for the period the plant is used or until control of the plant transfer to another person.

Crane records should also include:

- plant design or item registration information—if applicable
- final (i.e. as-built and approved) design drawings and calculations
- methods, data obtained and results on tests carried out on cranes and safety devices
- compliance statements and test certificates
- manufacturer's specifications
- information on maintenance, major repairs and major modifications carried out
- information on approved use that deviates from intended operating or design conditions
- results of risk assessments
- information, instruction, training provided to workers
- log books, and
- operator competencies.

Records should be kept in a suitable format and transferred with ownership of the crane. A crane service record, for example a maintenance logbook, should be kept and readily available and should:

- clearly describe the work carried out and the parts replaced, and
- identify the person or business that completed the work and be dated.

Documentation stating the crane has been inspected by a competent person and is in a safe and satisfactory condition, should be readily available.

The checks, adjustments, replacement of parts, repairs, inspections performed and irregularities or damage concerning the crane's safe use should be recorded.

Boom-type elevating work platform means a telescoping device, hinged device, articulated device or any combination of these, used to support a platform on which personnel, equipment and materials may be elevated.

Bridge crane means a crane that:

- consists of a bridge beam or beams, mounted to end carriages at each end
- is capable of travelling along elevated runways, and
- has one or more hoisting mechanisms arranged to traverse across the bridge.

Dogging work means:

- the application of slinging techniques including the selection and inspection of lifting gear to safely sling a load, or
- the directing of a plant operator in the movement of a load when the load is out of the operator's view.

Electricity Supply Authority means a person or body engaged in the distribution of electricity to the public or the transmission or supply, directly or indirectly, to the public. An electricity supply authority may also be known as a network operator, a network service provider or an electricity entity.

Fail safe means a state or condition where, if any component or function of the plant fails, a system exists to prevent an increase in the risks. The reliability or safety integrity of the fail safe system should be commensurate with the determined level of risk, for example Category 1 to Category 4 applied in AS 4024-2006: *Safety of machinery*.

Gantry crane means a crane that:

- consists of a bridge beam or beams supported at one or both ends by legs mounted to end carriages, and
- is capable of travelling on supporting surfaces or deck levels, whether fixed or not, and
- has a crab with one or more hoisting units arranged to travel across the bridge.

Hoist means an appliance intended for raising or lowering a load or people and includes an elevating work platform, a mast climbing work platform, personnel and materials hoist, scaffolding hoist and serial hoist, but does not include a lift or building maintenance equipment.

Load chart means a notice fitted or displayed in electronic form on or in a crane or hoist specifying the rated capacities as supplied by the manufacturer or competent person.

Mobile crane means a crane capable of travelling over a supporting surface without the need for fixed runways and relying only on gravity for stability.

Operator protective device includes a roll-over protective structure (ROPS), falling object protective structure (FOPS), operator restraining device and seat belt.

Overturning moment means the moment that tends to tip the crane over. When the overturning moment exceeds the stabilising moment, the crane will overturn, see 'Stabilising moment'.

Portal boom crane means a boom crane or a jib crane that is mounted on a portal frame that, in turn, is supported on runways along which the crane travels.

Rated capacity means the maximum gross load that may be applied to the crane while in a particular working configuration and under a particular condition of use (see WLL).

Reach stacker means a powered reach stacker that incorporates an attachment for lifting and lowering a shipping container.

Rigging work means:

- using mechanical load shifting equipment and associated gear to move, place or secure a load using plant, equipment or members of a structure to ensure the stability of those members, or
- the setting up or dismantling of cranes or hoists.

Slinging techniques means the exercising of judgement in relation to the suitability and condition of lifting gear and the method of slinging, by consideration of the nature of the load, its mass and its centre of gravity.

Stabilising moment means the moment that tends to keep the crane upright. 'Moment' is the engineering calculation of force multiplied by the perpendicular distance between the force and the turning point.

Working load limit (WLL) means the maximum gross load that may be applied to the lifting gear and lifting attachments while in a particular working configuration and under a particular condition of use, see also 'Rated Capacity'.

APPENDIX B - HIGH RISK WORK LICENCES

The following types of plant require a high risk work licence to operate.

Class of plant	Type of plant included in this class	Condition
Boom type elevating work platform	Self-propelled	if boom extends >11 m
	Trailer mounted	if boom extends >11 m
	Vehicle mounted	if boom extends >11 m
Bridge crane	Top running bridge crane	if certain conditions apply*
	Underslung bridge crane	if certain conditions apply*
Concrete placement units	Static mounted with delivery boom	
	Vehicle mounted with delivery boom	
Gantry crane	Gantry crane	if certain conditions apply*
	Semi-gantry crane	if certain conditions apply*
	Portside container crane	
Hoist	Materials hoist	
	Personnel and materials hoist	
	Platform hoist	
Mast climbing work platform	Single mast climber	to install
	Double mast climber	to install
Mobile crane including: <ul style="list-style-type: none"> ■ Articulated ■ Crawler ■ Trailer mounted ■ Truck mounted 	Slewing crane	
	Non slewing mobile crane	if capacity >3 t
Multi-purpose tool carrier or Telescopic handler	When equipped as a boom-type elevating work platform	if boom extends >11 m
	When equipped as a slewing crane	if rated capacity >10 t
	When equipped as a non-slewing crane	if rated capacity >3 t
Reach Stacker	Reach Stacker	if capacity >3 t
Tower crane	Articulated jib Luffing Self-erecting Topless Trolley jib	
Vehicle loading crane	Vehicle mounted crane for loading and unloading the vehicle	if capacity >10 metre tonnes
Work box	Personnel work box	to direct the crane in certain conditions e.g. dogger
	First aid box	

* Licence required for cranes with an operator cabin or a pendant control with four or more powered movements