INTEGRAL SKILLS

VEHICLE LOADING CRANE

TLILIC0024 Licence to operate a vehicle loading crane (capacity 10 metre tonnes and above)

RIIHAN307E Operate a vehicle loading crane

LEARNER GUIDE

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MODIFICATION HISTORY

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1.1 Introduction

This training course is based on the units of competencies RIIHAN307E Operate a Vehicle loading crane and the National High Risk Licence Unit **TLILIC0002 Licence to Operate a Vehicle Loading Crane (capacity 10 metre tonnes and above).**

You will learn about:

- Planning the work.
- Selecting and inspecting equipment.
- Preparing the site and equipment.
- Shifting loads using a vehicle loading crane.
- Shutting down the job and cleaning up.

1.1.1 What is a Vehicle Loading Crane?

A vehicle loading crane is a crane mounted on a vehicle. Its main purpose is to load and unload the vehicle it is mounted onto.

There are 2 main types of vehicle loading cranes:

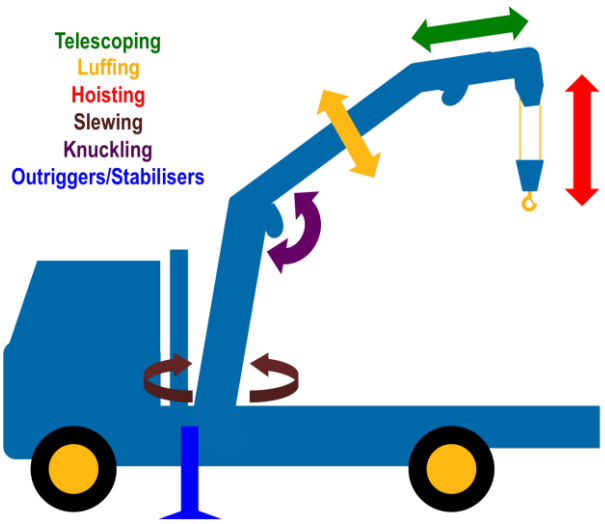
- Cranes with less than a 10 metre tonne capacity.
- Cranes with a 10 metre tonne capacity or more.

This training course is for operating a vehicle loading crane with a 10 metre tonne capacity or more.

1.1.1.1 Vehicle Loading Crane Movements

Crane movements that you may use when operating the crane and shifting loads include:

- **Telescoping** – the extension and retraction movement of a hydraulic type boom.
- **Luffing** – the up and down movement of the boom.
- **Hoisting** – the raising and lowering of the hook block using the hoist rope.
- **Slewing** – the circular movement of the boom.
- **Knuckling** – folding action of the boom articulating at the knuckle.
- Operation of **outriggers/stabilisers**.

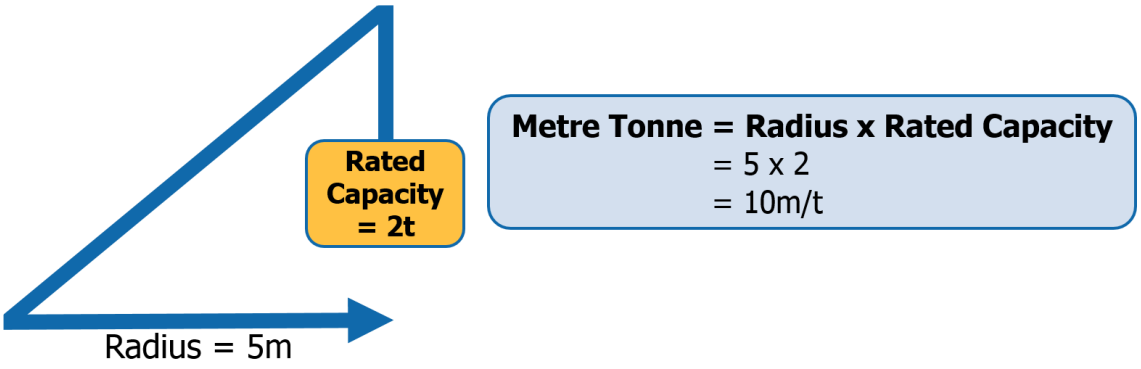


1.1.2 Do I Need a HRW Licence?

You will need a HRW licence to operate a vehicle loading crane if the capacity of that crane is 10 metre tonnes or more.

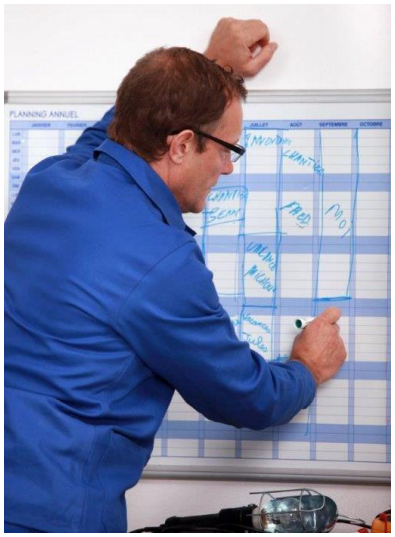
To work out the capacity of your vehicle loading crane, you need to know the rated capacity of the vehicle and the working radius for that rated capacity. These will be found on the load chart.

For example:



As the capacity of this crane is 10 metre tonnes you must have a High Risk Work licence to operate it.

1.1.3 High Risk Work Licence Requirements



Once you pass your assessment you will have **60 days** to apply for your licence.

You must renew your licence within 12 months of its expiry otherwise:

- Your licence can't be renewed.
- You need to repeat the course and re-apply for your licence.
- You need to enrol in the course again and be supervised by somebody who has a current licence for the same class.

You can still do high risk work without a licence as long as:

- You are enrolled in a high risk course for the class, and
- You are being supervised by somebody who has a licence for the same class.

Any licensed worker must take reasonable steps to make sure the way they work does not impact on the safety of themselves or any other worker. This is their legal duty of care. Failing to work safely can result in the health and safety regulator:

- Suspending or cancelling your licence.
- Refusing to renew your licence.
- Ordering that you are reassessed to ensure you are competent.

Your employer might ask you for evidence that you have a high risk licence before you start any high risk work. You can show them:

- Your licence.
- Proof from the training company that you have passed your assessment.
- Proof that you are currently completing a course for high risk work.

1.2 Plan Work

It is important that you understand all of the health and safety rules relevant to your job.

As a crane operator you are responsible for planning and carrying out high risk work. This work must be done in accordance with a range of safety requirements including:

- Work Health and Safety (WHS) requirements.
- Duty of care.
- Work instructions and procedures.

1.2.1 Work Health and Safety Requirements

Work Health and Safety (WHS) laws and guidelines help keep your workplace safe.

These can be broken down into four main types:

Acts	Laws to protect the health, safety and welfare of people at work.
Regulations	Gives more details or information on particular parts of the Act.
Codes of Practice	Are practical instructions on how to meet the terms of the Law.
Australian Standards	Give you the minimum levels of performance or quality for a hazard, work process or product. *AS 2550.1-2011 Cranes, hoists and winches - Safe use - General requirements* is one Australian Standard closely related to crane operation.

1.2.2 Duty of Care

Everybody in the workplace has a responsibility to keep themselves and others as safe as possible while they are at work. This is called a 'Duty of Care'.

Anyone who has a high risk work licence needs to make sure they take care of their own health and safety and make sure that they don't put others in any danger.

The following people have a duty of care in the workplace:

- Employers and self-employed persons.
- Any person in control of the workplace.
- Supervisors.
- Designers.
- Manufacturers.
- Suppliers.
- Workers.
- Inspectors.

To keep yourself and other workers safe you need to:

- Follow your instructions.
- Follow all workplace rules.
- Have the right qualification or licence for a job (licences, tickets or certificates of competency).
- Make sure all equipment is safe to use.
- Carry out your work safely.
- Report any problems.
- Meet any other relevant state and territory WHS requirements.

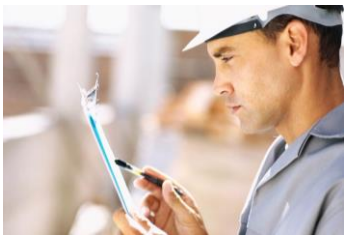
If you do not work safely when carrying out high risk licence work the WHS regulator can:

- Suspend your licence.
- Cancel your licence.

The regulator might also refuse the renewal of your licence or you could be required to pass the assessment again to prove that you are competent.

1.2.3 Work Instructions and Procedures

All work needs to follow worksite and company safety procedures.



Procedures help to make sure that all work is done in a safe way, without damaging equipment or putting people in unsafe situations. They also help to make sure that work is done in the correct order and doesn't interrupt or get in the way of other work that is happening on the site.

Work instructions will tell you the safest way to do the job, and the equipment that you will need to use. It is a good idea to check your work instructions with your boss or supervisor to make sure you know exactly what you need to do.

Work instructions can include:

- Manufacturer's guidelines (instructions, specifications, checklists).
- Industry operating procedures.
- Workplace procedures (work instructions, operating procedures, checklists).

It is important that you can read and understand all documents relevant to your work and role. If you don't know where to get your instructions or you can't understand them, you can ask your boss or supervisor. They will tell you where to find your work instructions and explain what they mean.

1.2.4 Planning for the Task

There will be specific considerations and requirements you will have to think about and plan for depending on the particular task you will be completing.

You should think about:

- Workplace specific issues.
- Communications (safe and adequate).
- Access and egress.
- Location of the task.
- Permits and/or licences required for the task.
- Requirements for taglines, dogman/rigger.
- Load configuration and conditions, weight, size of the load, slinging arrangements, load balance, load security (loose load).
- Equipment required for the task.
- Availability of equipment.
- Capability/Capacity of the crane.
- Safe work procedures.
- Sequence of movements.
- Specifics of the task, including path for load movement.

For example, if you needed to set up a crane in a busy street, you would need to check with the local authorities to see if there are any permits required for traffic control, any exclusion zones that need to be put in place, or if there are any conditions/requirements under which you would need to operate the crane.

1.3 Manage Hazards and Risks

Before starting any work it is important to manage any hazards or risks in the area, or related to the work.

A **Hazard** is a thing or situation with the potential to cause harm or damage.

A **Risk** is the chance of a hazard causing harm or damage.

By lowering or removing risks we can make hazards less dangerous.

1.3.1 Consulting with Other Workers about Hazards and Risks

Controlling a hazard can be a team effort and it's important that everybody knows what they need to do and how or if they need to change their work process to suit.

Make sure you talk to the right people. This can include:

- Safety officers.
- Site engineers (where applicable).
- Supervisors.
- Other workers.
- Managers who are authorised to take responsibility for the workplace or operations.

These people may have information about site hazards and ground conditions.

It is also important to communicate with other personnel and safety officers before starting on a worksite to ensure that any workplace policies or site-specific procedures are followed.

1.3.2 Identify Hazards

Part of your job is to look around to see if you can find any hazards before you start any work.

When you start checking for hazards, make sure you look everywhere. A good way to do this is to check:

- **Up high** above your head.
- All around you **at eye level**.
- **Down low** on the ground (and also think about what is under the ground).

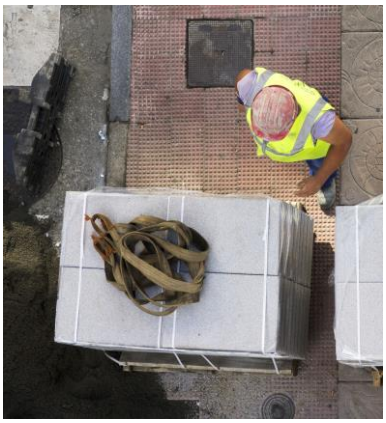
Some general hazards you should check for in the work area:

- Power lines.
- Overhead service lines.
- Underground services or pipes.
- Ground or floor surfaces that may not bear the weight of the crane or other equipment.
- Bad weather conditions such as strong winds, storms or lightning.
- Insufficient lighting or a lack of illumination.
- Traffic including:
  - Pedestrians and other workers.
  - Vehicle traffic.
  - Other plant.
- Ground stability including:
  - Ground condition.
  - Recently filled trenches.
  - Slopes.
- Dangerous materials.
- Trees.
- Buildings, facilities and other surrounding structures.
- Obstructions, including equipment and materials.
- Hazards caused by the crane operator's position.

As part of planning your work check the path of movement for the crane and load for any obstructions. This is to make sure that you have identified all hazards in the path of movement and put effective control measures in place.

When checking the path of movement think about:

- The size of the load.
- Dimensions of the crane.
- The suitability of the pickup and landing sites.
- Overhead power lines.
- Underground services.
- Communication arrangements with the dogger.
- Preventing pedestrians and workers accessing the pathway.
- If there is a need for spotters/observers.
- Any obstructions, including:
  - Equipment.
  - Materials.
  - Other vehicles, plant and people.
  - Building and other structures.
  - Overhead power lines.



Inspect the pick-up and landing areas to make sure they are suitable for the crane and load. Check the dimensions of the crane and load to make sure that they can pass safely along the route of travel and through access and egress points without encountering any difficulties.

You will also need to check for any other hazards such as equipment or people working in the area. You may need to prevent access to certain areas.

1.3.2.1 Working Near Power Lines

Working near power lines can be dangerous if you are not careful.

It is very important that you know the safe operating distances for different types of power lines and the steps you must take if your job needs you to work closer than the safe distances.

Generally, if you need to work closer than the safe work distance you must:

- Contact the local electrical authority for permission to work closer (this is called an exemption).
- Have the power lines shut off. If this is not possible then have the power lines insulated by the electrical authority.
- Use a spotter (depending on local laws and rules).

Distances are different depending on the state or territory you are working in and the voltage of the power lines. You should check with the authority responsible for the power lines for information and advice to find out the voltage of power lines in your work area.

Queensland

The Queensland Electrical Safety Regulation breaks down the distances in detail. Exclusion zones are broken down not only by size of power line but also by the competency level of the operator. This means that the requirements should be clarified with the electrical authority before work commences even if the distance appears to be outside the zones.

The following minimum distances are provided as guidance:

Power Line Type	Distance
Up to 132kV	3.0m
132kV up to 330kV	6.0m
330kV and above	8.0m

New South Wales

In New South Wales, for anyone who is not accredited, equipment operation may not be any closer than the following distances to power lines:

Power Line Type	Distance
Up to and including 132kV	3.0m
Above 132kV up to and including 330kV	6.0m
Above 330kV	8.0m

To work closer than these distances requires authority from the relevant electrical authority and adherence to cl.64(2)(e) of the regulations.

Australian Capital Territory

In the ACT mobile plant operators and persons erecting or working from scaffolding must maintain a safe minimum distance to power lines as outlined in the table below:

Power Line Type	Distance
Less than 33kv	4.0m
33kV or more (transmission lines)	5.0m

Victoria

In Victoria the Framework for Undertaking Work Near Overhead and Underground Assets states that equipment must not be closer than the following distances to power lines:

Power Line Type	Distance
Distribution lines up to and including 66kV (power poles)	6.4m (or 3.0m with a qualified spotter)
Transmission lines greater than 66kV (towers)	10m (or 8m with a qualified spotter)

Tasmania

In Tasmania equipment must not be closer than the following distances to power lines:

Power Line Type	Distance
Up to and including 133kV (poles)	6.4m (or 3m with a safety observer)
Greater than 133kV (towers)	10m (or 8m with a safety observer)

South Australia

In South Australia mobile plant operators and persons erecting or working from scaffolding must maintain a safe minimum distance to power lines as outlined in the table below:

Power Line Type	Distance
Up to 132kv (including 132kv poles)	6.4m (or 3.0m with a spotter)
132kv or more (including 132kv towers)	10.0m (or 8.0m with a spotter)

Western Australia

In Western Australia this falls under Regulation 3.64 from the OSH Regulations and states the following as the minimum distances:

Power Line Type	Distance
Up to 1kV (insulated)	0.5m
Up to 1kV (uninsulated)	1.0m
Above 1kV and up to 33kV	3.0m
Above 33kV	6.0m

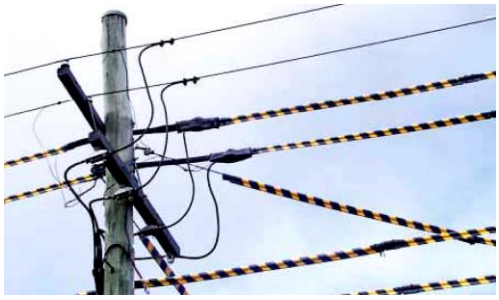
Northern Territory

In the Northern Territory equipment must not be closer than the following distances to power lines:

Power Line Type	Distance
Up to and including 132kV (distribution lines)	6.4m (or 3m with a spotter)
Greater than 132kV (transmission lines)	10m (or 8m with a spotter)

Tiger Tails

Tiger tails are used to clearly show the location of overhead power lines. Tiger tails **DO NOT** insulate the power lines so exclusion zones and safe operating distances must still be used, even when tiger tails are in use.



1.3.3 Assess Risks

Once you have identified the hazards on site or related to the work you will be doing you need to assess their risk level.

Risk levels are worked out by looking at 2 factors:

Consequence	How bad will it be if the hazard causes harm?
Likelihood	What is the chance of the hazard causing harm?

You can use a table like the one shown here to work out the risk level:

	Consequence				
Likelihood	**1. Insignificant**	**2. Minor** First Aid Required	**3. Moderate** Medical Attention and Time Off Work	**4. Major** Long Term Illness or Serious Injury	**5. Catastrophic** Kill or Cause Permanent Disability or Illness
1. Rare	Low	Low	Moderate	Moderate	Moderate
2. Unlikely	Low	Low	Moderate	Moderate	High
3. Possible	Low	Moderate	High	High	Extreme
4. Likely	Moderate	Moderate	High	High	Extreme
5. Almost Certain	Moderate	High	High	Extreme	Extreme

For example, a hazard that has a **Major** consequence and is **Almost Certain** to occur has a risk level of **Extreme**.

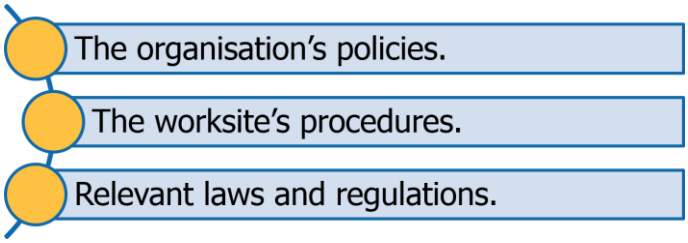
	Consequence				
Likelihood	**1. Insignificant**	**2. Minor** First Aid Required	**3. Moderate** Medical Attention and Time Off Work	**4. Major** Long Term Illness or Serious Injury	**5. Catastrophic** Kill or Cause Permanent Disability or Illness
1. Rare	Low	Low	Moderate	Moderate	Moderate
2. Unlikely	Low	Low	Moderate	Moderate	High
3. Possible	Low	Moderate	High	High	Extreme
4. Likely	Moderate	Moderate	High	High	Extreme
5. Almost Certain	Moderate	High	High	**Extreme**	Extreme

The risk level will help you to work out what kind of action needs to be taken, and how soon you need to act.

The table below is an example of a site risk policy:

Risk Level	Action
Extreme	**This is an unacceptable risk level** The task, process or activity **must not proceed**.
High	**This is an unacceptable risk level** The proposed activity can only proceed, provided that: **1.** The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. **2.** The risk controls must include those identified in legislation, Australian Standards, Codes of Practice etc. **3.** The risk assessment has been reviewed and approved by the Supervisor. **4.** A Safe Working Procedure or Work Method Statement has been prepared. The supervisor must review and document the effectiveness of the implemented risk controls.
Moderate	**This is an unacceptable risk level** The proposed activity can only proceed, provided that: **1.** The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. **2.** The risk assessment has been reviewed and approved by the Supervisor. **3.** A Safe Working Procedure or Work Method Statement has been prepared.
Low	The proposed task or process needs to be managed by documented routine procedures, which must include application of the hierarchy of controls.

The action you take will depend on:



1.3.4 Control Hazards to Reduce Risks

The best way to control hazards is to use the Hierarchy of Hazard Control. The hierarchy of hazard control is a range of options that can eliminate, or reduce the risk level.

You start at the top of the list and see if you can take away (eliminate) the hazard or danger.

If you can't take it away you move down the list to see if you can swap it for something safer (substitution).

Keep working through the list until you find something (or a combination of things) that controls that hazard or danger.

This table shows you the 6 different types of controls in order from best to worst:

Hierarchy Level	Action
1. Elimination	Completely remove the hazard. This is the best kind of hazard control.
2. Substitution	Swap a dangerous work method or situation for one that is less dangerous.
3. Isolation	Isolate or restrict access to the hazard.
4. Engineering Controls	Use equipment to lower the risk level.
5. Administrative Controls	Site rules and policies attempt to control a hazard.
6. Personal Protective Equipment	The least effective control. Use PPE while you carry out your work.

It is important to think about all of the options available when deciding on the best hazard controls. You may need to use more than 1 control measure to bring the risk level down to an acceptable level.

1.3.4.1 Apply Hazard Control Measures

Make sure you have implemented the required hazard control measures before you start any work.

Talk to the other workers in the area to make sure they are aware of the work you are doing, and the control measures you have put in place.

Control measures could include:

- Disconnecting power when working near power lines or overhead services.
- Putting safety tags on electrical switches or isolators to stop somebody from turning the power back on while you are working on or near power lines.
- Insulating power lines.
- Using a safety observer (also known as a spotter) inside the exclusion zone to make sure you don't get too close to power lines.
- Setting up barricades and traffic control to keep the area clear.
- Placing pedestrian controls (barricades, signs, etc.) to limit the number of people in the area.
- Moving any obstructions out of the way.
- Wearing personal protective equipment such as high-visibility clothing and non-slip work boots.
- Setting up additional lighting in the work area.

Check the situation after you have applied a control measure to see if more controls, or different controls are needed to make the job safe. If more controls are needed, make sure they are applied before you start or continue the work.

1.3.4.2 Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) is clothing and equipment designed to lower the chance of you being hurt on the job. It is required to enter most work sites.

You should select and inspect your PPE at the planning stage of your work.

PPE includes:

- **Head protection** – hard hats and helmets.
- **Foot protection** – non-slip work boots.
- **Hand protection** – gloves.
- **Eye protection** – goggles, visors or glasses.
- **Ear protection** – plugs or muffs.
- **Breathing protection** – masks or respirators.
- **Hi-visibility clothing** – clothing that makes you stand out and lets other people know where you are.
- **Weather protection** – clothing that protects you from the sun or from the cold.

Make sure any PPE you are wearing is in good condition, fits well and is right for the job.

If you find any PPE that is not in good condition, tag it and remove it from service. Then tell your supervisor about the problem and they will organise to repair or replace the PPE.

1.3.4.3 Control Strategies for Operating at Night or in Dark Areas

If you are using the crane at night or in dark areas, additional, adequate and sufficient lighting needs to be used across the entire work area.

This is to make sure you and other workers can see properly and work safely.

1.3.4.4 Task-Specific Control Strategies

Some examples of the risks/hazards associated with vehicle loading crane operations, and their possible controls, include:

Situation:
Retracting/folding a boom (or boom section).

Hazard:
Someone being trapped or crushed by the boom. Someone being hit by the boom.

Controls:

- Exclusion zones.
- Staying outside the operational area of the crane.

Situation:
People or objects within the operating radius of the crane.

Hazard:
Someone being hit or crushed by the crane or load when it is moved.

Controls:

- Exclusion zones.
- Staying outside the operational area of the crane.

Situation:
Working near pedestrians, workers, other mobile plant or vehicles.

Hazard:
Hitting or crushing a person or vehicle with the crane or load.

Controls:

- Pedestrian and/or vehicle exclusion zones.
- Traffic control (e.g. a flag person).
- Warning signs.
- Protective barriers.
- Flashing hazards lights.
- Gantries.
- Hoardings.
- Scaffolding.

1.3.5 Report All Actions

It is important that you report the details of all identified hazards and all action taken to your supervisor.

Complete any forms required by site policies and procedures.

Speak with anybody who is affected by the actions you have taken to make sure they are aware of them, and know if they need to do anything differently.

1.4 Workplace Communications

As a crane operator you need to be able to communicate effectively with those around you while you work. This may include personnel such as doggers and riggers.

Select the appropriate workplace communications methods while planning and preparing for crane operations.

Communication methods may take the form of:

- Verbal (spoken) communication.
- Written communication or instructions.
- Signs and symbols.
- Hand signals.
- Whistle, bell or buzzer signals.
- Use of communication equipment such as fixed channel two-way radio.
- Listening carefully and asking questions to check understanding, and appropriate worksite protocols (rules).

Choosing the most appropriate communication method for the job will depend on the specific circumstances you may encounter during operations.

For instance, if the crane operator is always in view of the person dogging the load, then hand signals would be an effective communication method.

If, however, the load is in sight of the dogger and not always going to be in sight of the crane operator, then whistle signals could be used.

Fixed channel two-way radios can be used when they are going to prove more effective than other methods. They are useful when the operator is out of view of the load and whistle signals could not be heard or could be confused with other signals when other cranes are operating in the area.

Good verbal communication with the dogger is essential when planning the move.

2.1 Assess the Load

Part of putting together a job plan includes assessing the load itself. Different types of loads will have different requirements for safe lifting.

The person who is responsible for establishing the weight of the load is either someone with a vehicle loading crane operator high risk work licence, or a dogging high risk work licence.

The operator can estimate the weight of the load, or, if working with a dogman the crane operator needs to communicate with the person slinging the load (the dogger) and give them appropriate information such as the capacity of the crane.

By identifying the weight of the load you will be able to properly assess whether or not the crane will be able to shift the load and the limitations of operation for the crane.

It is extremely dangerous to attempt to lift a load of unknown weight. You could cause structural damage to the crane and damage to the lifting gear and load.

Methods for determining the weight of a load include:

- On the delivery docket/consignment note or on a weighbridge certificate – Check with the driver who delivers the load.
- Checking the load itself – the weight may be marked on the load or the packaging it arrives in.
- Weighing the load.
- Estimating the weight of the load through appropriate calculations.

2.1.1 Common Load Weights

The table below lists the weights of common loads:

Material	Weight per Cubic Metre	Material	Weight per Cubic Metre	Material	Weight per Cubic Metre
Aluminium	2.7t	**Concrete/Cement**	2.4t	**Lead**	11.2t
Bricks	4.0t	**Copper**	9.0t	**Mild Steel**	7.85t
Bronze	8.5t	**Earth**	1.9t	**Poly Pipe**	1.1t
Cast Iron	7.2t	**Granite**	2.6t	**Timber** (hardwood)	1.1t
Cement	1.0 per 25 bags	**Gypsum**	2.3t	**Timber** (soft)	0.6t
Clay	1.9t	**Iron, ore**	5.4t	**Water**	1.0t
Coal	864kg				

2.1.2 Lifting Points

Some loads have specially designed lifting points (e.g. lifting lugs). These points should be clearly marked on the load. Consult with associated personnel such as doggers or riggers when identifying lifting points.

You will need to make a visual inspection of lifting points to make sure that they are safe to use. This may include:

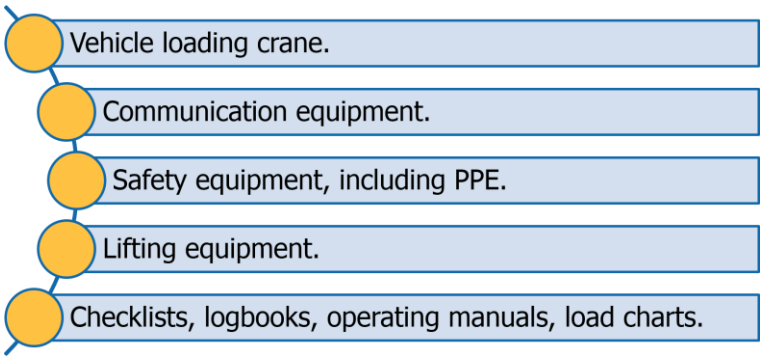
- Checking that there are no defects or damage such as stretching, splitting, rusting, cracking or twisting of the lugs or splitting or cracking of welds.
- Checking that the rated capacity is stamped on them. Make sure the rated capacity is legible and is sufficient for your lifting needs.
- The lifting lugs are correctly positioned in relation to the centre of gravity of the load.

Suitable lifting points need to be identified before slinging of the load occurs.

2.2 Choose the Right Equipment for the Job

Select the equipment you will need for your specific work tasks while making your work plan.

Equipment may include:



2.2.1 Choosing and Inspecting Lifting Equipment

It is important that you choose the correct lifting equipment before undertaking any crane operations.

Lifting equipment could include:

- Flexible Steel Wire Rope (FSWR).
- Chains.
- Synthetic slings.
- Eyebolts.
- Shackles.

The lifting equipment that you choose should be inspected before each use.

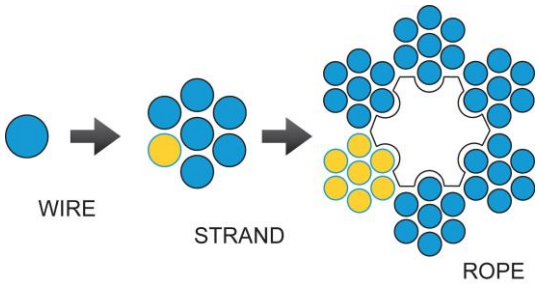
In some cases the vehicle loading crane operator is responsible for inspecting the lifting equipment associated with the crane they are using.

While you may not be authorised to inspect lifting equipment, it is still important that you can identify faults, especially in situations where there is a standard procedure for what sling to use for specific loads and a dogger is not required.

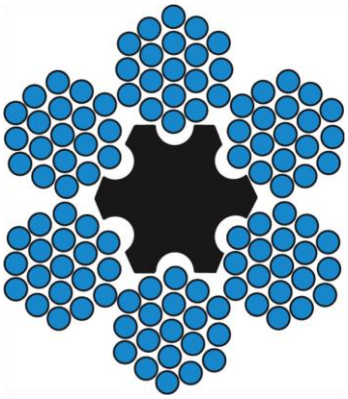
Lifting equipment must be inspected before and after each use, and in line with any other manufacturer's recommendations.

2.2.1.1 Flexible Steel Wire Rope

Flexible Steel Wire Rope (FSWR) is constructed of wires and strands laid around a central core.



In the example below there are 19 wires to the strand and 6 strands around the core making up the rope.



This table shows the faults and defects that will render the FSWR unusable:

Possible FSWR defects include:	
Bird-caging (strands loosened from proper tight lay).	Stretched or overloaded FSWR.
Kinking or fractures from bending or reeving.	Damage to the: ◆ Splice; ◆ Ferrule; ◆ Eye; or ◆ Thimble.
More than 10% wear in the rope diameter.	
Crushed/damaged strands.	
Abrasion/wear.	
High stranding.	
High temperature exposure.	Severe/serious corrosion (indicated by loose/springy wires).
Core collapse.	Knotted FSWR.
Excessive number of broken wires. (Not to exceed 10% of the total number of wires in the FSWR over a distance of not more than one rope lay – where one rope lay is approximately 8 x the diameter of the FSWR). E.g. 10mm diameter 6/19 FSWR: 6 x 19 = 114 Wires. 114 ÷ 10 = 11.4 = 11. 11 Broken wires over a distance of 8 x 10mm = 80mm.	

2.2.1.2 Chain and Chain Slings

Chain slings should be made up to AS 3775 *Chain slings – Grade T* or the manufacturer's recommendations.

The faults and defects that will render chains unusable are shown below:

Possible chain defects include:	
Missing grade markings or unknown grade.	Stretching, locked, movement restricted.
Cracks in link welds, spot-welding.	Gouged, cut or crushed more than 10% of original link diameter.
Exposure to excessive heat.	
Pitting.	Excessive wear on chain (10% or more wear in link diameter).
Twists and/or kinks and/or knots.	
Severe/excessive rust or corrosion.	

2.2.1.3 Synthetic Slings

Flat webbing and round synthetic slings are used for lifting where it is necessary to protect the load from damage and for protection from electrical hazards.

They are made from nylon, polyester, polypropylene or aramid polyamide. Each sling must be labelled with the rated capacity.

This table shows the faults and defects that will render synthetic slings unusable:

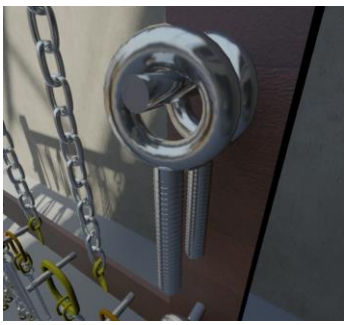
Possible sling defects include:	
Missing, illegible, destroyed or damaged tag.	Damage from temperature or sunlight exposure.
Excessive internal or external wear, burns or abrasions.	Damage from chemical exposure: ◆ Nylon slings contacting acids or alkalines. ◆ Polyester slings contacting organic solvents (paint, coal tar etc.).
Stretched/damaged sleeve.	
Cuts, tears or contusions.	
Damage to stitching.	Damage to eyes, terminal attachments or end fittings.

2.2.1.4 Eyebolts

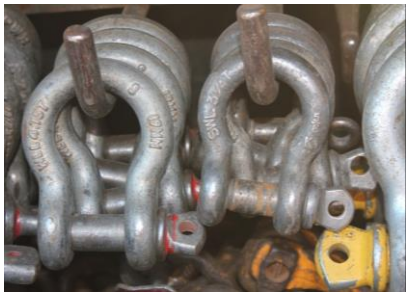
Eyebolts are used extensively as lifting lugs on set pieces of equipment.

Uncollared eyebolts should only be used with straight lifts. If the sling is set at an angle to the uncollared eyebolt, the sideways pull on the eyebolt could cause it to fail.

Only collared eyebolts should be used where the pull is inclined from the vertical.



2.2.1.5 Shackles



Shackles are portable links, used for joining various pieces of lifting equipment. Most are made of round bar and have circular eyes.

The two main shapes for load lifting are the 'D' and 'bow' shackle. A bow shackle is used to support multiple slings. When using multiple slings, always use a bow shackle large enough to accommodate all of the eyes safely on the bow. The pin of the shackle should rest on the hook.

Shackles must have their rated capacity stamped on them. It should be found on the shackle itself – not on the pin.

Check shackles for the following faults and defects, any of which will render them unusable:

Possible sling defects include:	
Missing or illegible rated capacity marks.	Bent or warped.
Stretched, wrong or defective pin.	Cracks and chips.
Pin won't screw in and/or missing retaining pin.	10% or more wear.

2.2.2 Choosing the Right Crane

Part of planning the job is to check that the vehicle loading crane will be able to shift the load safely. This means you need to check the capability and limitations of the crane.

When choosing the right crane or cranes for the job it is important to take into account:

- Environmental conditions you are going to work under, including weather and ground conditions.
- Size of work access points.
- Number and frequency of lifts.
- Weights and dimensions of loads.
- Maximum height and radius of lifts.
- Procedure for the movement of loads.

Refer to the manufacturer's specifications, crane chart and range diagrams to see if the crane is appropriate for the job. You will be able to use this information to configure the crane for operation.

2.3 Check the Crane and Equipment

Before using a vehicle loading crane or any other item of equipment you will need to check that it is in safe working order and is suitable for the task.

The crane operator has the responsibility for inspecting the crane itself.

Routine checks include:

- Pre-start checks (checks done before the crane is started up).
- Operational checks (checks made after the crane is started up).

An example of an Inspection Checklist can be found in Appendix A

If you find an 'Out of Service' tag attached to the crane or an item of equipment while carrying out an inspection then you must leave it in place.

Do not remove the tag or use the crane or equipment (unless you have been authorised to remove the tag).

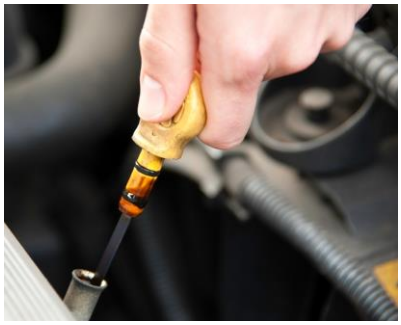
The only people that can remove the tag is the person who put it there **or** someone authorised to remove it in line with workplace safety procedures.

2.3.1 Pre-Start Checks

Routine pre-start checks (or pre-operational checks) should be carried out according to procedures including:

- The manufacturer's guidelines – these may include a range of instructions and specifications, including the operator's manual or appropriate checklists.
- Industry operating procedures.
- Workplace procedures, instructions, operating procedures and checklists.

Routine pre-start checks of the crane include:



- Visually checking the motor.
- All fluid levels including:
  - Oil (e.g. motor, hydraulic, gearbox).
  - Fuel.
  - Battery water level.
  - Radiator water/coolant level.
  - Lubrication (grease).

- No evidence of fluid/oil/water leaks, particularly under the crane/vehicle.
- Jib.
- Outriggers or stabilisers and packing.
- Tyres are safe and legal (where applicable).
- Tyres are at the correct pressure and in good condition.
- All wire ropes, anchorages and wedge sockets.

- Winch drum and rope drums (where applicable).
- Hydraulic hoses for damage or leaks.
- Boom extension.
- Lifting hooks.
- Communications system.
- Signs of damage to the structure, including:
  - The crane.
  - The boom/jib.

- Crane security or attachment to the truck.
- Check that there are no safety tags on the crane.
- Signage and labels (or notices) are present, correct and legible. This includes:
  - Rated capacity.
  - Manufacturer's data plate and labels.
  - Load charts.
  - Crane decals
  - Control labels.

- The logbook is present, current and checked for maintenance records and defects.
- Load charts are present and appropriate to the crane.

It is important that all signs, labels and notices, and the logbook and load chart are present, readable and correct because the information in these will inform you of the crane's capacity and capabilities.

2.3.1.1 Lifting Hook

Inspect the lifting hook for damage or excessive wear. Defects that would render a lifting hook unusable include:

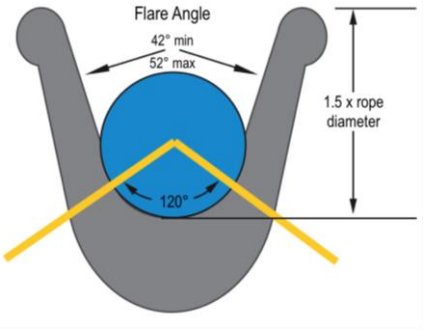
Possible hook defects include:	
Cuts or gouges more than 10% wear.	Exposure to excessive heat.
Bill stretched more than 5%.	Safety latch that is damaged or missing.
Cracks or twisting of the hook.	Visible damage to the hook swivel.
Rated capacity mark/stamp missing from the hook.	

2.3.1.2 Sheaves

Sheaves lead the rope over the head of cranes and hoists and are used in pulley systems to gain a mechanical advantage.

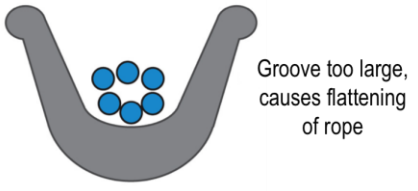
Make sure that the FSWR sits neatly in the base of the sheave groove. The amount of FSWR sitting in the groove should be either one third (1/3), 120° or as per the manufacturer's specifications.

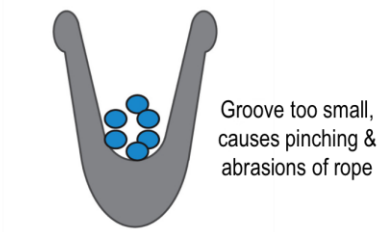
The groove depth of a sheave should not be less than 1.5 times the diameter of the FSWR (or in accordance with the manufacturer's specifications).



Correct Groove

If the grooves are too large then the rope will be flattened and deformed. If the grooves are too small the rope will be pinched and abraded. Any damage to the FSWR may lead to its failure.





Check sheaves for the following faults and defects, any of which will render a sheave unusable:

Possible sheave defects include:	
Sheave is twisted or deformed out of shape.	Worn sheave or hinge pins.
Excessive wear in the groove.	Damage to the cheek plates or the cheek plate wall/ partition is too far or too close from the sheave.
Damage (e.g. cracks) in the flange.	

2.3.1.3 Drums

The drum is the pulling mechanism that rotates, hauls in and stores surplus wire. The braking mechanism is connected to either the drum or the gearing. The drum or gearing is joined to the drive mechanism.

Drums are measured from the centre to the inside of the flange. A drum that measures 1m from flange to flange is therefore a 0.5m drum.

The rope should lie neatly on the drum and not be bunched up. When the hook block is at its lowest possible point, there should still be a minimum of 2 full turns on the drum (or as per the manufacturer's specifications).

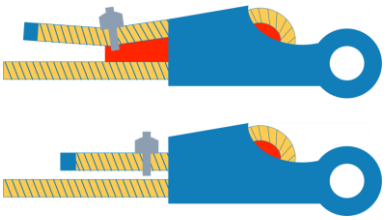
When the drum has been wound to its maximum turns the flange must still extend 2 rope diameters above the outer layer of the rope.

The rope must be anchored to the drum with a fixed mechanical anchorage such as a socket and wedge or a clamp and bolts. Be aware of the danger of not properly tightening an anchorage. Do not rely on the frictional grip relayed by the 2 turns on the drum.

2.3.1.4 Wedge Sockets

A wedge socket is used to securely hold the tail of a hoist wire rope. A minimum of 200mm of tail on the dead end of the rope should project from the wedge socket.

A bulldog clamp or wire rope clamp should be applied to the tail of the rope below the socket.



2.3.1.5 Boom Checks

The boom must be checked to ensure there are no defects that would make the crane unsafe to use.

Possible boom defects include:	
Cracks – particularly in the boom, superstructure or welds.	Loose bolts.
Bends or twists in the boom or superstructure.	Oil leaks.
Flaking paint.	Rust from joints or welds.

2.3.2 Locate and Identify Crane Controls

Before starting up the vehicle loading crane and carrying out operational checks, it is important that you are familiar with the location of various controls and their functions.

Controls may include:

- Luffing levers.
- Knuckling levers.
- Hoisting and lowering levers.
- Slewing levers (including brake).
- Boom extension levers (where fitted).
- Throttle control.
- Hand brakes.
- Slew brake lock (where fitted).

Make sure all control labels are present and legible.

2.3.3 Check the Crane Logbook

The crane logbook is used to record information on crane operation, servicing and repairs, daily safety checks and the reporting and rectification of defects.

The crane logbook may also be called the:

- Service logbook.
- Logbook.
- Service book.
- History record.

All defects must be recorded in the crane logbook and according to site procedures. Records should also include any action taken to return the crane to service.

Do not start up the crane if previously reported defects have not been fixed.

The crane logbook is also useful for checking that crane operators across numerous shifts are conducting the correct routine checks in accordance with procedures.

Make sure the logbook is applicable to the vehicle loading crane you are operating. The crane owner should also be listed in the logbook.

2.3.4 Start the Crane

Start the crane according to the manufacturer's start-up procedure.

If you hear any abnormal noises after you have started up the crane, you will need to:

1. Stop.
2. Shut down the crane.
3. Assess the problem/situation – determine if the problem can be fixed immediately.
4. Tag out the crane if the problem cannot be fixed.
5. Report the problem to the appropriate person.
6. Fill out the logbook.
7. **Do not** use the crane until the problem has been fixed.

If the abnormal noise is heard during a lift make sure you lower the load before shutting down the crane.

2.3.5 Check and Test Crane Safety Devices

Check and test all safety devices on the vehicle loading crane including:

- Horns and sirens.
- Audible and visual devices.
- Lights.
- Anti-upset devices (e.g. load sensors).
- Anti-collision devices (e.g. warning lights/alarms).
- Crane hook safety latches.
- Two-block/double block system.

The load mass indicator should be calibrated every six months (or in accordance with the manufacturer's specifications). You can test the accuracy of the load mass indicator by selecting a load that you already know the weight of, lifting it and testing the result on the indicator against the known weight of the load.

2.3.6 Conduct Operational Checks

Make sure you have plenty of room to test out the crane before starting it up. Operational (or post-start) checks are made after the crane is turned on.

It is important that all of the controls are tested to their full range of movement to be sure that the crane is safe and functioning correctly.

Operational checks include:

- Testing all crane movements and controls to the full extent of their capacity. This will ensure that the crane is working correctly and is safe to use. Movements and controls to test include:
  - Boom.
  - Luff.
  - Hoist.
  - Slew.
  - Raise and lower.
- Entering data into the crane's computer (if applicable) and making sure it is accurate.
- Throttle control.
- Brakes are working correctly.
- The slew brake lock is working.
- Checking you have a clear view.
- Gauges are functioning correctly.
- The outriggers/stabilisers are extended and functioning properly, with correct packing.
- Two-block/double block system/limit and limit switches.
- Crane safety devices including:
  - Audible and visual warning systems.
  - Lights and devices.
  - The horn or sirens.
- Communication equipment and systems.
- The maximum radius and load radius indicator.

2.3.7 Check Communication Equipment

Communication equipment used in vehicle loading crane operations may include whistles, bells, buzzers or fixed channel two-way radios.

Inspect all communication equipment before starting the task to make sure that it is working correctly and that effective communication can be established and maintained at all times.

Where radio communication equipment is used, the transmitting frequencies must be selected to prevent interference to or from other radio equipment being used in the vicinity of the crane.

2.3.8 Report and Record Equipment Faults

If you find any faults or defects in the crane or your equipment, or the vehicle loading crane cannot function to the full range of its movements, you must:

1. Tag out the crane or the equipment to isolate it from use.
2. Record the fault in the crane logbook.
3. Report the fault to an authorised person following site procedures and requirements.

If you find any fault with an item of lifting equipment it must be tagged out and reported.

Report any evidence of tampering or interference with the crane to your supervisor or other responsible person.

Do not use the crane or equipment until it has been fixed and returned to service.

2.4 Check Ground Conditions

Before driving the crane to the work area and setting it up you will need to make sure the ground is firm, level and safe and that it will support the weight of the crane and load.

The ground should be checked by a competent person such as an engineer before setting up the crane so that the bearing pressure value of the soil can be determined.

The crane could become unstable during operation if the ground is rough, uneven or soft.

Do not set up a crane on back-filled trenches. The fill may not have compacted completely and this is dangerous to set the crane up on.

Check to make sure there are no underground services running through the area where you plan to set up the crane. The pressure of the equipment could cause damage to the underground services, pipes or cables.

You may need to use plates or packing under the outriggers to make sure the crane remains stable on soft ground.

When setting the crane up on a concrete slab an engineer's report is required to confirm that the concrete slab can support the weight of a crane.

Other ground conditions that you may encounter when setting up a crane include soft soil, hard compacted soil, rock, bitumen and concrete.

2.5 Drive the Crane to the Work Area

Follow all manufacturer's specifications, procedures and relevant motor vehicle road legislation when driving the crane to the work area. A HRW licence to operate a vehicle loading crane **does not** licence you to drive on public roads, thoroughfares or to the work area.

Maintain safe speeds and watch out for pedestrians and other vehicular traffic on site. Turn on warning lights to warn others of your approach.

2.5.1 Position the Crane for Work

Once you have arrived at the work area you will need to correctly position the crane for work operations.

Make sure the crane is placed so that all tasks can be carried out safely and effectively.

Establish the safe working radius of the crane and make sure there are adequate clearances from hazards and structures (e.g. overhead power lines or buildings).

Make sure the crane is level before starting any operations. This will help to keep the crane safe and stable while work tasks are carried out. Use a bubble level indicator, provided on the crane, to make sure the crane is level when setting up.

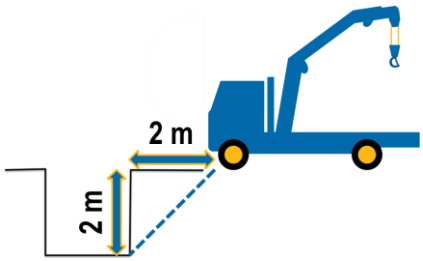
Make sure you take into account the specific issues related to a particular work area.

Setting Up Close to Buildings
If you were working near a building there are number of actions and things to consider:

- If possible, set up the boom so that it articulates/slews away from the building.
- Determine if protection for the building will be required. For example, fitting screens to easily damaged areas (e.g. windows).
- Pay close attention to the effect of wind on loads, as wind speeds tend to increase around buildings.
- Take extra care of back-filled trenches placed close to the building.
- The crane configuration may be affected. Check the load chart for the appropriate configuration that allows for the placement of the outriggers/stabilisers.
- Access and egress may be difficult and require extra planning or directions when moving.
- The foundations of the building or underground services may affect set-up and operations.

Setting Up Close to Trenches/Excavations
Do not set up the outriggers/stabilisers and packing close to an excavation. The pressure of the crane could cause a collapse of the excavation wall.

The distance to safely set up a crane near a trench or excavation will depend on the soil conditions. However, the general rule is to position the packing at a distance that is the same as the depth of the excavation or trench. For example, if a trench is 2 metres deep you would position the packing 2 metres away.



Setting Up in a Restricted Space
When setting up a crane in a restricted space it is important to think about:

- Adequate access for the crane to enter, operate and exit the work area.
- Manufacturer's specifications can be followed while operating the crane.
- There are no personnel or obstructions in the work area.
- Outriggers/stabilisers are able to be fully extended.
- Safe slewing of the boom without striking any surrounding structures.
- The possible need to use a dogman or spotter.
- Adequate access for the load to be slung and landed safely.

Engage the power take off (PTO) according to the manufacturer's specifications (if applicable).

2.5.2 Deploying Outriggers/Stabilisers

Once the crane is in position you may need to deploy the outriggers. Outriggers (sometimes called stabilisers) are hinged or sliding beams that are used to keep the crane stable during operation.

Outriggers can be used with packing to help distribute the weight of the crane and load on softer ground.

The outriggers need to be fully extended to bring the tyres off the ground and make the crane level (in accordance with the manufacturer's specifications).

Never reset the outriggers while the crane is in use, as this can cause major instability.

If the outriggers or one or more wheels begin to sink during set-up you will need to stop operations and rectify the sinking.

You may need to add more packing under the stabilisers/outriggers or if this is not possible you will need to move the crane to a more suitable and stable position.

2.5.3 Installing Packing

Selecting the correct packing is important. There are different kinds and sizes of packing available including:

- Steel plates.
- Hardwood packing (pig-stying or cribbing).
- Matting.

Packing must cover as much area as possible to distribute the load. Make sure you determine the minimum area of packing under each outrigger to ensure that the crane and load remain stable at all times.

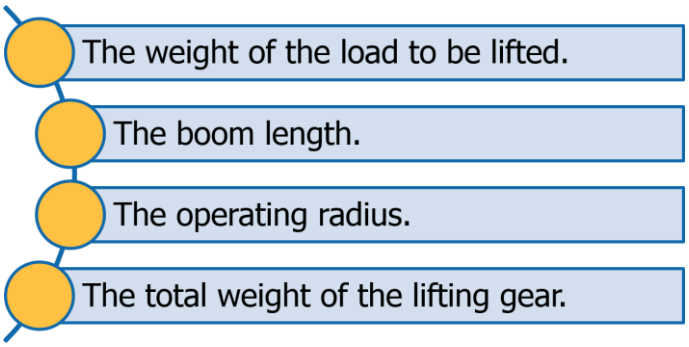
Hardwood packing should be arranged so that each layer is at a 90 degree angle to the one underneath.

2.6 Enter Data into the Crane Computer

Note: Not all cranes are fitted with a crane computer. Check the operator's manual for the crane you are using to see if it has a crane computer installed.

Boom/jib and configuration data should be entered into the crane's computer when the crane is being set up.

When setting up the crane all relevant details should be entered into the crane computer (where applicable). This may include:



Test that the crane computer is working by comparing the computer results with the crane load chart.

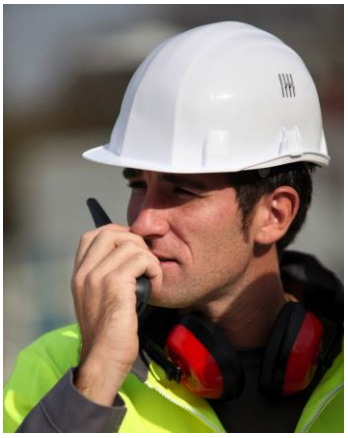
2.7 Apply Hazard Control Measures

Once the crane has been set up it is important to put any hazard control measures into place before you start shifting loads.

Hazard controls may include:

- Putting safety tags or locks on electrical switches and isolators.
- Insulating power lines.
- Using a safety observer to guide you if operating inside power line exclusion zones.
- Disconnecting power.
- Putting on personal protective equipment (PPE).
- Installing traffic barricades and controls.
- Setting up additional lighting.
- Setting up pedestrian and traffic controls.
- Using trench covers.
- Moving obstructions out of the way.

2.7.1 Test Communication Equipment

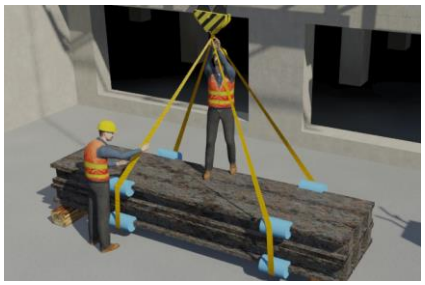


Before starting work you will need to make sure any communication equipment you are using is working properly on site.

Check the manufacturer's instructions to make sure the equipment is working correctly.

Check for radio interference and make sure you are not interfering with other workers on site who may also be using radios. Use a dedicated radio frequency to prevent interference with other equipment. Make sure batteries are fully charged and you have spare batteries in case they are needed.

2.8 Prepare Lifting Equipment



Once you have decided on the type of lifting gear you are going to use, you should assemble it as required. This may include attaching slings to lifting beams using shackles.

All lifting equipment should be used according to procedures including manufacturer's guidelines, safe operating procedures and workplace procedures.

Other licenced workers such as doggers or riggers would usually be responsible for assembling assemble the lifting gear.

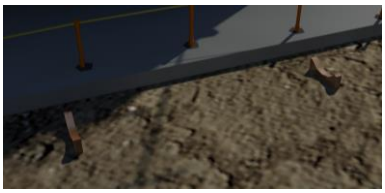
2.9 Prepare the Load Destination

Make sure that the load destination is tidy and ready to receive the load.

The load destination could be:

- A vehicle.
- The ground.
- Loading platforms.
- Suspended floors.

Check that the load will be supported by the load destination. You may need to set up blocks or chocks to keep the load stable once it is lowered and allow you to safely remove the lifting gear without it being damaged or crushed by the weight of the load.



3.1 Determine Crane Capacity

You will need to determine the characteristics and capabilities of the crane you are going to use so that it can be configured to suit the loads that are to be moved.

Information relating to the capabilities of a crane can be found:

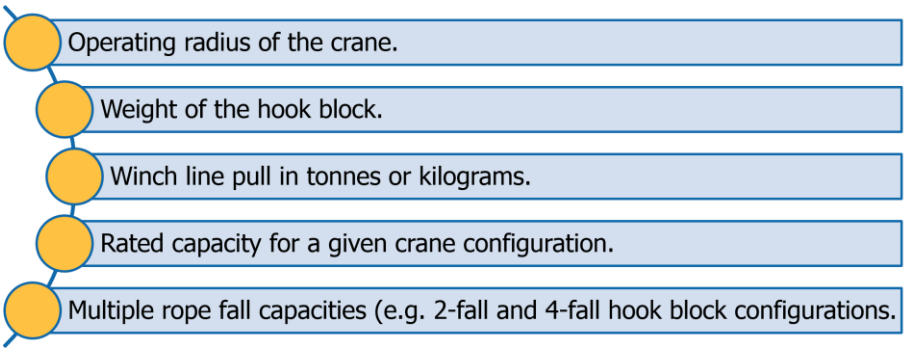
- In the appropriate load charts.
- In the manufacturer's specification.
- In the operator's manual.
- Labelled or marked on the crane itself.

The lifting capacity of a crane is limited by structural strength (when the operating radius is small) and stability (when the operating radius is large).

3.1.1 Load Charts

Load charts or crane charts contain details of the crane and the information you need to properly calculate the crane's capacity in any given configuration.

This information includes:

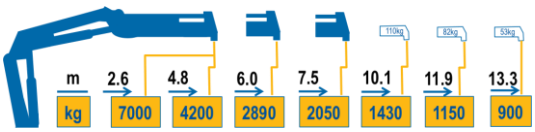


The operating radius is the distance at which the crane can safely lift a known weight.

Where a precise reading is not available on the load chart you must always use the higher operating radius. The increased operating radius decreases the load capacity.

Do not risk overloading the crane.

If the load chart is unreadable from age or wear you must not operate the crane. Have the load chart replaced before attempting to lift anything with the crane.



If a manual extension is being used you can work out the capacity using the load chart.

3.1.2 Factors that Affect the Amount a Crane Can Lift

One of the most important things you need to know in order to work out the crane's capacity is the operating radius. This is the distance of the hook from a known point on the crane at which a crane can operate safely with a known load. The operating radius changes depending on the angle of the boom.

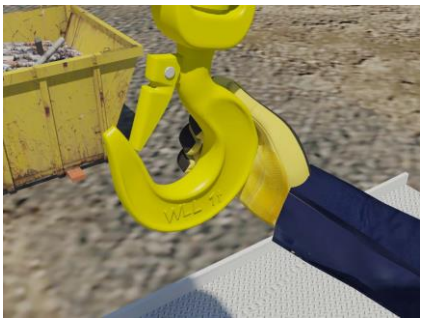
Boom/jib deflection should also be taken into account when determining the capacity of a crane. Boom/jib deflection is the slight bending of the boom/jib under the weight of the load. Boom/jib deflection can result in a slight increase in the operating radius, which reduces the amount of weight that can be lifted safely by the crane.

Luffing the boom up will decrease the operating radius, allowing the crane to safely lift more.

Before attempting to lift anything you need to calculate the amount of weight that the crane will be lifting. This includes:

- The weight of the hook block.
- The weight of any lifting gear including hook block, slings, spreader beams, kibbles and ladles.
- The weight of the load.

All of these items must be deducted from the rated capacity of the crane to determine the actual rated capacity of the crane at a particular radius.



It is important to take into account the forces and loads placed on the crane and the load when conducting operations. This may include:

- Dynamic forces (caused by the movements of the crane and load).
- Wind loads (result from the effect of wind on the crane and load).

Check that the crane hook has an adequate rated capacity for the loads that are to be lifted. You can find the rated capacity of a hook stamped or marked on the hook itself.

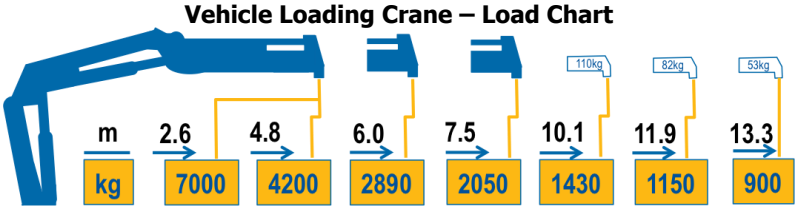
3.1.2.1 Crane Capacity Calculations

It is important that you are able to calculate the capacity of different crane configurations using information found in the load chart.

The following are examples of how to calculate the weight of a load and use the crane chart to work out if the load is within the capacity of the crane.

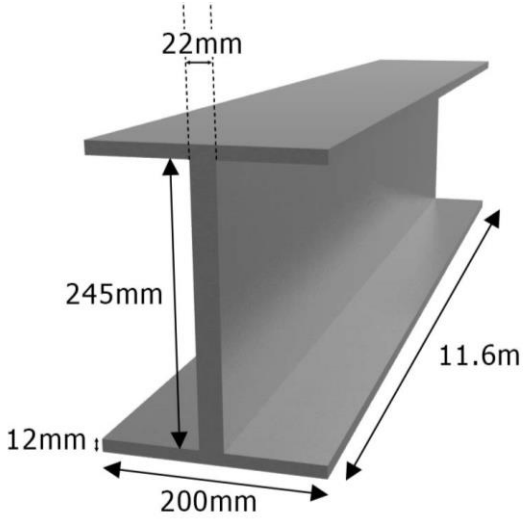
Each crane has a set of documents that outline its unique specifications. The image below is being used for these examples and should not be used for any other purpose.

Vehicle Loading Crane – Load Chart



Example 1 – Load Calculation – Single Beam

Work out the weight of a steel universal beam with the following dimensions to the nearest kilogram.



Concrete Tee Beam			
Top and bottom flanges		**Web**	
Length	11.6m	**Length**	11.6m
Width	200mm	**Width**	245mm
Depth	12mm	**Depth**	22mm

Note: Steel has an approximate weight of 7850 kg per cubic metre.

The first step in calculating the weight of the beam is to work out the volume of the beam.

The general rule for finding out the volume of an object is:

Length x Width x Depth

The steel beam has 3 main parts within it – the web and the two flanges. Each of these sections can have their volume calculated separately and then added together for a total volume.

Before beginning any calculations it helps to convert the inputs into the same units of measurement:

Concrete Tee Beam					
Top and bottom flanges			**Web**		
Length	11.6m	= 11.6m	**Length**	11.6m	= 11.6m
Width	200mm	= 0.2m	**Width**	245mm	= 0.245m
Depth	12mm	= 0.012m	**Depth**	22mm	= 0.022m

We can begin by working out the volume for both of the flanges (because they have the same dimensions):

Volume = L x W x D
= 11.6 x 0.2 x 0.012
= 0.028 m^3

Make sure that you multiply this answer by two because there are two sections that are this volume – both of the flanges:

0.028 m^3 x 2
= 0.056 m^3

Working out the volume of the web follows much the same process as above:

Volume = L x W x D
= 11.6 x 0.245 x 0.022
= 0.062 m^3

Now that we have worked out the volume for all the separate sections you add these together to find the total volume of the beam:

0.056 + 0.062 = 0.118 m^3

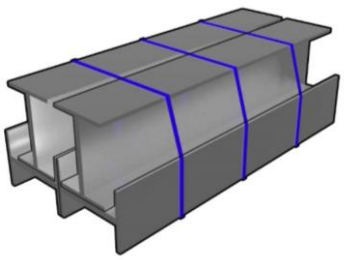
Now that we have the total volume of the beam you can use this to find the weight. Steel has an approximate weight of 7850 kg per cubic metre.

To find out the weight of the beam we simply multiply the volume of the beam by the approximate weight of steel per cubic metre:

0.118 x 7850 = 926.3 kg

Therefore:
The steel beam weighs 926.3 kg (or 0.926 tonne).

Example 2 – Load Calculation – 4 Beams



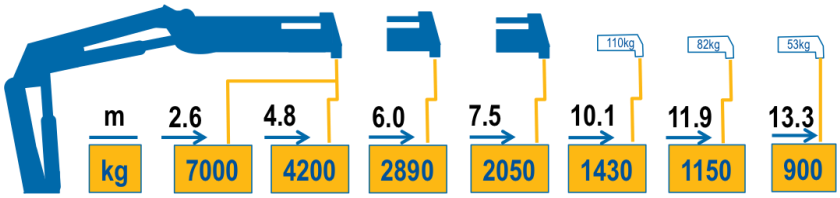
If there were 4 of these beams bundled together, what would the total weight of the load be?

To work this out we need to take the total weight of 1 beam and multiply it by 4:

926.3 kg x 4 = 3705.2 kg or 3.7 tonnes

Example 3 – Crane Capacity – 4 Beams

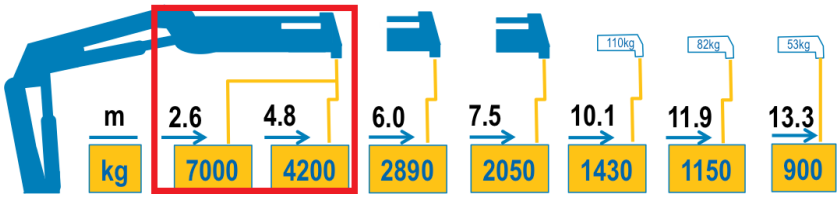
Using the load chart below you can work out the maximum boom length (while horizontal) that the vehicle loading crane could safely lift the bundle of steel beams from Example 2.



The total weight of the beams from Example 2 is 3705 kg. Using the crane chart shown we can see that that the crane cannot shift the load beyond 4.8m because the capacity is reduced to less than the weight of the load beyond that distance.

The red box outlines the configurations with rated capacities that are more than the weight of the load (3705 kg).

Therefore, the maximum boom length (while horizontal) that the vehicle loading crane could safely lift the bundle of beams from Example 2 is 4.8 m.



Example 4 – Load Calculation – Bin of Materials

The vehicle loading crane needs to shift a bin containing a range of scaffolding materials. The measurements and quantities are listed below:

- 12 x 2m Steel scaffold tube
- 18 x 3m Steel scaffold tube
- 21 x 1m Steel scaffold tube
- 1 x Box of scaffold parts labelled as 35kg
- 15 x Timber scaffold planks each weighing 16kg
- 1 x Bin weighing 375kg

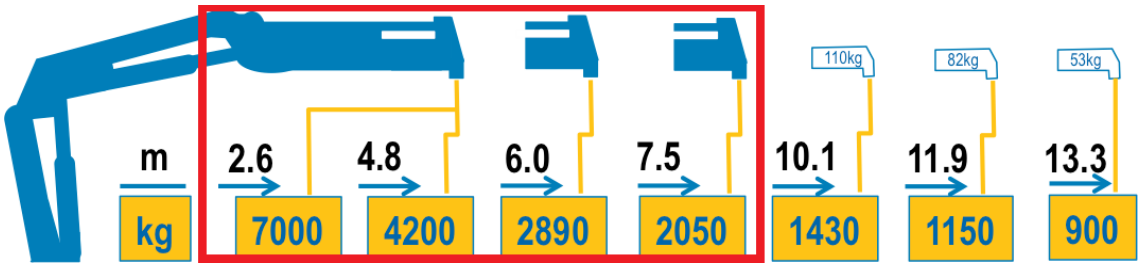
To work out the total weight of this load we need to calculate the weight of each of the items.

For the purpose of this example the steel scaffold tubes weigh 9kg per metre.

Item	Calculation
2m scaffold tubes	12 x 2 x 9 = 216kg
3m scaffold tubes	18 x 3 x 9 = 486kg
1m scaffold tubes	21 x 1 x 9 = 189kg
Box of scaffold parts	1 x 35 = 35kg
Timber scaffold planks	15 x 16 = 240kg
Bin	1 x 375 = 375kg
Total Weight	**216 + 486 + 189 + 35 + 240 + 375 = 1541kg or 1.54 tonnes**

Example 5 – Crane Capacity – Bin of Materials

Using the load from Example 4 and the crane chart shown here we can see that the maximum boom length (while horizontal) for this load is 7.5m.



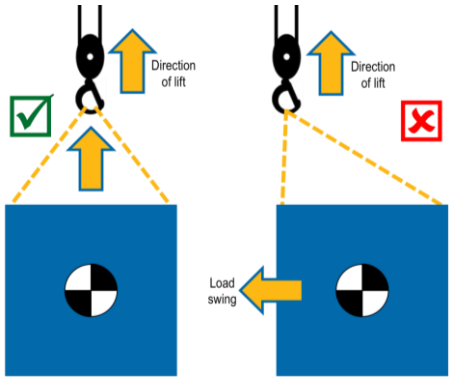
3.1.3 Review Work Plans and Information

Before starting any crane operations you will need to make sure that all necessary factors have been considered.

- What are the weights and sizes of the loads you need to move?
- Have you chosen a crane that has the appropriate capacity for lifting the loads?
- Is there adequate access to and egress from the areas you are working in or the routes you need to take?
- Have all potential hazards and obstructions been dealt with?
- Have you taken into consideration the working radius of the crane?
- Have you accounted for potential boom deflection when releasing a load?

When you are confident that all necessary factors have been considered and all potential problems dealt with you will be able to start operations.

3.2 Position the Crane Hook



The crane hook should be positioned above the centre of gravity of the load before lifting operations are commenced. This will help to keep the load from swinging when it is lifted or being dragged or snigged when it is moved.

Get the dogger or rigger to guide you to make sure the crane hook is positioned correctly above the load.

3.2.1 Attach and Secure Lifting Equipment

Once the hook is in position the load will need to be attached to the crane hook using the appropriate equipment and procedures. This may include using fixed lifting points (e.g. lifting lugs) fitted to the load or employing basic sling reeving techniques.

The crane operator can sling the load when:

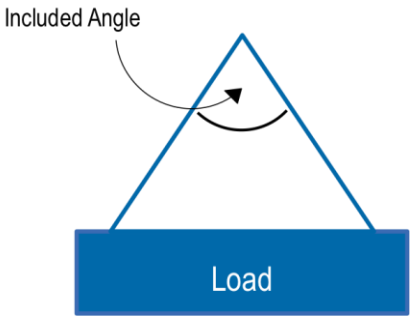
- The load being slung is a known weight.
- The load being slung is within the capacity of the vehicle loading crane.
- The lifting equipment being used has already been inspected by a competent person such as a dogger.

However, a licensed dogger is needed if the lift requires a decision-making process to be applied to the slinging techniques. A dogger is also needed to direct the crane operator if the load will go out of the operators sight.

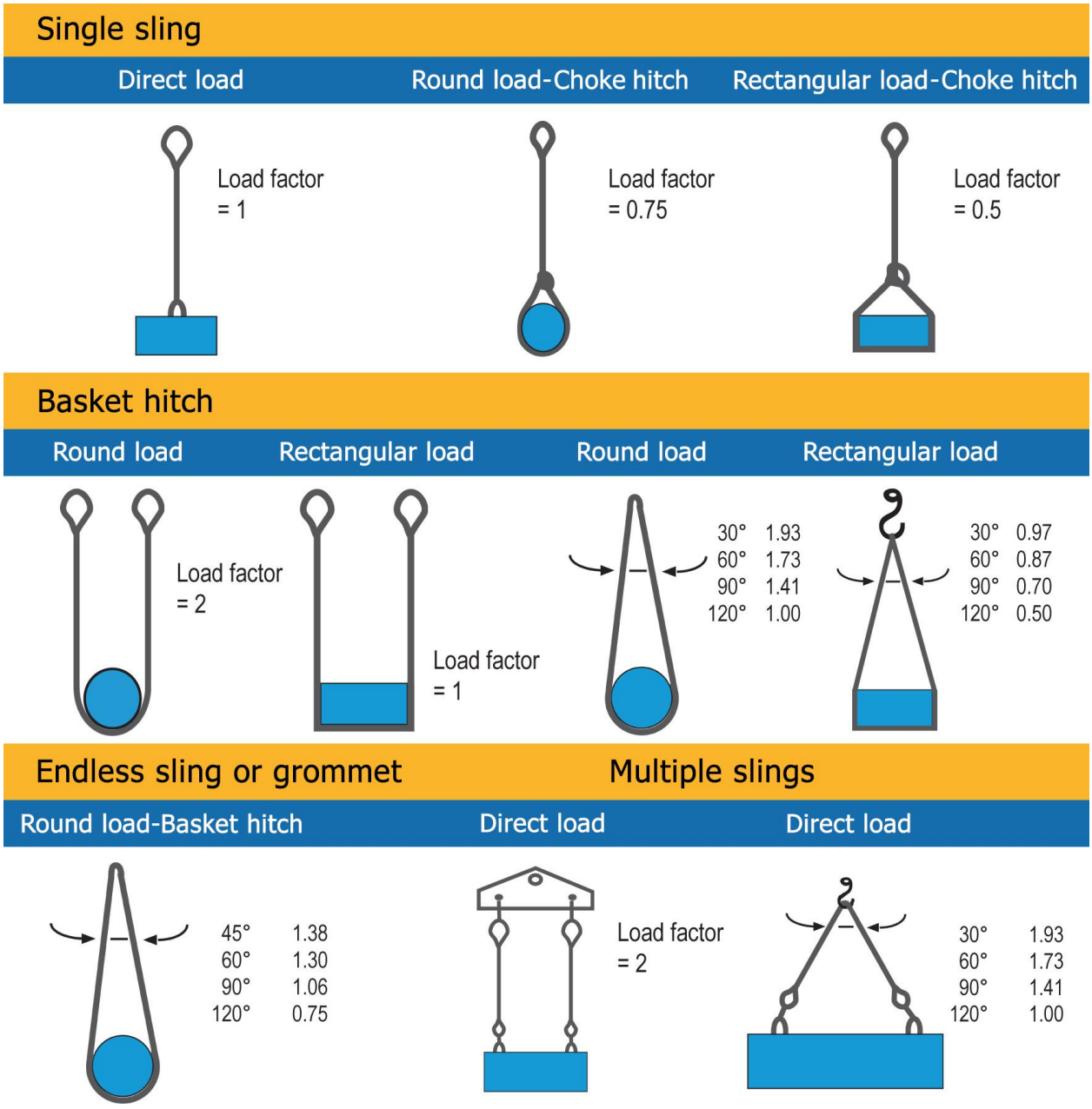
If, during slinging, a sling or other equipment appears to be faulty or have defects separate the item, tag it out and give the item to a competent person for inspection.

3.2.1.1 Load Factors and Slinging

The recommended maximum safe angle of a two legged reeved sling is 60 degrees. Different methods of slinging will also alter the lifting capacity.



Common slinging techniques and the relevant load factors are outlined here.

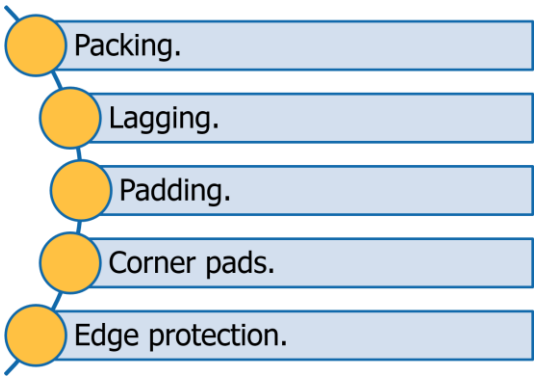


3.2.2 Protecting a Load

Packing and dunnage should be used when moving loads to:

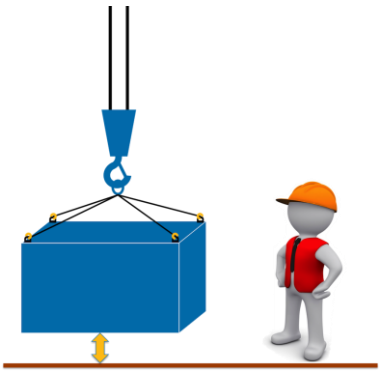
- Protect the load.
- Prevent damage to lifting equipment (e.g. from the sharp edges of the load).
- Allow lifting gear to be attached and removed safely.

To protect the load and lifting equipment you could use:



3.2.3 Conduct a Test Lift

Before moving the load it is important to conduct a test lift. This will ensure that the load remains stable and secure, the crane stays stable and that all crane functions are working correctly. A test lift also allows you to confirm the load weight.



A test lift is performed by raising the load slightly off the lifting plane (e.g. ground or truck). Associated personnel such as doggers and riggers will be able to determine if the load is slung correctly by the amount the load moves as it is lifted.

When conducting a test lift it is important to check that the sling method is correct, there are no obstructions or loose parts under the load and that the load isn't being dragged or snigged.

If there are any problems with the lift (e.g. the load is unstable or slung incorrectly) then you should lower the load immediately and make the necessary adjustments before conducting another test lift.

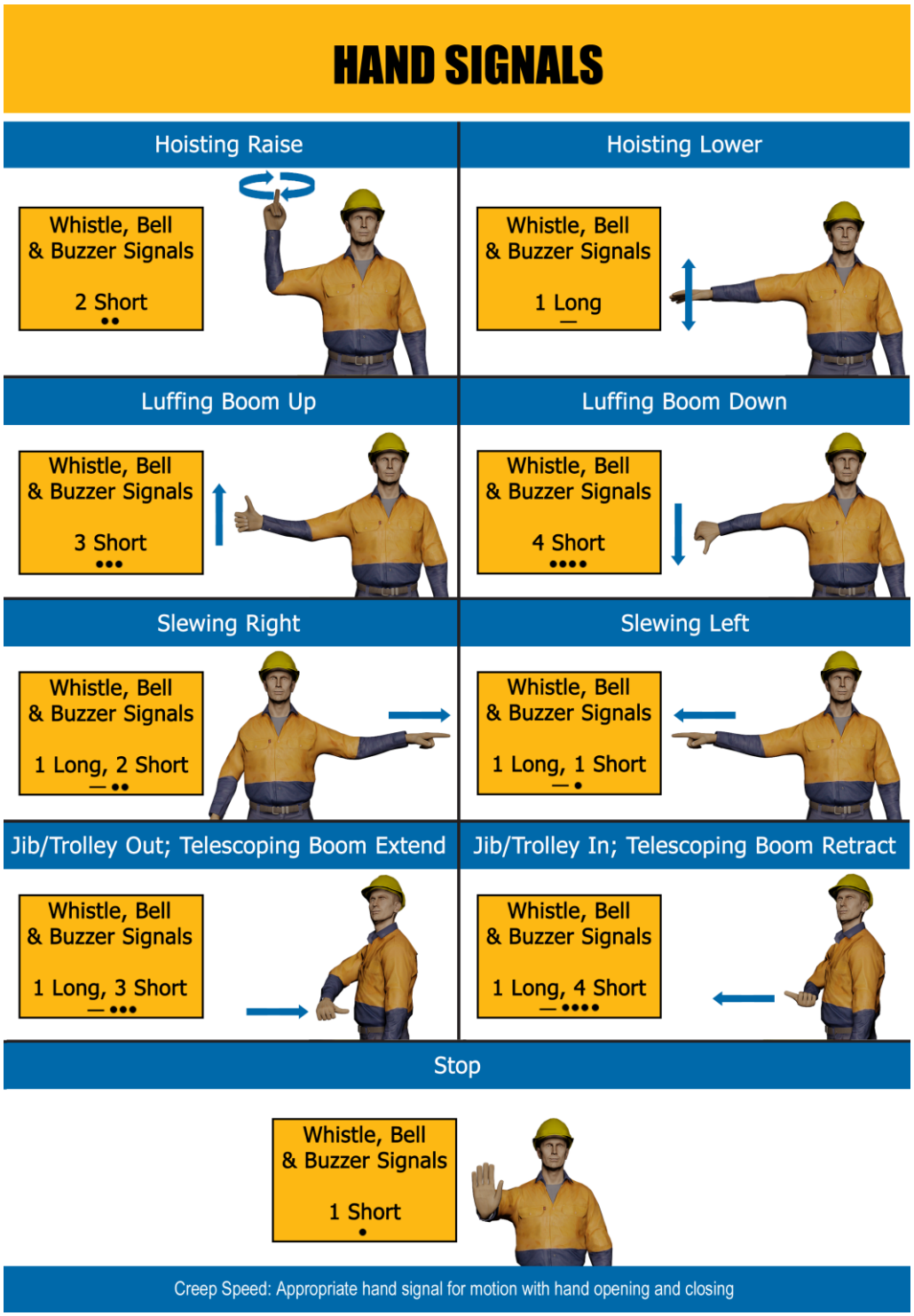
Test lifts can also be used to ensure that:

- Near capacity loads do not overload the crane.
- Loads of unusual shape or weight distribution are slung correctly.
- Load measuring equipment can be used to verify the calculated weight of the load.
- All crane equipment is functioning properly.
- Adjustments to the slinging can be made in a safe manner.

3.3 Follow Communication Signals

Always follow the directions given to you by the person dogging the load. They may use hand/whistle signals or two-way radios to direct you. If at any point you are unsure of the directions being given to you, stop all crane motions and confirm the instructions with the dogger/rigger.

Shown here are the hand and whistle signals used in Australia:



3.4 Operate the Crane

Once you are satisfied that the load is ready to be moved safely, begin the lift. If your view is obstructed, get a competent person to warn you of any hazards in the path of the load.

If new or unforeseen hazards appear while work is being carried out you will need to stop and control them before carrying on with your work.

Always operate the crane according to procedures. For example:

- Manufacturer's guidelines (instructions, crane charts /specifications, checklists).
- Industry operating procedures.
- Workplace procedures (work instructions, operating procedures, checklists).

Consult the crane's load charts and manufacturer's specifications to find information when deciding which side of a rubber-rated crane is the most stable to lift a load from.

Some vehicle loading cranes have controls on both sides of the vehicle. If you are moving a load with the boom extended, it is safest to use the controls on the side of the vehicle opposite to the load.

3.4.1 Crane Movements

Follow all appropriate procedures and standards when transferring loads.

Make sure all crane movements are controlled and smooth.

Quick or jerky movements may cause the load to swing, increasing the operating radius to a dangerous length resulting in carrier instability or structural damage to the crane.

Check the load chart to find out what effect slewing the boom from the front of the crane to the rear will have on the lifting capacity of the crane – it may vary greatly.

Always stay within the safe operating radius of the crane.

3.4.2 The Exclusion Zone

Vehicle loading cranes operate in a slightly different way to other mobile cranes.

On a vehicle loading crane the outer section of the boom (knuckle-boom types) is in an upside down position when secured for travel.

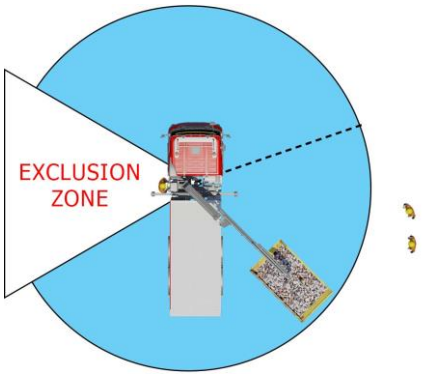
Because of this, the controls will result in different movements depending on the position of the boom sections.

When the outer boom is upside down the luff control levers will cause this part of the boom to move in the opposite direction to when it is in lifting mode.

Whenever using a vehicle loading crane you must make sure you do not allow the boom to luff or slew into the 'exclusion zone' – directly above the operator control station (or your head if operating the crane via remote).

Allowing the boom to move through the exclusion zone is extremely dangerous as you could be struck by the boom of the crane or by the load itself.

Any other workers in the area must be kept out of the way of the boom and load as well.



3.4.3 Double Blocking

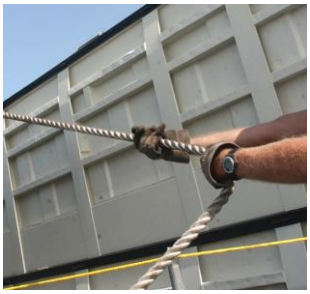
Double blocking, also known as two-blocking, occurs when the hook block jams into the head sheaves or the load suspended from the hook becomes jammed against the crane structure, preventing further winding up of the hoist drum.

A hoist limit or cut-out switch can be used to stop the winch or to warn the operator before the hook block makes contact with the head block. Ensure that the hoist limit/cut out switch is checked and fully functioning before operating the crane.

Double blocking can result in the following:

- Flexible Steel Wire Rope (FSWR) can break.
- Load can drop.
- Damage to the sheave.
- Structural damage to the crane.

3.4.4 Using Taglines



A dogger or rigger may use a tagline to control the rotation of the load while in motion.

It is necessary to use a tagline when working near overhead power lines, when light winds are causing the load to swing or rotate, or if there is a risk of a loss of control during the landing process.

Dry non-conductive rope, dry natural fibre rope or dry natural rope should be used as taglines to reduce any risk of conductivity.

Make sure the tagline is at least 16mm in diameter.

3.4.5 Monitoring Weather Conditions

Keep an eye on the weather conditions around the crane.

Be particularly aware of the effect of wind. The force of wind may cause the load to swing or spin around or damage the crane or cause it to lose stability.

Load swing/spin and uncontrolled slewing may cause the load to move beyond the crane's safe operating radius, causing instability or structural damage to the crane.

If wind speeds exceed the allowable limits for the crane you will need to lower the load and make the crane and load safe.

Check the manufacturer's specifications or the crane itself for information related to maximum allowable wind speeds/velocity for operations.

If a severe electrical storm is approaching, you should lower the load and pack up the crane. Do not operate the crane during an electrical storm.

If it begins to rain heavily and you have to stop operating the crane for a period of time, you must re-check the ground conditions before recommencing work. If the ground has become unsuitable you must move the crane to a new position.

3.4.6 Monitoring Load Movement

It is important to continually monitor the movement of the load to make sure the load remains safe, that no personnel are put in danger and that the crane remains stable.

You need to identify and control any hazards that may occur while moving a load.

Do not raise or lower the boom or load over workers or pedestrians. This would be extremely dangerous and could result in a serious injury or death.

Do not drag or snig the load as this may cause damage to the crane, the load or lifting equipment, or cause the crane to become overloaded or unstable.

3.5 Land the Load

It is important to minimise upwards boom/jib movement when releasing a heavy load from the crane hook. Slowly and smoothly release the load, lowering the boom/jib slightly to allow for any upward movement.

Land the load at the prepared load destination. The load destination should be prepared to ensure that the load can be made stable and secure from movement once it is landed. If the load is not secure or stable it could move, causing damage to the load or injury to workers.

Loads should be landed on blocks or packing (where necessary) to allow the safe removal of the lifting gear.

Round loads should be chocked, before the load is released, to prevent the load from rolling or shifting once the lifting gear is removed.

Do not continue to winch/luff down after landing the load or hook block. This can cause bird nesting, loose spooling of the winch wire or unsheaved rope in the sheaves.

No load should be allowed to remain suspended on the hook if the crane is going to be left unattended as this may cause winch and boom creep.

3.5.1 Remove Lifting Equipment

Remove or disconnect the lifting equipment from the load and/or lifting hook according to procedures.

Before removing lifting gear make sure you take the weight off the sling and implemented appropriate measures to prevent the crane from being operated.

Lifting equipment should be properly stored or prepared for the next task.

3.6 Unplanned and Unsafe Situations

Unplanned or unsafe situations can occur at any time while you are operating a vehicle loading crane. These may include:

- Failure/loss of control (e.g. brakes, steering).
- Failure of equipment (e.g. hydraulic system).
- Environmental conditions (e.g. wind, lightning, storms).

If an unsafe situation occurs whilst you are operating a crane you will need to:

1. Stop work immediately (if safe to do so).
2. Assess the problem.
3. Find a solution if possible/resolve the problem.
4. If needed, seek advice and assistance.
5. Report the incident according to procedures.

Keep a look out for warning lights, cut-outs and alarms during crane operations. They may indicate that a defect has occurred. If you observe these warning signs you will need to do the following:

1. **Stop.**
2. **Identify the problem.**
3. **Slowly lower the load, ensuring it is under control.**
4. **Tag out the crane.**
5. **Report the problem to the appropriate person.**
6. **Fill out the logbook.**
7. **Do not use the crane until the problem has been fixed.**

3.6.1 Defective Limiting Device

If you found a limiting device had been damaged or was not working correctly you would need to take the following steps:

1. Notify the dogman and anyone in the immediate area.
2. Stop the operation/task.
3. Lower the load (if applicable).
4. Shut down the crane.
5. Assess the problem/situation.
6. Tag out the crane.
7. Report the problem to the appropriate person.
8. Have the crane inspected to check for any damage caused.
9. Fill out the logbook.
10. **Do not** use the crane until the problem has been fixed.

3.6.2 Abnormal Noises and Movements

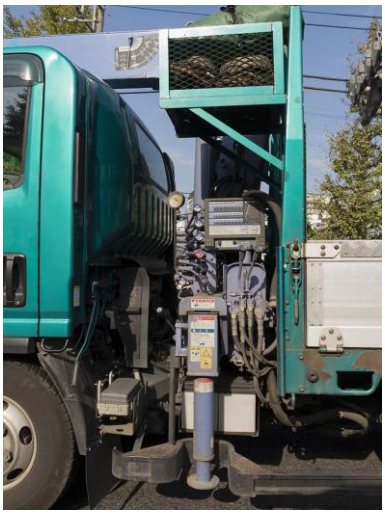
If at any time during the shifting of loads there is an abnormal movement of the boom or hoist, or any abnormal noises you should immediately:

1. Notify the dogman and anyone in the immediate area.
2. Stop the operation/task.
3. Lower the load (if applicable).
4. Shut down the crane.
5. Tag out the crane.
6. Report the problem to the appropriate person.
7. Have the crane inspected to check for any damage caused.
8. Fill out the logbook.
9. DO NOT use the crane until the problem has been fixed.

3.6.3 Faulty Crane Computer or Visual Display

If the computer or visual display is not working correctly when lifting loads you will need to:

1. Slowly lower the load, ensuring it is under control (if applicable).
2. Shut down the crane.
3. Assess the computer or visual display unit and decide if the problem can immediately be fixed.
4. Tag out the crane.
5. Refer to the load chart.
6. Report the problem to the appropriate person.
7. Fill out the logbook.
8. **Do not** use the crane until the problem has been fixed.



3.6.4 Unstable Crane or Load

If the crane becomes unstable during operations you will need to lower the load, stop operating the crane, assess the situation and seek help.

If the outrigger/stabiliser, packing or tyres begin to sink into the ground during crane operation, you must immediately:

1. Shorten the radius/retract the boom.
2. Lower the load to a safe position.
3. Stop operations.
4. Assess the situation.
5. Seek assistance.

You may need to add more packing under the stabilisers/outriggers or move the crane to more suitable ground.

If at any time the load becomes unstable, stop and lower the load (if safe to do so) and address the reason for the instability (e.g. lifting gear, crane, weather conditions).

3.6.5 Workplace Emergencies

Site emergencies may include:

- Injury to personnel.
- Fire (electrical, chemical, gas, mechanical, paper, wood or natural).
- Gas leak.
- Toxic or flammable vapours emission.
- Vehicle or machine accident.
- Chemical spill.
- Structural collapse.

Always communicate with the person dogging the load prior to leaving the crane. **Dial "000" if there is an emergency.**

3.6.5.1 Emergency Response

If an emergency situation arises it is important to communicate the important information. You should communicate:

- That an emergency situation exists.
- The nature of the emergency (e.g. fire, structure collapse).
- Where the emergency is and the unsafe area/s.

Always follow the emergency procedures for the workplace, such as evacuating personnel or contacting the first aid officer.

3.6.5.2 Reporting an Emergency

There are a number of people that will need to be told about the emergency. These include:

- Other people at the workplace.
- The workplace safety office.
- Management and supervisors.
- Emergency services.

When calling emergency services (Dial 000) let the operator know the following details:

- Where the emergency is.
- What has happened.
- What is being done to solve the emergency.
- Your name.

Do not hang up the phone until you have been given instructions on how to proceed.

3.6.5.3 First Aid

First Aid kits must be supplied by your employer. The location of these kits should be clearly marked with signage.

In the case of an emergency where somebody requires first aid notify your supervisor or first aid officer and they will take action.

3.7 Conclude Operations

Once the job has been completed you will need to conclude operations in accordance with site procedures and manufacturer's specifications.

Generally this will involve:

- Removing hazard control measures.
- Packing up the crane.
- Shutting down and securing the crane.

Do not leave the crane controls until you have done the following:

1. Made sure the crane is not still carrying a load.
2. Raised the crane hook to a safe height.
3. Shut down the crane according to the manufacturer's specifications.
4. Folded/retracted the boom for travel and ensured the jib is correctly stored.
5. Secured the crane against unauthorised use (locking the cabin and securing controls).

Always make sure that you apply the park brake when you shut down the crane, as well as when you leave the crane or stop operations. A hoist brake may also need to be applied if applicable to the crane used.

3.7.1 Removing Hazard Control Measures

Any hazard control measures that are no longer required should be removed from the work area (e.g. removal of temporary fences or barricades or signage). This may be done after all shut down procedures have been completed.

3.7.2 Packing Up the Crane

Once the hazard control measures have been removed the crane needs to be packed up in preparation for travel to the designated shutdown and secure location. It is important that all site procedures and manufacturer's specifications are followed throughout this process.

The packing up of the crane may include:

- Stowing the crane boom/jib.
- Applying the motion locks and brakes.
- Stowing and securing the outriggers/stabilisers.
- Stowing and securing the plates and packing.

3.7.2.1 Stow Crane Boom/Jib

Stow the boom/jib during shut down, before you move the crane. Follow all manufacturer's specifications and site safety procedures when stowing the crane boom/jib.

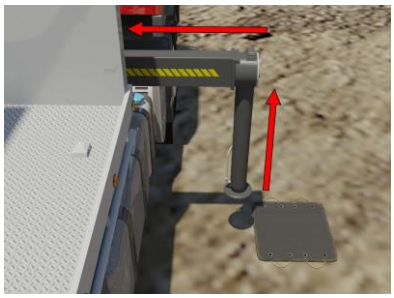
Secure the hook following the manufacturer's specifications.

3.7.2.2 Apply Motion Locks and Brakes

It is important that all relevant motion locks and brakes are applied before shutting the crane down. Ensure that all manufacturers' specifications and site safety procedures are followed.

3.7.2.3 Stow and Secure Outriggers/Stabilisers

Follow all appropriate procedures when securing and stowing the outriggers/ stabilisers. Retract all outriggers/stabilisers and (if applicable) lock them in with the correct pins.

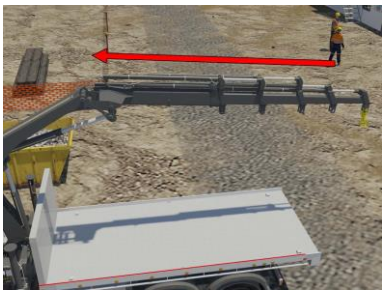


3.7.2.4 Stow and Secure Plates and Packing

Stow and secure all plates and packing. Clean the steel plates and place 'pig-sty' packing either on the carrier or in a designated storage area so they will be ready and easily accessible for future use.

3.7.3 Shutting Down and Securing the Crane

Once the crane is in the designated shutdown location ensure that you follow the manufacturer's specifications and site safety procedures.



A typical shutdown procedure may include:

- Raising the hook/lifting assembly clear of obstructions.
- Retracting the jib in accordance with the manufacturer's specifications.
- Making sure the hoist brake is applied (if applicable).
- Retracting the boom for travel.
- Retracting the hoist rope and hook block.
- Positioning/securing the boom/jib.
- Retracting the outriggers/stabilisers.
- Idling the engine to stabilise the temperature.
- Turning off the engine (where applicable).
- Putting all controls in neutral (if applicable).
- Turning the isolator switch off (if fitted) and secure.
- Removing the key from the ignition (where applicable).
- Locking and securing the cabin (where applicable).
- Securing the crane for travel.

No load should be allowed to remain suspended on the hook if the crane is going to be shut down or left unattended. This may result in the load lowering, swinging or becoming unstable.

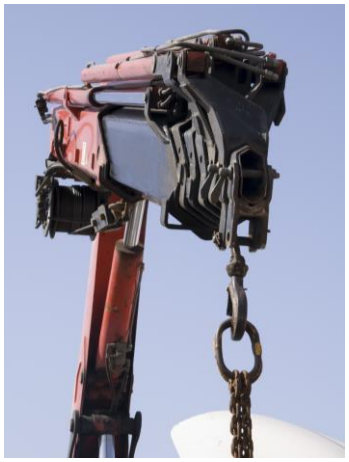
3.8 Conduct Post-Operational Checks

After completing all shutdown procedures it is important that all post-operational checks are conducted. This is done to look for any crane defects.

Carry out all post-operational checks according to the manufacturer's instructions and relevant site procedures.

Check the crane for any damage or defects that have occurred during use.

Refer to the crane logbook or inspection checklist for a list of items that should be checked on the crane.



Post-operational checks may include:

- Checking for any damage including:
  - Structural damage to the boom/jib.
  - Damage to the crane.
- Checking all fluid level and for any signs of leaks.
- Making sure loose items are stowed or secured correctly, including plates and packing.
- Using load restraints if and when necessary and making the crane ready for road travel.
- Stowing and securing outriggers/stabilisers correctly and according to procedures.
- Checking that the hook/lifting assembly has been raised clear of obstructions.
- Any applicable controllers are in neutral.
- Any other checks as specified in the manufacturer's instructions.

3.8.1 Storing Lifting Equipment

Store all lifting equipment in a clean dry storage cabinet or area and hang them or coil them neatly according to site procedures.

When storing lifting equipment, it is important to ensure that the equipment is:

- Stored in a clean, dry and well-ventilated place.
- Never stored on the ground or floor.
- Stored undercover and out of direct sunlight, ultra-violet light or fluorescent lighting.
- Stored away from chemicals and oils.
- Stored away from sand/grit.
- Stored away from machinery.
- Stored in a vermin-free environment.

3.8.2 Recording and Reporting Damage and Defects

Record and report any faults that you find during the post-operational checks for corrective action, or according to workplace procedures.

Generally this will involve:

1. Isolating the crane or faulty equipment and attaching a danger tag to it.
2. Recording the fault as per site procedures (e.g. in the crane logbook).
3. Reporting the fault to an authorised person for corrective action.

3.8.3 Completing Records

All information related to crane operations and equipment faults should be accurately recorded in the appropriate documents.

Records may include:

- Log books.
- Daily inspection checklists.
- Maintenance records.
- Hazard reports.
- Handover certificates.
- Supply and delivery documentation.
- Permits.

All required documents should be completed properly and on time. There may be strict timeframes that need to be met.

Use clear and simple language when completing written documentation.

Check all information that is entered into written documents. Inaccurate, missing or misleading information can cause confusion, delays, hazards or legal issues.

Use only approved forms and documents when communicating in the workplace.

3.8.4 Clear Work Area

Clearing / refurbishing the work area and returning it to normal operations also includes:

- Removal of rubbish.
- Disposal of contaminated waste according to site procedures.
- Disposal of any fluids.
- Use of recycling where possible.

Appendix A – Vehicle Loading Crane Daily Inspection Checklist

Vehicle Loading Crane Daily Inspection Checklist			
Company Name:			Date:
Operator Name:			Site:
Machine Number:			
Check Type (Please Circle):		Pre-Start	Post-Operational
Component	**What to Check for**	✓	**Comments**
External Check			
Tyres and wheels.	Inflation, pressure, damage, covers.		
Truck/carrier structure.	Wear, damage, cracks, leaks, loose parts, excessive debris.		
Crane structure.	Damage, welds, loose parts.		
Crane hook.	Damage, cracks, welds, loose parts.		
Attachments/lifting gear.	Damage, loose parts, secure.		
Underneath machine.	Leaks, loose parts, damage.		
Lubrication points.	Leaks, loose parts, lubricated.		
Hydraulics (rams, hoses, connectors).	Damage and leaks.		
Outriggers.	Damage, wear, loose or missing parts.		
Decals and signage.	Readability, wear.		
Load /data plate.	Damage, wear, visible.		
Overall machine.	Loose or missing parts, damage, wear, missing guards and safety devices.		**Out of Service Tag Attached? Yes / No**
Engine Check			
Fluids.	Engine oil, hydraulic oil, transmission oil, coolant, engine pre-cleaner, brake fluid.		
Battery.	Cleanliness, security.		**Out of Service Tag Attached? Yes / No**
Overall engine.	Damage, dirt buildup, leaks.		
Internal/Cabin Check			
Levers, controls and gauges.	Damage, cleanliness, labels, working.		
Floor plates.	Clear and free of oil/grease.		
Seat and seat belt.	Adjustment, damage, wear.		
Logbook.	Present and correct.		
Mirrors (if fitted).	Adjusted, clean, visible.		
Fire extinguisher.	Present, damage, wear.		
Overall cabin interior.	Cleanliness, damage, missing parts.		**Out of Service Tag Attached? Yes / No**

Operational Checks			
Attachment controls.	Working, damage, wear, dirt build up on controls.		_____
Lifting controls.	Working, smooth, jerky.		
Radios, lights, horn.	Functioning, damage, wear.		_____
Emergency cut-out systems.	Functioning, responsive.		
Gauges.	Oil pressure, fuel level, engine temperature, hydraulics, and speedometer.		_____ **Out of Service Tag Attached? Yes / No**

Action Taken to Repair Vehicle Loading Crane:	
Name:	Date of Repair:

Return to Service Authority by Supervisor		
Comments		
Supervisor Name:	Signature:	Date: