CPCCLRG3001

Licence to Perform Rigging Basic Level

LEARNER GUIDE

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1.1 Introduction

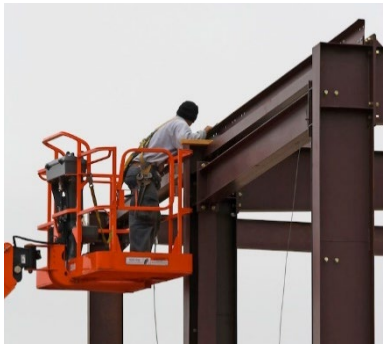
This training course is based on the National High Risk Licence Unit of Competence **CPCCLRG3001 Licence to Perform Rigging Basic Level**.

You will learn about:

- Planning out your work.
- Selecting and inspecting equipment.
- Setting up for the rigging task.
- Erecting and dismantling structures and plant.

Before completing this course you must have already finished CPCCLDG3001 Licence to Perform Dogging. This course builds on those skills and knowledge.

1.1.1 When is a Risk Licence Needed?

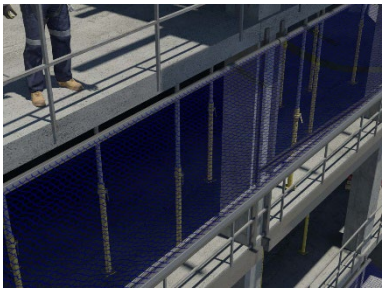


A high risk work licence allows you to lawfully work with certain high risk equipment and plant such as forklifts, cranes, hoists, elevating work platforms, scaffolding, rigging and pressure equipment. There are 3 levels of rigging class under a high risk licence. This course covers the work associated with the Basic Rigging (RB) class of high risk work licence involving the use of mechanical load shifting equipment and associated gear to move, place or secure loads, including plant, equipment or members of a structure, as well as ensuring the stability of those members and the set up and dismantling of hoists.

Competence in this unit does not in itself result in a licence. A licence is obtained after competence is assessed under applicable Commonwealth, state or territory work health and safety (WHS) regulations.

1.1.2 What Types of Work can you do with a Rigging Basic Level Licence?

A person with a basic rigging high risk work licence is allowed to complete the following range of tasks:



- Dogging work.
- Installation of cantilevered crane loading platforms.
- Structural steel erections.
- Installation of static lines.
- Installation of some hoists (including mast climbing hoists and work platforms).
- Installation of perimeter safety screens and shutters.
- Placement of pre-cast concrete.
- Installation of safety nets.

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.

As part of their legal duty of care, licensed workers must take reasonable steps to make sure the way they work does not impact on the safety of themselves or any others on site.

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.
- Taking action to prosecute.

Your employer should 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 Gather Site Information and Plan Job

All work activities must be guided by and comply with the relevant legislation, regulations and work requirements.

Before beginning work you should review all the information required to ensure you complete the work safely. You could find work site and safety information in:

- Legislation and regulations.
- Relevant Australian Standards.
- Management Plans.
- WHS/OHS Policy.
- Code of practice.
- Manufacturer's instructions.
- Operations manuals.
- Safe working or job procedures.

1.2.1 Assess the Task

Before you start any work or planning, look to see what the task actually is. Ask yourself the following questions:

- Are there task plans (steel schedules) that you need to look at?
- Is there adequate access and egress to and from the work area?
- Where is the work being done?
- What is the task?
- What plant and equipment will you need to carry out the job, and are these available?
- Is there any information about the load, weights or other details that will affect how you plan the job?

1.2.2 Relevant Legislation, Regulations and Work Requirements

All work activities must be guided by and comply with the relevant legislation, regulations and work requirements.

Legislation can be broken down into four main types:

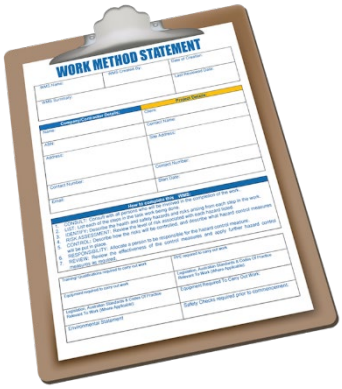
Legislation	Explanation
Acts	Laws to protect the health, safety and welfare of people at work.
Regulations	Gives more details or information on particular parts of the Act.
Codes of Practice	Are practical instructions on how to meet the terms of the Law.
Australian Standards	Give you the minimum levels of performance or quality for a hazard, work process or product.

When you are planning your work remember to think about:

- **Job or Task Requirements** – Think about everything the job involves such as: What is the job? Where is the job? What do I need for the job? What type of plant or equipment will be used? What are its functions, capabilities and limitations?
- **Priorities or Sequencing** – Break the entire job into tasks and put them in a logical order. When prioritising the tasks make sure you consider what tasks need to be completed before others can begin.
- **Site Rules and Regulations** – Find out and understand any regulations or site rules that affect your job. If you are unsure about any rules or regulations, speak to your supervisor.
- **Permits and Procedures** – Find out if you need a permit to complete this job. If so, you need to ensure that you have one and that it is current. You also need to understand and apply any site procedures that are in place for this task. If you have any questions about permits or procedures talk to your supervisor. Procedures outline the steps you need to follow for:
  - Emergency response.
  - Incident and accident reporting.
  - Equipment fault reports.
  - Equipment maintenance requirements.
  - Communication methods and equipment use.
  - Supervision requirements.
- **Risk Management** – This involves managing any risks or hazards that are present throughout the worksite and in relation to your task.

1.2.3 Work Method Statements

Many worksites require a work method statement before any dangerous construction work can start. A work method statement is a list of steps that outlines how a job will be done. It also includes any hazards that occur at each step, and what you need to do about them.



These statements can also be known as Safe Work Method Statement (SWMS), Job Safety Analysis (JSA) or Safe Operating Procedure (SOP).

Work method statements are a great tool for organising your work activities. They help to make sure you have completed everything and will also outline the details of all tools, equipment and coordination needed with other workers relating to your job. Make sure all of these are available and ready before you start.

1.2.4 Duty of Care

All personnel have a legal responsibility under duty of care to do everything reasonably practicable to protect themselves and others from harm by complying with safe work practices.

This includes activities that require licences, tickets or certificates of competency, or any other relevant state and territory WHS requirements.

Duty of care applies to:

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

To meet their duty of care obligations an employer is required to provide and maintain a work environment without risks to health and safety. This includes providing and maintaining safe plant and structures as well as safe systems of work. Adequate facilities need to be provided by the employer to meet the needs of everyone on site.

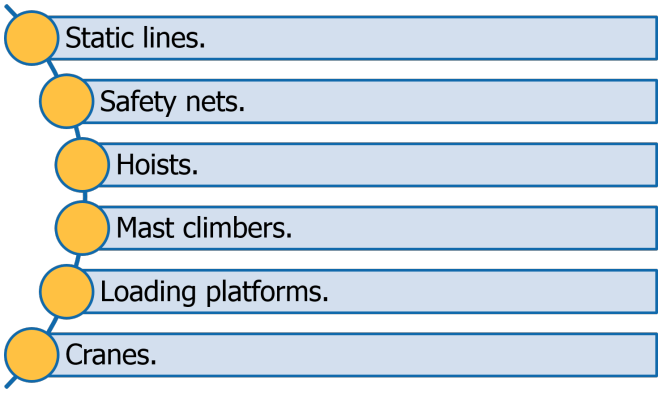
They must also ensure that everyone has received adequate training, information, or supervision to complete their work. This includes providing sufficient information, training, instruction and/or supervision to individuals who have recently completed their High Risk Work Licence and are going to be completing unfamiliar rigging work.

Intentionally or recklessly interfering with or misusing any WHS equipment provided by your employer is a breach in duty of care. You must cooperate with the health and safety policies and procedures set out by your employer, doing this will assist you in meeting your duty of care obligations.

1.2.5 Forces and Loads

A 'load' is any type of force exerted on an object. It is important to understand the relevant forces and loads that are associated with the rigging work you will be doing. Forces and loads apply to structures such as scaffolds, structural steel or precast panels.

They also apply to plant associated with the rigging work including:



Forces and loads can be divided up into the following types:

- **Dynamic Forces** - These are forces caused by movements of the crane and on the load being lifted.
- **Wind Loads** - These result from wind acting on the crane and the load being lifted.

1.3 Risk Management

HAZARDS CREATE RISK. CHECK FOR HAZARDS.

A **HAZARD** is a thing or situation that has the potential to harm a person.

A **RISK** is the possibility of harm (death, injury or illness) occurring if someone was exposed to a hazard.

If you can remove or at least control a **HAZARD** you can reduce the **RISK** involved.

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

A good tip is to check:

- **Above head height** – Remember the load may be moving above your head or you may be working at heights.
- **At eye level** – Look around to see if there is anything in the way of where you want to move the load.
- **On the ground (and below)** – Have a look at the ground conditions and think about where the load is being moved to. Will it support the weight of the load?

1.3.1 Workplace Hazards

Common workplace hazards you need to consider and plan for include:

- Ground conditions:
  - Underground services.
  - Potential non-weight bearing surfaces.
  - Recent excavations.
- Poor lighting.
- Traffic:
  - Pedestrians.
  - Vehicles.
  - Other plant.
- Overhead hazards:
  - Power lines.
  - Overhead service lines.
  - Obstructions.
  - Trees.
- Working at heights:
  - Fall from heights.
  - Falling objects.
- Weather:
  - Lightning.
  - Storms.
  - Wind.
- Surrounding structures:
  - Buildings.
  - Obstructions.
  - Bridges.
- Workplace-specific hazards:
  - Other workers.
  - Equipment and machines.
  - Electrical items.
  - Facilities.
  - Other equipment.
- Dangerous materials.
- Hazardous manual tasks.

Once a hazard has been identified you need to 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.

It is important to talk with workplace personnel and safety officers before starting on a worksite to make sure that any workplace policies or site-specific procedures are followed, and to identify known hazards.

1.3.2 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 or an access permit).
- Have the power lines shut off. If this is not possible then have the power lines insulated.
- 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 local electrical authority 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)

1.3.2.1 Identifying Overhead Power Lines

There are a range of different indicators in use across the country to identify the position of overhead power lines.

Important: Visual indicators **DO NOT** insulate the power lines so exclusion zones and safe operating distances must still be used, even when any of these systems are in use.

Tiger Tails and Coloured Markers

Tiger tails or coloured markers are used to clearly show the location of overhead power lines. Poles may also be coloured up to 3m from the ground.

Marker Balls or Flags

Marker balls are fixed to the power line and are often red or another bright colour.

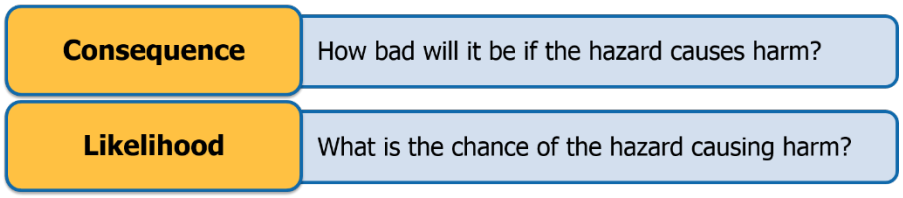
Safety, Warning and Danger Signs

Signage may also be present to warn of overhead power lines and services.

1.3.3 Risk Assessment

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:



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

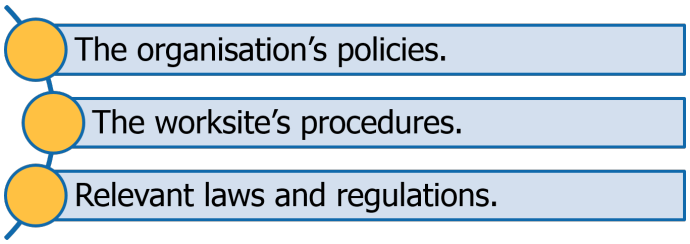
For example, a hazard that has a **Major** consequence and is **Almost Certain** to occur has a risk level of **Extreme**.

	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

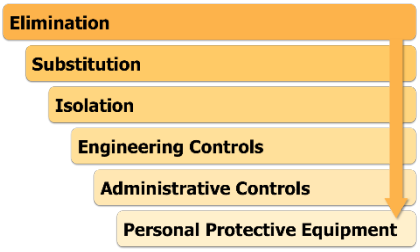
The risk level will help you to work out what kind of action needs to be taken, and how soon you need to act. The table below is an example of a site risk policy:

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 Hazard Controls



Once hazards and risks have been identified and assessed you need to work out what the best way to manage them will be.

The Hierarchy of Hazard Control is the name given to a range of control strategies used to eliminate or control hazards and risks in the workplace. Hazard controls should be applied before you start work, or as soon as a hazard is identified during the work.

The Hierarchy has 6 levels.

Always start at the top of the list and work your way down.

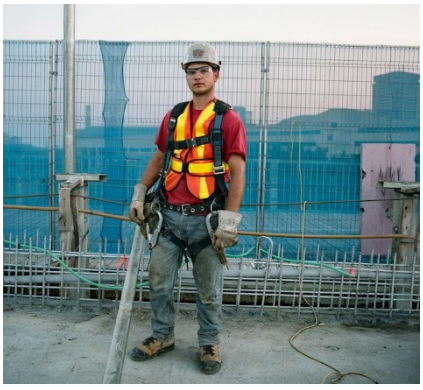
Hierarchy Level	Explanation
1. Elimination	Completely remove the hazard. This is the best kind of hazard control.
2. Substitution	Swap a dangerous work method or situation for one that is less dangerous.
3. Isolation	Isolate or restrict access to the hazard.
4. Engineering Controls	Use equipment to lower the risk level.
5. Administrative Controls	Site rules and policies attempt to control a hazard. Includes Safe Work Practices.
6. Personal Protective Equipment	The least effective control. Use PPE while you work. This should be selected at the planning stage of your work and checked before starting the job.

You may need to use a range of control measures to reduce the risk to an acceptable level.

1.3.4.1 Personal Protective Equipment Used During Rigging Work

Riggers often have to wear helmets, gloves, eye protection, face masks and respirators, and steel-capped boots to protect themselves from injury.

It is the responsibility of your employer to provide the necessary protective equipment. It is the responsibility of riggers to wear and use the equipment properly, when and where necessary.



Sign	Explanation	Sign	Explanation
	Safety helmets with chin straps must be worn wherever there is a risk of objects falling from above and on any worksite where the hard hat sign is displayed.		Hearing protection must be worn where there are high volumes of noise such as trucks and equipment.
	Riggers should wear close fitting pigskin gloves to protect hands from: ◆ Heat and abrasion. ◆ Molten metal. ◆ Sharp edges.		Riggers should be careful to choose footwear that is comfortable, gives maximum grip and provides protection from pinching, jamming and crushing.
	Wear eye protection if you are likely to be exposed to: ◆ Physical damage. ◆ Chemical damage. ◆ Radiation damage.		To prevent permanent damage caused by ultra violet rays always wear a hat, long sleeves, long trousers and use sun block cream when working outside.
	Riggers should wear respiratory protective devices if exposed to: ◆ Toxic gases and vapours. ◆ Irritating dusts, such as silica.		It is important to wear the appropriate high visibility clothing to make sure other operators know where you are.

1.3.4.2 Specific Control Strategies for Traffic

If the work area is going to be shared with pedestrians, site personnel, vehicles or mobile plant, you will need to make sure you have selected appropriate control measures. These may include:

- Using a flag person to control traffic.
- Setting up flashing hazard lights.
- Organising hoardings, gantries or scaffolding.
- Setting up warning signs and barriers.
- Setting up pedestrian and vehicle exclusion zones.

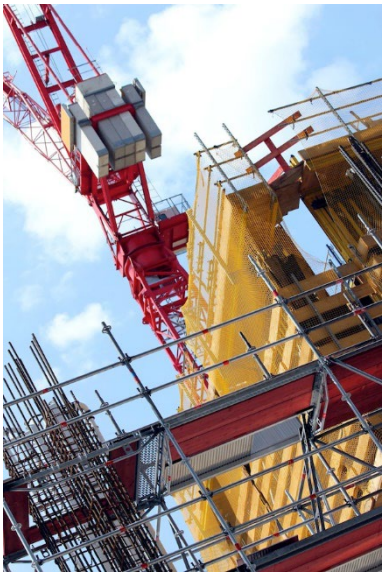
1.4 Identify Equipment Requirements

Each job will require the use of different equipment and resources depending on site requirements.

1.4.1 Rigging Equipment and Gear

Once you have worked out exactly what the job requirements are you can begin to decide on the equipment you will use to do the work.

Riggers may use, or work with, any of the following equipment to carry out their job:

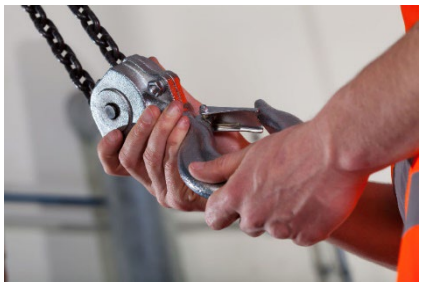


Plant & Associated Equipment:

- Scaffolds.
- Elevated work platforms.
- Personnel boxes/workboxes.
- Cantilevered crane loading platforms.
- Hoists and mast climbing equipment.
- Safety screens and shutters.
- Cranes.

Tools & Lifting Equipment:

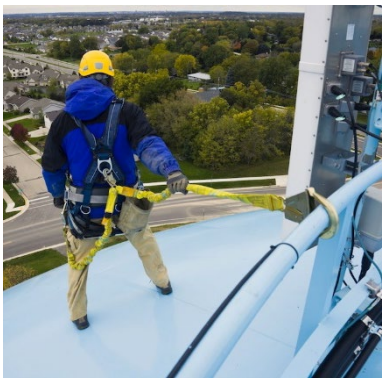
- Fibre ropes.
- Flexible steel wire rope (FSWR).
- Chains.
- Rigging screws.
- Anchors.
- Levels.
- Eyebolts.
- Beam clamps.
- Load equalising gear.
- Rope grips.
- Turnbuckles.
- Wire and synthetic slings.
- Sheaves.
- Spreader bars.
- Lifting beams.
- Shackles.
- Chain blocks.
- Tirfors.
- Plate clamps.
- Levers.
- Jacks.
- Lever-action winches.
- Skates.
- Girder/beam trolleys.
- Wedges.
- Rollers.
- Bolts.
- Braces.
- Spanners.
- Podgers.
- Power and manually operated lifting gear.
- Pipe clamps.
- Tag lines.
- Props.
- Snatch blocks.
- Lifting clutches.



1.4.2 Safety Equipment

Depending on the requirements of the job, you may need to use safety equipment to reduce the risk to an acceptable level.

Safety equipment includes:

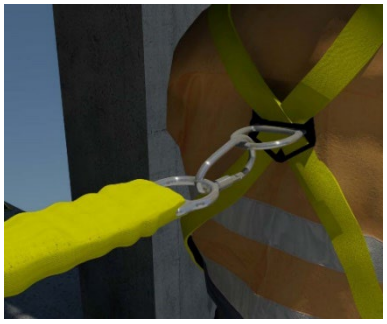


- Full body safety harnesses.
- Lanyards.
- Energy absorbers.
- Inertia reels.
- Static safety lines.
- Safety (catch) nets.

Other safety equipment such as work platforms (including elevating work platforms) may also be used when working at heights.

All safety equipment should be selected and checked before starting the work, at the planning stage to ensure it is safe to use before starting the task.

1.4.2.1 Full Body Safety Harnesses



In most cases when working at heights a full body safety harness should be worn.

Harnesses must be correctly fitted in accordance with the manufacturer's instructions to ensure effectiveness.

Personnel should connect the fall-arrest line to the attachment point on their harness (dorsal attachment point in the middle of the back, or the chest connection) that will provide the best protection for the situation in which it is being used.

Safety harnesses must meet the requirements of AS/NZS 1891 Industrial fall-arrest systems and devices.

1.4.2.2 Lanyards & Energy Absorbers

There should be a minimum of slack in the fall-arrest lanyard between you and the anchor point, which should be as high as the equipment permits.

The length of the lanyard should restrict the fall distance to a maximum of 2 metres before the fall-arrest system takes effect.

Avoid work above the anchor point, as this will increase the free fall distance in the event of a fall, resulting in higher forces on the body and greater likelihood of the lanyard snagging on obstructions.

To reduce injuries caused by a fall, energy absorbers should be used as part of the lanyard.

1.4.2.3 Inertia Reels

Inertia reels provide a worker with a relatively free range of movement or extra reach compared to a lanyard, with the added safety feature of being able to lock in the event of a fall, arresting the descent of the worker.

Inertia reels should not be used in the following situations:

- While working on a sloped surface (e.g. a steeply pitched roof) or any other surface where a fall may not be a quick vertical one.
- Locked as a constant support for a worker during normal work.
- In conjunction with a lanyard.

Inertia reels must comply with AS 1891.3 Fall arrest devices.

1.4.2.4 Static Safety Lines

Static safety lines are horizontal or substantially horizontal lines to which a lanyard may be attached and which is designed to arrest a free fall.

These provide a suitable anchor point for a fall-arrest system, while still allowing a limited range of movement along the path of the line.

1.4.2.5 Safety Nets

Industrial safety nets are sometimes used as an effective means of fall protection for those working at heights where it is not practicable to provide scaffolds or temporary guard railings.

Safety nets are often used as an additional or lower order control measure. They may be used in a variety of different situations, including:

- During construction to prevent unchecked falls.
- Under roof sheeting.
- As a scaffold catch platform safety net.
- Under circus and children's adventure activities.
- During demolition works.

When combined with overlay nets of finer mesh size, they can also be used to contain falling debris.

Safety nets may be installed where there is a risk of tools, equipment and materials falling from a height on other workers, plant, machinery, structures or pedestrians.

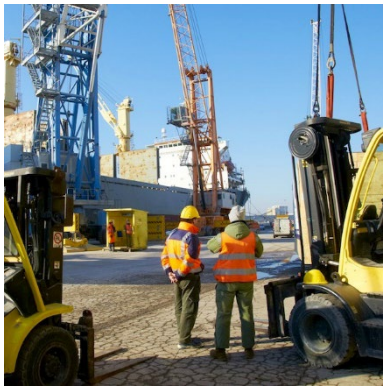
1.5 Identify Communication Methods

As a rigger you need to be able to communicate with those around you while you work, and you need to be able to understand task and equipment instructions.

1.5.1 Workplace Communications

Workplace communications may take the form of:

- Written instructions.
- Signage.
- Hand signals.
- Whistle signals.
- Listening.
- Questioning to confirm understanding, and appropriate worksite protocol.
- Toolbox meetings.



Talk to the appropriate personnel (e.g. supervisors, colleagues or managers) to discuss the best methods for communication while you are still at the planning stage of the job.

To direct the crane driver you may use:

- Hand signals.
- Whistle signals.
- Fixed channel two-way radio.

DO NOT use a mobile phone to talk to the crane operator while conducting rigging work.

2.1 Select and Inspect Rigging Equipment

Your selection of rigging and associated equipment will depend on a number of factors. Make sure the equipment you are using is suitable for the type of job and the shape, size, weight and requirements of any loads.

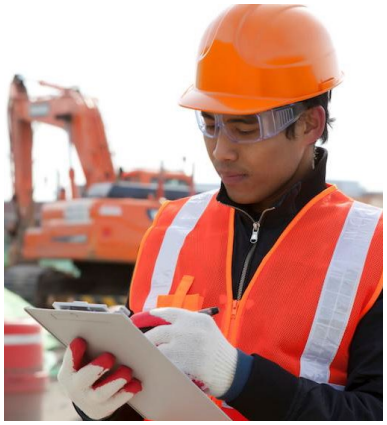
The selection of equipment also includes any cranes, hoists, plant or scaffold required to carry out the job.

2.1.1 Selection of Equipment

Once you have clearly identified the work that needs to be completed you will need to select appropriate rigging equipment.

It is important that you consider how you will:

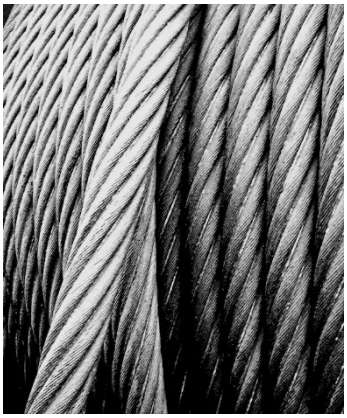
- Complete the tasks (tools, plant, equipment and materials required).
- Position materials and equipment safely.
- Access the task.
- Ensure the safety of all personnel during and after the work has been completed.
- Ensure the security of all equipment during and after the work has been completed.



For example:

- If a load is easily damaged, you may choose to use synthetic webbing slings instead of chains.
- If the load is bulky or has an uneven weight disbursement, you may need to use a lifting beam to equalise the load and taglines to help keep it from moving too much during the lift.
- The load may require specific handling equipment such as beam or plate clamps.
- If the task is to erect structural steel, make sure you have considered how the steel will be positioned, how you will access it and what tools and materials you will need to secure it in place.

2.1.2 Flexible Steel Wire Rope (FSWR)



Flexible steel wire rope (FSWR) is the link between the crane or hoist and the load.

The hoist drum is the pulling mechanism that rotates to store or release the wire rope.

The wire passes over the head sheave then down to the load.

Wire flexes as it bends over sheaves and drums. As the wire bends over the sheave fatigue takes place.

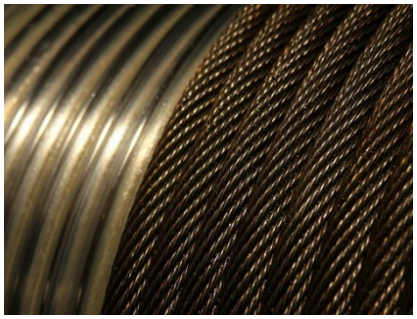
The outer wires are stretched and the inner wires are crushed against the sheave groove or drum.

Wire never lays straight into the groove of a sheave because the load swings slightly or the rope vibrates.

This causes friction or abrasion between the side of the sheave and the wire, wearing the outer wires of the strands.

2.1.2.1 FSWR Lays

There are many different types of lays and construction of FSWR to combat fatigue and abrasion, the two destructive forces which occur whenever FSWR is bent over a system of sheaves.



Lay is the direction the wires are formed into strands and the strands are formed into the finished rope. The strands can be laid either left or right around the core. In left hand lay the strands are laid anti-clockwise and in right hand lay they are laid clockwise.

Lay does not affect the rated capacity of the rope but it does determine characteristics such as the spin of the rope.

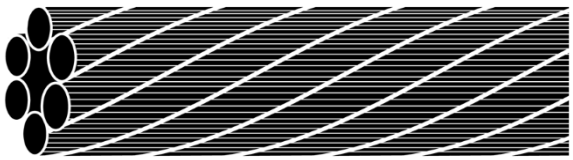
Ordinary lay is where the wires are laid in the opposite direction to the strands. Most general purpose ropes are right hand ordinary lay. Ordinary lay ropes are used extensively for slinging.

Lang's lay is where the wires are laid in the same direction as the strands. Lang's lay is used where both ends are fixed to prevent rotation such as for luffing. **It must not** be used for lifting.

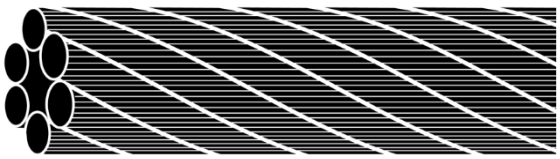
Lang's lay is more flexible and harder wearing than ordinary lay ropes. It is used as excavator, dragline, and pile driving ropes where severe abrasion occurs.

It is harder wearing because more of the individual wires are exposed to the sheaves.

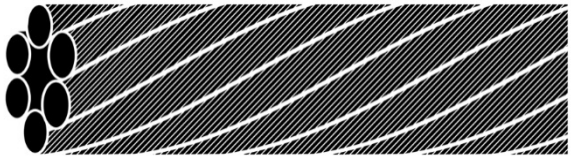
Therefore there are 4 main types of Flexible Steel Wire Rope:



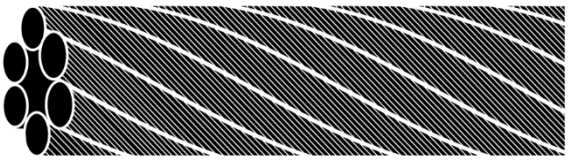
Left Hand Ordinary Lay



Right Hand Ordinary Lay



Left Hand Lang's Lay



Right Hand Lang's Lay

2.1.2.2 Anchors and Rope Terminations

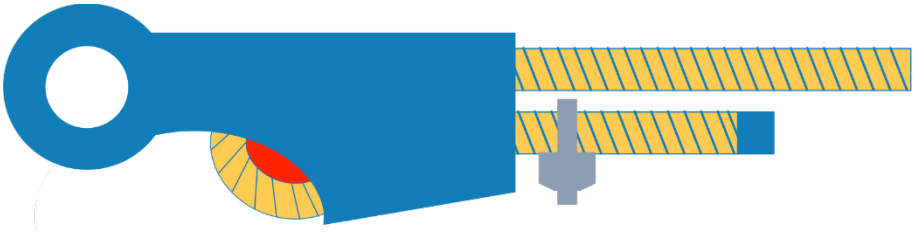
Anchors are used to secure FSWR to various pieces of equipment. Rope terminations are used to protect the FSWR during dogging and rigging tasks.

These commonly include:

- Hambone wedge sockets.
- Splices with thimbles and swage fittings.
- Turnbuckles and rigging screws.

Hambone Wedge Sockets

Wedge sockets are used to securely hold the tail of a hoist wire rope (either to the hoist drum or the boom head of a crane).



Rope Splice with Thimble

Some wire ropes end with a thimble. Thimbles are designed to protect the load bearing area inside the crown of the eye from chafing and distortion, and to form a hard eye in a rope.

A thimble fitting is often coupled with a swaged aluminium fitting to help form an eye splice or thimble eye in a wire rope.

Indications of a defective swage fitting are:

- The tail of a FSWR has slipped inside the swage fitting.
- The steel collar thimble is loose on the rope.
- The fitting is loose.
- There is a broken wire at either end of the swaged fitting.

Turnbuckles and Rigging Screws

Turnbuckles are an open-framed attachment with an anchorage and threaded rod at each end used to tension a rope or to provide fine adjustment.

There are many different anchorages that may be used on a turnbuckle including rings, hooks and shackles.

Rigging screws are similar to turnbuckles, however they are enclosed as opposed to being open-framed.

They contain an anchorage point and a threaded rod in each end. Rigging screws are used to tension a FSWR or to provide fine adjustment to a sling assembly.

2.1.2.3 Rope Grips

Rope grips (sometimes called bulldog grips) are a wire rope grip consisting of a U-bolt, two nuts and a saddle.

Bulldog grips (wire clips) must not be used to join two lengths of wire together for lifting purposes.

The wire rope could crush or pull through the bulldog grip.

2.1.2.4 FSWR Slings

FSWR slings are available in a number of different configurations including:

- Soft eye.
- Thimble eye.
- 2 leg sling.
- 4 leg sling.
- Open swage socket.
- Closed swage socket.
- Hook captive.
- Master link captive.

The minimum construction for use as a sling is 6/19.

2.1.2.5 Inspection Criteria for FSWR

You must check any FSWR carefully before using it. The checklist below outlines what you are looking for. If a FSWR shows any of these defects then it is unsuitable for rigging and dogging.

Possible FSWR Defects:	
Missing or illegible rated capacity tag.	Abrasion wear.
Bird-caging (strands loosened from proper tight lay).	Stretched or overloaded FSWR.
Severe kinking or fractures from bending or reeving.	Knotted FSWR.
More than 10% wear in the rope diameter.	Core collapse.
Crushed/damaged strands.	High stranding.
Splice, ferrule, eye or thimble damage.	High temperature exposure.
Severe/serious corrosion (indicated by loose and springy wires).	
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 9 = 114 wires 114/10 = 11.4 = 11 wires 11 Broken wires over a distance of 8 x 10mm = 80mm	

If any of these are present then the rope **MUST NOT BE USED!**

2.1.2.6 Calculating FSWR Size Requirements

The rated capacity of a sling is the maximum load limit that may be lifted by that sling during a straight lift.

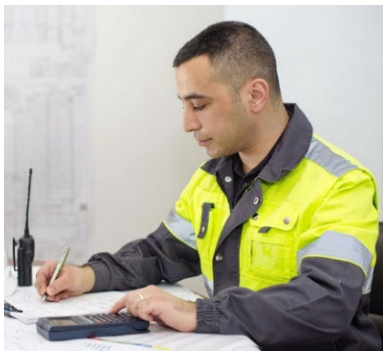
Calculate the Rated Capacity of FSWR

To calculate the rated capacity in kilograms of FSWR, square the rope diameter (D) in millimetres (mm) and multiply by 8.

For example:
Rope diameter = 12mm
Rated Capacity (kgs) = D^2 (mm) x 8
= D (mm) x D (mm) x 8
= 12 x 12 x 8
= 1152 kg

Therefore:
Rated Capacity (t) = 1.15 tonnes

Calculate the Required Diameter of FSWR



To calculate the diameter (D) in millimetres of FSWR needed to lift a given load, divide the load (L) in kilograms by 8 and find the square root of the result.

For example:

Load = 1152 kg
Diameter of FSWR (mm) = √(1152 ÷ 8)
= √144
= 12 (mm)

Therefore:
A FSWR sling of at least 12 mm in diameter is needed to lift a 1152 kg load for a straight lift.

2.1.3 Chain Slings

Lifting chain is proof-tested, short link chain. The barrel of short link chain requires a greater force to bend, provides greater strength, reduces the tendency to twist and provides better reeving performance.

Chain slings should be made up to AS 3775 Chain slings–Grade T or the manufacturer's recommendations. When ordering parts for chain slings, ensure that they comply with the appropriate Standard.

The rated capacity tag must be fixed on all chain assemblies. The tag must detail the rated capacity under all conditions of loading.

If a tag is missing the sling should be taken out of service.

2.1.3.1 Inspection Criteria for Chain Slings

You must check chain slings carefully before using them. The checklist below outlines what you are looking for. If a chain sling shows any of these defects then it is unsuitable for use.

Possible Chain Defects:	
Missing rated capacity tag.	Twists and/or kinks and/or knots.
Cracks in link welds, spot-welding.	Stretching, locked, movement restricted.
Exposure to excessive heat.	Gouged/cut more than 10% of original link diameter.
Pitting.	Severe/excessive rust or corrosion.
Squashed/crushed more than 10% of original link diameter.	
Excessive wear on chain (over 10% wear in link diameter).	

If any of these are present then the chain **MUST NOT BE USED!**

2.1.3.2 Rated Capacity of Chain

The rated capacity of chain is determined by the grade (G).

Do not use a chain to lift if it does not have a manufacturer's tag that gives details of the rated capacity. Return it to the manufacturer for rated capacity assessment and retagging.

Calculate the Rated Capacity of Grade 80 Chain

To calculate the rated capacity of 80 grade lifting chain in kilograms, square the diameter (D) in millimetres (mm) and multiply by G (grade of chain) by safety factor (0.4 for Grade 80 chain).

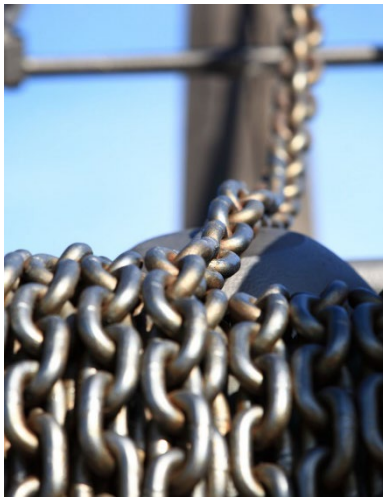
For example:

Chain diameter = 10mm
Chain Grade = 80 (T)

Rated Capacity (kgs) = D^2 (mm) x (80 x 0.4)
= D (mm) x D (mm) x 32
= 10 x 10 x 32
= 3200 kg

Therefore:
Rated Capacity (t) = 3.2 tonnes

Calculate the Required Diameter of Grade 80 Chain



The previous equation can be reversed to calculate the diameter (D) in millimetres of chain needed to lift a given load. To do this, divide the load (L) in kilograms by G multiplied by safety factor and find the square root of the result.

For example:

Chain Load = 3200 kg
Chain Grade = 80 (T)

Diameter of Chain (mm) = √(Load (kg) ÷ (80 x 0.4))
= √(3200 kg ÷ 32)
= √100
= 10 mm

Therefore:
A Grade 80 (T) chain, 10 mm in diameter, is needed to lift a 3200 kg load for a straight lift.

2.1.4 Synthetic Webbing 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.

Ensure that synthetic webbing slings are not twisted when being used to support or lift loads, as this will decrease the capacity of the sling.

Synthetic slings are colour coded, however you must always follow the rated capacity tag and not rely on the marking or colour coding.

The tag should display:

- The rated capacity.
- Angle factors.
- Reeve factors.
- Manufacturer.
- Grade/applications.
- Conditions of use.

2.1.4.1 Inspection Criteria for Synthetic Slings

You must check any synthetic slings carefully before using them. The checklist below outlines what defects you are looking for.

Possible Synthetic Sling Defects:	
Missing or illegible rated capacity tag.	Burn marks on outer sleeve.
Stretched or damaged sleeve.	Damage to stitching.
Cuts, tears or contusions in outer sleeve.	Damage from temperature or sunlight exposure.
Broken fibres/strand (internal wear). You can usually feel a soft lump on the inside of the sleeve.	
Excessive internal or external wear, burns or abrasions.	
Damage from chemical exposure (including alkaline or acidic substances or solvents).	
Damage to eyes, terminal attachments or end fittings.	

If a synthetic sling shows any of these then it is unsuitable for rigging and should be tagged, separated from usable equipment and reported to the appropriate person.

2.1.5 Shackles

A shackle is a portable link used for joining various pieces of lifting equipment. The two main shapes for load lifting are the 'dee' and 'bow' shackles.

Almost all shackles are made of round bar and have circular eyes. The pin of the common shackle screws directly into one eye and should preferably have a collar.

If you are using a shackle to support multiple slings ensure that you use a bow shackle. Selecting the right shackle for the job is one way of preventing damage to the shackles during a lift. There are other things that can cause damage to the shackle during a lift, these include:

- Incorrect set-up of shackle.
- Undersized shackle.
- Side loading.
- Setting a load down on the shackle.
- Dragging a shackle along the ground.
- Heating up the shackle (extreme, hot work environments).

If a shackle shows any of these defects then it is unsuitable for rigging:

Possible Shackle Defects:	
Missing or illegible rated capacity.	Bent or warped.
Stretched, wrong or defective pin.	Cracks and chips.
Pin won't screw in and/or missing retaining pin.	Over 10% wear.

2.1.6 Associated Equipment

There is a wide range of equipment that is designed for specific tasks and that are often used in rigging operations. These can include:

Equipment	Description	Equipment	Description
	**Chain Blocks** Chain blocks are a geared portable appliance used for hoisting a load suspended on a chain.		**Come-along** A come-along allows workers to move heavy loads manually by hand. It works much the same as a lever block, however it uses a rope instead of a chain. A come-along should be used when skidding a load horizontally instead of a chain block because it is not likely to jam or fill up with debris.
	**Lever Blocks/Lever-Action Winches** Lever blocks are a geared portable appliance incorporating a load chain, which is operated by a lever handle.		**Wedges** Steel wedges are used to pack under steel columns on the concrete base to ensure the column is plumb.
	**Rollers** Rollers can be used where the loads are bulky or heavy, and there is no room to lift the load into position by crane. Types of rollers include: ◆ Steel scaffold tube for light loads. ◆ Solid steel bar for heavy loads. ◆ Timber rollers or logs for 'bush jobs'.		**Skates** Skates are a method of moving heavy loads with a set of small rollers fixed into a solid frame which are set in bearings and run very freely. They are built to hold a specific safe working load which should not be exceeded.
	**Jacks** A jack is a geared mechanical device which is placed under a load to raise or lower it.		**Girder Trolley or Beam Trolley** Girder trolleys or beam trolleys are attached to the lower flange of a steel girder to provide a means of moving loads along the length of the girder.
	**Hand Tools** Hand tools are used throughout different rigging tasks. These can include spanners, podgers, levers, levels, tirfors, bolts and braces. Hand tools should be inspected for: ◆ Faulty ratchets (where applicable). ◆ Obvious signs of damage or wear.		

2.2 Select and Inspect Associated Plant and Equipment

Depending on the type of rigging task, there are a number of associated types of plant and equipment that you may use.

These include:

- Sheaves and drums (used with cranes and hoist assemblies).
- Purchases and tackles (pulley systems that are configured to gain mechanical advantage).
- Access equipment (elevating work platforms, work baskets and mast climbers).
- Load shifting equipment (cranes and material hoists).

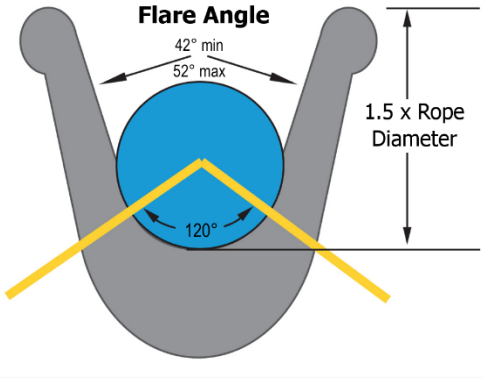
2.2.1 Sheaves

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

The minimum diameter sheave for power-operated lifting using FSWR should be 1.5 times the rope diameter. The sheave diameter is measured groove to groove across the face of the sheave.

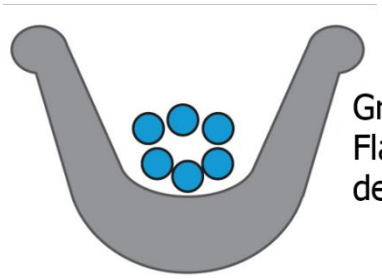
The groove depth of a sheave should not be less than 1.5 times the rope diameter, and 1/3 of the rope circumference should sit within the groove of the sheave.

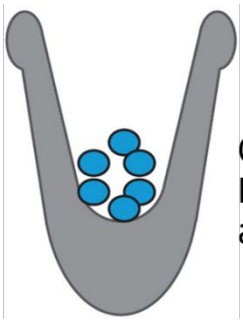
The sheave groove sides should have a flare angle of a minimum of 42° and a maximum of 52°.



Correct Groove

The grooves should be slightly larger than the nominal diameter of the rope. Grooves which are too large will cause flattening of the wire rope. Grooves which are too small will cause pinching and abrasion of the wire rope.


Groove too large. Flattens and deforms the FSWR.

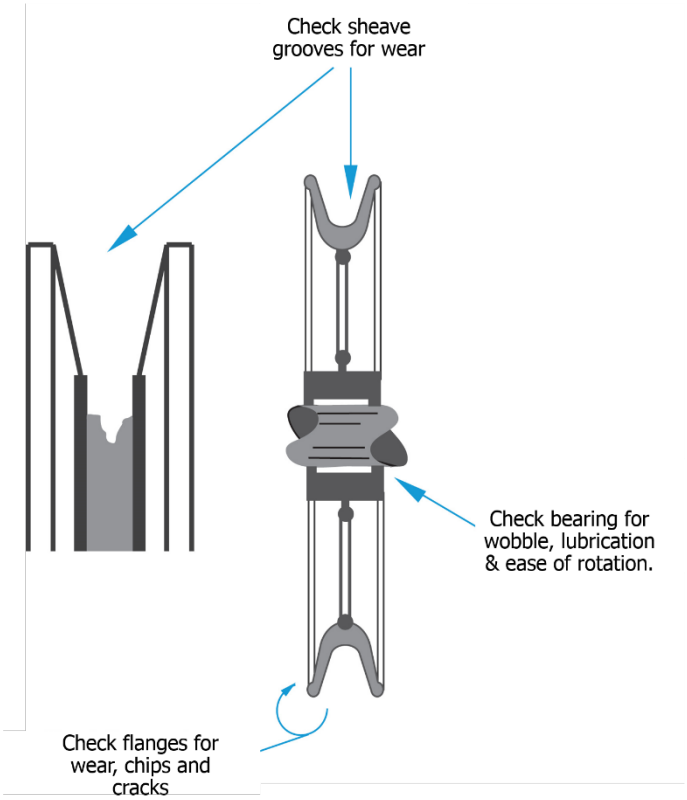

Groove too small. Pinches and abrades the FSWR.

2.2.1.1 Inspection Criteria for Sheaves

When inspecting sheaves you need to check for:

Possible Sheave Defects:	
Cracks or chipping in the flange of the sheave.	Sheave bearing is worn.
Sheave grooves are worn or seized.	Sheave is stretched or damaged in any way.
Sheave is warped or bent out of shape.	Missing safety clips or pins.
Missing WLL marking.	

The sheave block is not safe to use if any of these defects are identified.

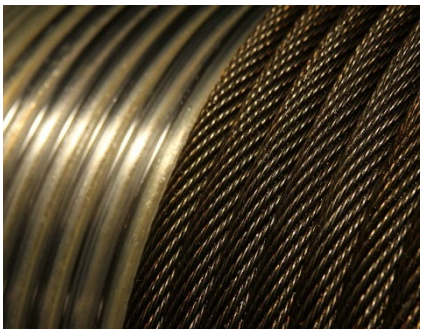


2.2.2 Drums

Drums are the pulling mechanism which rotates, hauls in and stores surplus wire.

The braking mechanism is connected to either the drum or the gearing which is joined to the drive mechanism.

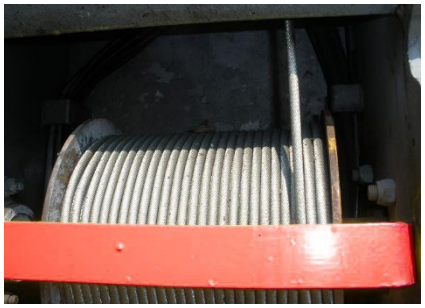
Drums are measured from the centre to the inside of the flange. A drum which measures 1m from flange to flange is therefore a 0.5m drum.



There are 2 types of drum:

- Plain.
- Grooved.

The grooves in a grooved drum need to be a minimum of 1/3 of the rope diameter being wound onto it.



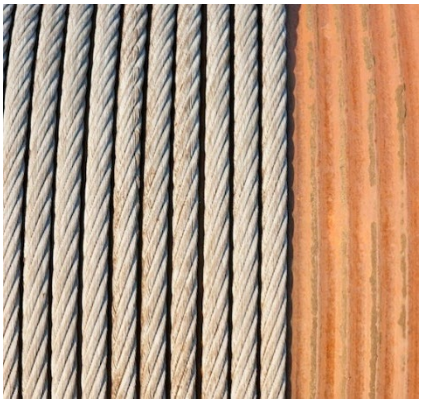
The rope should lay neatly on the drum and not be bunched up. When the load on the hook block is fully lowered, a minimum of two revolutions (full turns) must remain on a non-crane winch drum.

The minimum height of the flanges on an ungrooved/plain drum is 3 times the diameter of the rope, or as otherwise indicated by 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.

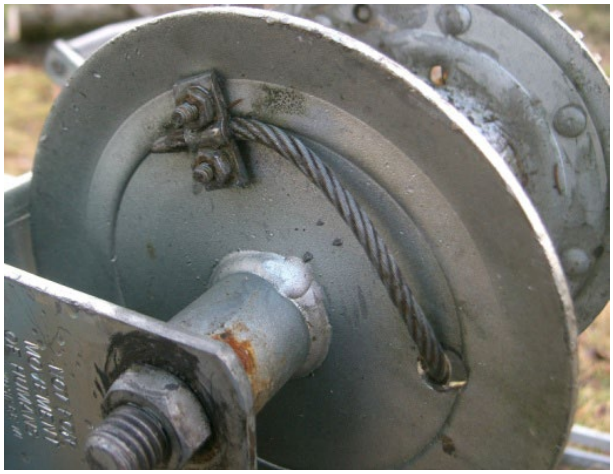
The tail of the wire hoist rope can be secured to the winch drum using anchorage equipment such as:

- Ferrule-secured rope attachments.
- Swaged end fittings.
- Poured sockets.
- Wedge grip capels.
- Wedge-type sockets.
- Wire rope grips.
- Clamp and bolts.

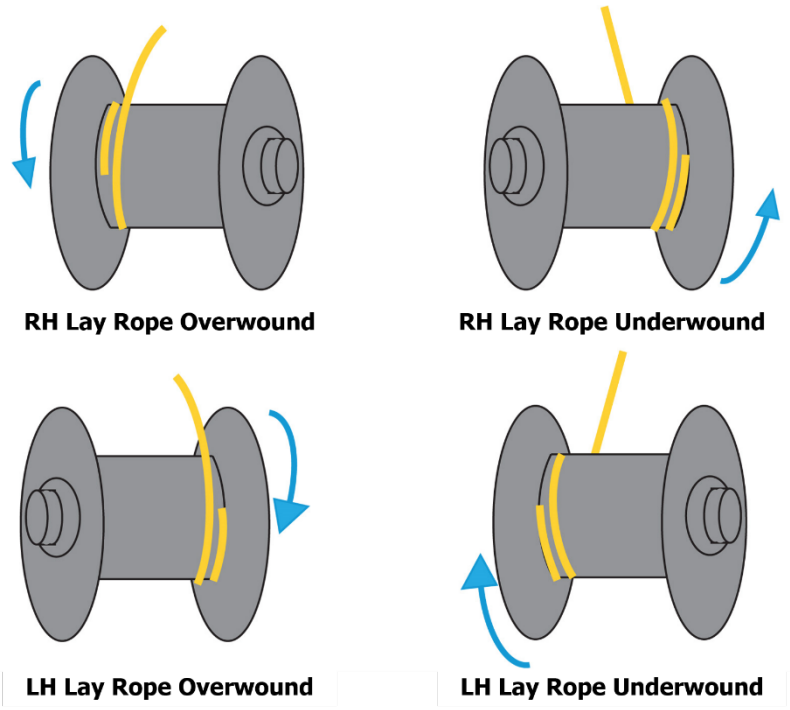


Be aware of the danger of not properly tightening an anchorage. Do not rely on the frictional grip relayed by the two turns on the drum.

Example of a clamp and bolts:

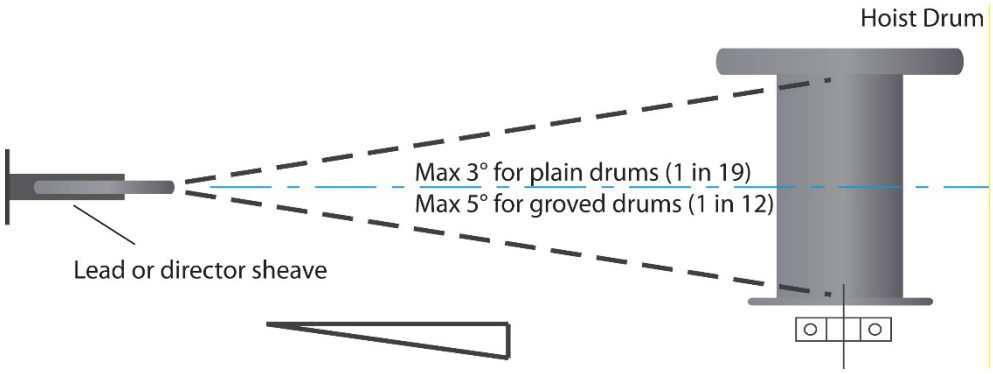


2.2.2.1 Winding Flexible Steel Wire Rope onto a Drum



2.2.2.2 Fleet Angle

The maximum fleet angle is measured from the centre of the drum to the centre of the first diverting sheave then back to the inside flange at the middle of the drum.



The fleet angle needs to be within the correct range for the rope to spool correctly on the hoist drum.

When the fleet angle is **too large** the following can occur:

- Severe wear or damage to the flange of the sheave.
- Wear to the hoist rope.
- Uneven spooling.
- Windings too tight.

When the fleet angle is **too small** you can get poor spooling.

2.2.3 Purchases and Tackles

Purchases and tackles are a series of sheaves with either fibre or wire ropes reeved to gain mechanical advantage.

They can be used with cranes, winches and hoist assemblies.

2.2.3.1 Purchases

Purchases are a series of sheaves reeved up to form a mechanical advantage in the flexible steel wire rope.

Fibre rope can be safely used in a wire rope purchase block.

The minimum groove depth for a wire rope purchase block used in rigging work is 1.5 times the rope diameter.

2.2.3.2 Tackles

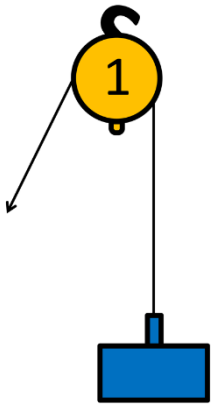
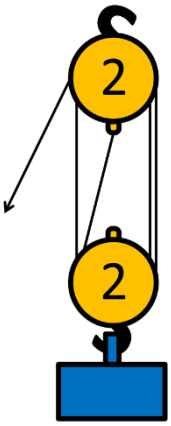
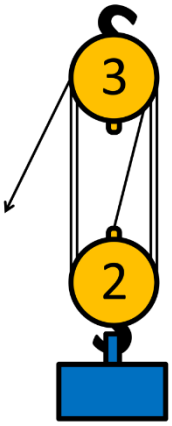
Tackles have fibre rope reeved through sheaves to form a mechanical advantage.

Wire ropes cannot be used in a fibre rope tackle block as they are incompatible (the wire rope does not bend as efficiently as fibre rope).

The minimum groove depth for a tackle is ½ the fibre rope diameter.

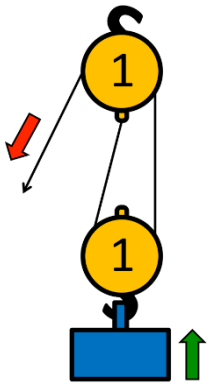
For the same size diameter rope, a purchase sheave will always be larger in diameter than a tackle sheave.

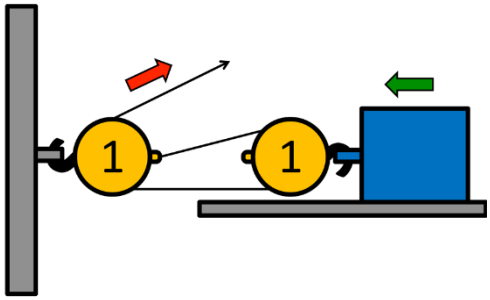
The minimum diameter fibre rope that can be used for lifting a load in a tackle block is 12mm (mechanically) or 16mm (by hand).

Gantline	Gun Tackle	Handy Billy
		
A fibre rope reeved through a single sheave block.	A fibre rope tackle, which uses an upper block with two sheaves and a lower block with two sheaves (two double blocks).	A fibre rope tackle where one block has two sheaves and the other block has three sheaves (double and treble blocks). It is also called 'light gin tackle'.

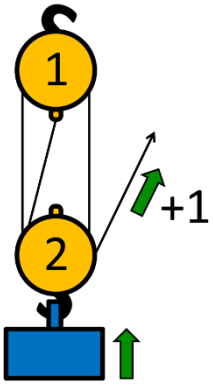
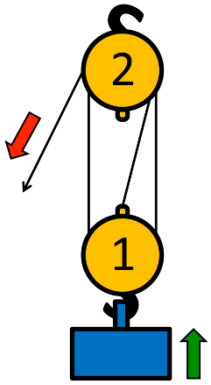
2.2.3.3 Using Sheaves to Gain Mechanical Advantage

Depending on the number of sheaves used in a hook/hoist block configuration, you can gain a significant mechanical advantage with no increase in pulling/hoisting power. In the configurations shown here we can see that there is a mechanical advantage of 2, regardless of whether we are hoisting the load up or hauling the load towards the anchorage:





The way that the rope is reeved through the sheaves can also affect the mechanical advantage. Rope can be reeved to 'advantage' or 'disadvantage' as shown in the 2 examples below:

Example A	Example B
	
Example A shows a series of sheaves reeved to advantage. We can see that 3 parts of line are supporting the load and that the rope is being pulled in the direction of the lifted load. This creates a mechanical advantage, increasing the ratio from 3 to 4.	Example B shows a series of sheaves reeved to disadvantage. Reeved to 'disadvantage' simply means that the rope is going around a sheave that does not add to mechanical advantage, it only adds friction. The same 3 parts of line are being used to hoist the load, however the rope is being pulled in the opposite direction to the lifted load (the direction of the pulling force is reversed). This action configuration is reeved to disadvantage and therefore the mechanical advantage remains at 3.

2.2.4 Types of Access Equipment

Access equipment is used to safely access a work area for any work at heights. These types of equipment often required additional use of safety systems such as work positioning or fall-arrest systems.

Generally, access equipment is made up of a work platform and a means of gaining safe access to the work area.

A work platform should be fixed to a structure for stability and installed with edge protection. It should be fitted so that it can be accessed and exited safely.

The surface should be non-slip, large and strong enough to safely support all the tools, materials and people placed upon it. It should not be fixed at a steep angle.

Work platforms include:

- Scaffolding (e.g. mobile, tower, suspended).
- Elevating work platforms (e.g. boom type, scissor lift or hydraulic lift).
- Mast climbers.
- Workboxes (crane or forklift lifted).

2.2.4.1 Scaffolds

Modular Scaffolds

Tube and Coupler Scaffolds

Hung Scaffolds

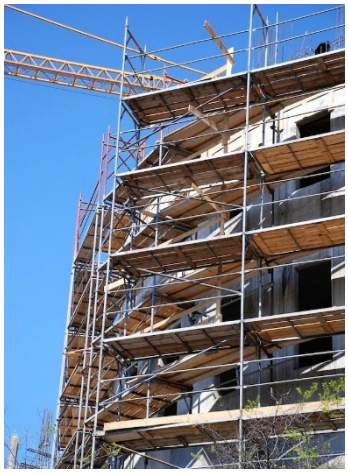
The erection of a scaffold from which a person or object could fall more than 4m must be carried out or directly supervised by a person holding the appropriate level scaffolding high risk work licence.

Hung scaffolds (sometimes known as a swing stage) may also be erected by someone with an advanced level rigging high risk work licence.

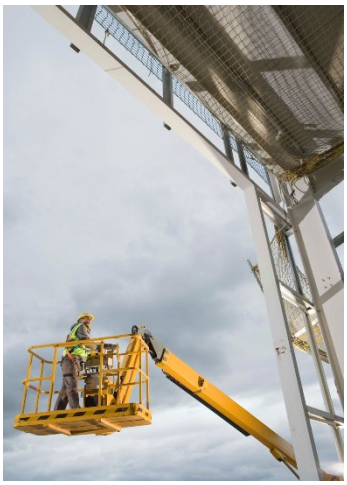
Steel erectors can often make use of scaffolds which have been set up for other work tasks such as wall cladding, bricklaying, concreting, roof work or services installation.

Scaffolds can also be provided specifically for the setting of steel and associated consolidation tasks such as welding, insulation and sheeting.

One of the most common forms of scaffolding used during the erection of low rise portal frame buildings and modern structural design multi-storey construction is mobile prefabricated tower frame scaffolds.



2.2.4.2 Elevating Work Platforms



Elevating work platforms (EWPs) are available in a variety of types and sizes such as boom type, scissor lifts and vertical mast.

When using an EWP it is important that:

- Operators wear a safety harness attached by a lanyard (with energy absorber) of appropriate length to a suitable anchorage point on the platform.
- The operator is adequately trained to use the EWP. A licence is required for the operation of boom type EWPs where the boom length is 11 metres or more.
- The use of the EWP should comply with the Australian Standard AS 2550.10 Cranes – Safe Use – Elevating work platform.
- The EWP has been checked to make sure it is in safe working order.

2.2.4.3 Mast Climbers

Mast climbers are made up of work platforms that are raised and lowered along 1 or more masts using a hoist mechanism.

They may need to be tied to a building under circumstances prescribed by the manufacturer to make sure they remain stable during use.

Mast climbers are generally not suitable for use if the profile of a structure changes at different elevations (e.g. if the upper floors of a building 'step' back or balconies extend from the building).

The erection and dismantling of mast climbing work platforms must be carried out, or be directly supervised, by a person holding an appropriate high risk work rigging or scaffolding licence.

Further information on mast climbing work platforms is provided in AS 2550.16 Cranes – Safe Use – Mast climbing work platforms.

2.2.4.4 Crane Lifted Personnel Boxes/Workboxes

Personnel boxes or workboxes are used to lift workers with a crane.

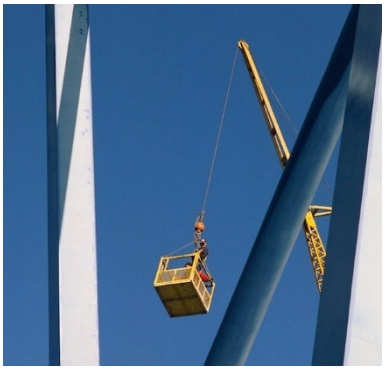
Crane-lifted workboxes are often suitable for very high work or isolated parts of the project where it is difficult or impractical to provide scaffolds or EWPs.

The workbox must be specifically designed for the purpose of lifting people. Its design must be registered with a state or territory regulatory authority and meet all of the necessary requirements of the workplace, crane manufacturer and AS 2550 and AS1418.17.

The workbox and personnel must be securely attached to an approved anchor point (capable of withstanding the force of the box falling). Personnel should be attached via a lanyard and full body harness unless the workbox is enclosed.

The workbox must be stamped or be provided with a stamped metal data plate, securely and permanently attached to it in a prominent position, and providing the following information:

- The maximum hoisted load (kilograms).
- The rated capacity (kilograms).
- The tare mass (kilograms).
- Minimum allowable (rated) crane capacity (kilograms).



2.2.5 Inspection of Associated Plant and Equipment

All rigging and associated equipment must be inspected before use.

Rigging equipment, such as scaffolds and plant, needs to be inspected by a competent and licenced person before they are used.

Plant and equipment, such as elevating work platforms, mast climbers or cranes, needs to be checked daily before use to make sure all items are working properly. These checks need to be completed by a person licenced to operate that equipment.

All other rigging equipment (where applicable) such as personnel boxes/ workboxes, cantilevered crane loading platforms and safety screens and shutters also need to be inspected before any work is carried out.

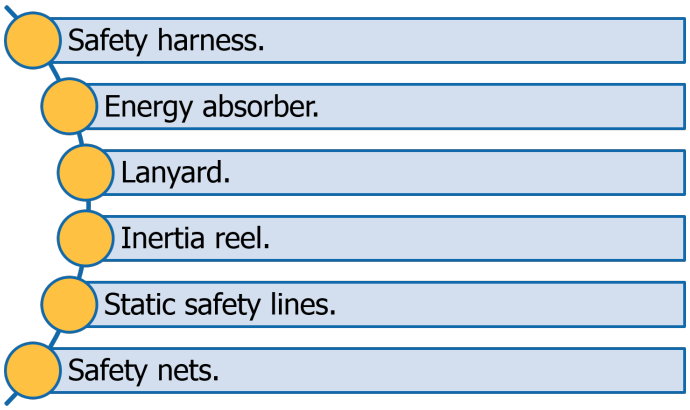
An accurate record must be kept of all checks and maintenance that is carried out on plant and equipment. Most sites have workplace forms, logbooks or checklists for writing down details of all equipment maintenance work. They are used to record the history of the equipment so that all operations and any problems can be monitored. They are also a way of making sure that all repairs and maintenance are done correctly and on time.

Equipment is often tagged to let you know that it has been checked by an experienced and authorised person and is safe to use. Some organisations use a range of tags in different colours to identify the time that a piece of equipment was last checked.

2.3 Inspect Safety Equipment

All safety equipment needs to be inspected for serviceability before you start the rigging work.

Safety equipment includes:



All harnesses and appropriate attachments need to be inspected in accordance with AS 1891.

2.3.1 Inspect Fall-Arrest Harness

A fall-arrest harness must be inspected before use. Common defects that will condemn a safety harness from use are:

- Fraying.
- Splitting.
- Chemical, UV or heat damage.
- Out of date.
- No current inspection tag.
- Any obvious signs of damage to any part of the harness.

Lanyards used as part of the fall arrest system should also be inspected for the same defects. If any of the above defects are identified on either the fall arrest harness or the lanyard, they should not be used.

Shown here are some examples of things you need to check the harness for:

Component	Condition/Fault to be Checked
Webbing	◆ Cuts or tears. ◆ Abrasion damage. ◆ Excessive stretching. ◆ Damage due to contact with heat, corrosives or solvents. ◆ Deterioration due to rotting, mildew, or ultraviolet exposure.
Snap Hooks	◆ Distortion of hook or latch. ◆ Cracks or forging folds. ◆ Wear at swivels and latch pivot pin. ◆ Open rollers. ◆ Free movement of the latch over its full travel. ◆ Broken, weak or misplaced latch springs (compare if possible with a new snap hook). ◆ Free from dirt or other obstructions, e.g. rust.
D-rings	◆ Excessive 'vertical' movement of the straight portion of the D-ring at its attachment point of the belt, so that the corners between the straight and curved sections of the D become completely exposed. NOTE: Excessive vertical movements of the D-ring in its mounting can allow the nose of larger snap hooks to become lodged behind the straight portion of the D, in which position the snap hook can often accidently 'roll out' of the D under load. ◆ Cracks, especially at the intersection of the straight and curved portions. ◆ Distortion or other physical damage of the D-ring. ◆ Excessive loss of cross-section due to wear.
Buckles and Adjusters	◆ Distortion or other physical damage. ◆ Cracks and forging laps where applicable. ◆ Bent tongues. ◆ Open rollers.
Stitching	◆ Broken, cut or worn threads. ◆ Damage or weakening of threads due to contact with heat, corrosives, solvents or mildew.

2.3.2 Inspect Inertia Reel

Shown here are some examples of things you need to check an inertia reel for:

Component	Condition/Fault to be Checked
Rope (Fully extend rewind drum anchorages)	◆ Cuts. ◆ Abrasions or fraying. ◆ Stretching. ◆ Damage due to contact with heat, corrosives, or solvents. ◆ Excessive dirt or grease impregnation. ◆ With rewind anchorages give a firm pull with the rope fully extended to check that the rope end is securely anchored to the drum.
Anchorage Body	*a) Mounting ring:* ◆ Physical damage or wear, especially at any pivot points. ◆ Cracks, especially in corners. ◆ Mounting security. *b) Anchorages body proper:* ◆ Physical damage such as significant dents, distortion, or corrosion. ◆ As far as possible, but without dismantling, check for the entry of foreign bodies such as small stones. ◆ Loose or missing screws, nuts or similar objects (external check only). ◆ Position of the clutch compression indicator button (fitted only to rewind drums with steel rope).
Locking Mechanisms and Rope Guides	◆ Check externally visible rope guides for excessive wear or ridging. ◆ Check that the rope-locking mechanism locks and holds securely when the rope is given a sharp tug. ◆ Ensure that the rope runs freely through the anchorage with no tendency to stick or bind, and that on rewind drum anchorages the rope rewinds completely without loss of tension.
Hardware	◆ Examine the condition and locking action of any associated snap hooks or links.

2.3.3 Inspect Static Line Components

The parts of a static line need to be checked before installation and periodically while the system is in use. You should be checking for faults such as:

Component	Condition/Fault to be Checked
FSWR	◆ Kinks or fractures from bending or reeving. ◆ Crushed or damaged strands. ◆ Damaged splice. ◆ Exposure to high temperatures. ◆ Wear and abrasion. ◆ Broken wires. ◆ Damage to the ferrule. ◆ Damage to the eye. ◆ Damage to the thimble. ◆ Core collapse. ◆ Bird-caging where strands loosen from their proper tight lay. ◆ High stranding. ◆ Corrosion indicated by loose springy wires. ◆ Knotting. ◆ More than 10% wear in the diameter of the rope. ◆ Broken wires exceeding the allowable limit.
Anchors and Connectors	◆ Damage. ◆ Wear. ◆ Irregular or excessive movement. ◆ Security of parts. ◆ Capacity markings or information are present. ◆ Any indication that the component may fail during use.

2.3.4 Inspect Safety Nets

Before installing a safety net you need to make sure it is in safe working condition.

Common faults to check for are:

- UV or heat damage.
- Stretching.
- Frayed fibres.
- Missing identification tag.
- Out of date.

If any of these faults are identified, the safety net should be deemed unsafe and should not be installed.

You also need to check the safety net to make sure that it has been used, handled and stored correctly. You should look for any signs that may indicate the following:

- Dragging the net over rough surfaces or edges.
- Contact of cords with sharp edges.
- Stacking of materials on net.
- Accumulation of debris in the net.
- Indications of people jumping or throwing objects into the net.
- Indications of contact with flames or sparks from welding or oxy-cutting equipment.
- Contact with hot gasses from blowtorches.
- Contact with hot ashes from chimneys or furnaces.
- Chemical attack.
- Damage to the supporting framework from collisions or being struck by moving loads.
- Incorrect installation practices.

If the safety net shows signs of any of the above practices it should not be used.

2.4 Identify Faulty Equipment

If you identify any equipment that is defective, damaged or faulty you must not use it. Follow all procedures for reporting and isolating faulty equipment.

2.4.1 Report all Defects and Isolate Faulty Equipment

Faulty equipment needs to be isolated from use to stop anybody from accidentally using it and the defect needs to be reported to an authorised person.

Make sure you complete any isolation procedures as required.

This may include tagging or locking out equipment and completing fault reports or other documentation.

Faulty lifting equipment may need to be labelled and rejected, destroyed or returned to the manufacturer for repair (depending on the type and severity of the fault).

2.5 Select and Check Communication Equipment

It is important that the two-way system provides clear signals without any interference on the channel.

Make sure all equipment is working properly and that you can communicate with the crane or hoist operator clearly **BEFORE** you start the job. Do not use any communication equipment that is not consistently working properly. Check that there is no interference on the channel.

The two types of two-way radio are conventional and fixed channel.

2.5.1 Conventional Radio

Great care must be taken when allocating frequencies/channels to make sure that there are no other operators using the same frequency in the area.

Interference on your frequency can be a safety hazard. Stop work until the radio is checked or a new frequency selected and allocated.

2.5.2 Fixed Channel Radio

Fixed channel radio is a computer-controlled two-way system that locks other radio users out of your selected frequency.

With fixed channel radio it is possible to have several separate groups on one site communicating by radio without interfering with each other.

Fixed channel radio is recommended for large sites.

3.1 Set Up for the Task

You need to make sure everything is set up correctly so that you can carry out the rigging work safely and efficiently. Planning and preparation are essential to conducting the work safely and on schedule.

This includes:

- Applying hazard control measures to the site.
- Checking ground suitability.
- Reviewing site information.
- Positioning rigging equipment and associated plant.

3.1.1 Apply Hazard Control Measures

Part of preparing the site includes setting up any hazard controls.

This might include:

- Setting up barricades to keep traffic and pedestrians outside of the work area.
- Setting up extra lighting or safety shutters/screens.
- Having power lines insulated or disconnected.

If a structure or plant is required to be moved or erected over a pedestrian walkway/footpath you will need to implement appropriate control measures such as:

- Warning signs and barriers to restrict access or direct foot traffic.
- Overhead protection to prevent anything falling on somebody such as scaffolds or gantries.
- Pedestrian exclusion zones.

Some hazards are caused by the work being done so you may need to move obstructions such as equipment, materials or debris, or install trench covers if working near excavations.

Always wear the required PPE for the job. Make sure that any control measures are consistent with workplace and safety standards. If you are unsure what the required PPE is, check with your WHS officer or supervisor.

3.1.2 Check Ground Suitability

Before setting up any equipment or plant you will need to consult with relevant personnel, such as an engineer, to find out the ground or surface bearing capacity and to make sure the ground will support the weight of the equipment and load. All rigging tasks need to be carried out on a firm surface that is going to be able to support any structures or the completion of the task.

The plant could become unstable during operation if the ground is rough, uneven or soft. Backfilled trenches may not have compacted completely and are dangerous to set up the equipment on.

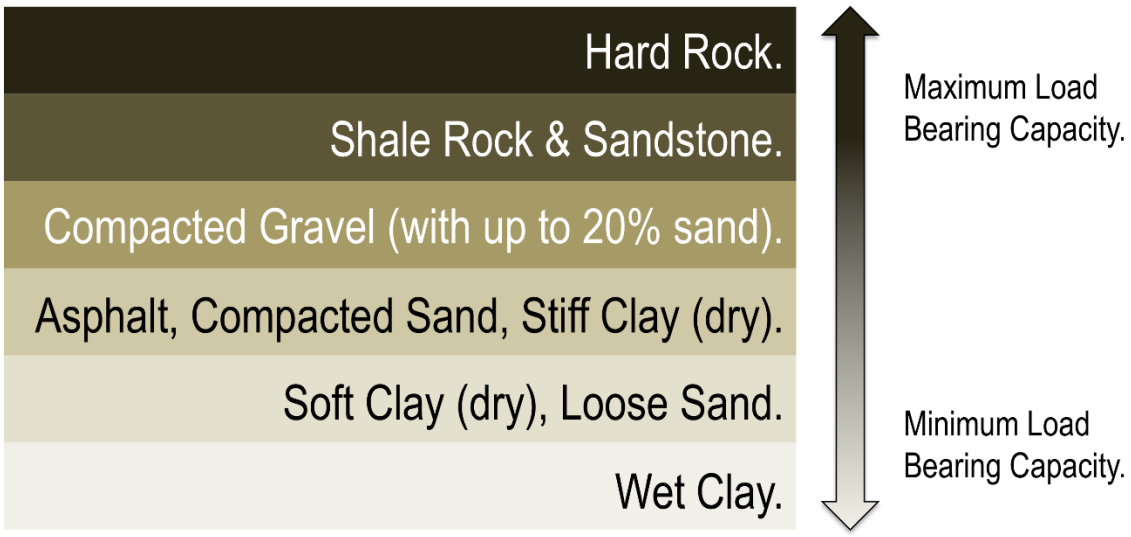
Check to make sure there are no underground services running through the area where you plan to set up the plant.

The pressure of the equipment could cause damage to the underground services/pipes/cables.

You may need to use packing or mats under the outriggers to make the equipment stable on soft ground.

You will need to establish the ground stability by referring to a soil report from an engineer.

Different ground and soil types have different load bearing pressures depending on how firm or dense they are:



You must also check the load bearing limits of suspended concrete floors, building roofs and landings if loads or pieces of equipment are going to be resting on them.

3.1.3 Review Site Information

Talk to other associated personnel such as your supervisor, doggers, other riggers and crane operators to review the site information and make sure you have properly selected and set up the equipment needed to carry out the job safely. If you have further questions, you may also need to consult with a site engineer.

You need to make sure all equipment is being placed or set up in the correct position for the work to be conducted. You may also need to make sure that the timeline for the job does not have you interfering with other work that is being conducted on the site.

All work must be in keeping with safety standards and workplace rules to ensure the safety of all personnel.

All structures and associated plant that are being erected as part of the rigging work need to be carried out according to procedures and site information.

Procedures and site information includes:

- Local conditions including access and egress.
- Work Method Statements.
- Site-specific Job Safety Analyses.
- Task plans.
- Work schedules.
- Structural plans.
- Manufacturer's instructions for plant and equipment use.
- Equipment service and maintenance records.
- Permits and certifications.
- Emergency response procedures.

3.1.4 Assess Structure for Suitability

An assessment of the structure will need to be carried out before any work begins. You will need to consult with relevant personnel, such as a site engineer, to ensure that the structure has been assessed as appropriate for the load bearing task.

3.1.5 Determine Forces and Loads

You also need to determine all forces and loads associated with the erecting and dismantling of structures and associated plant to make sure rigging equipment is set up correctly.

This includes working out the weights of plant and equipment, and the additional weight of loads as they are moved around the site.

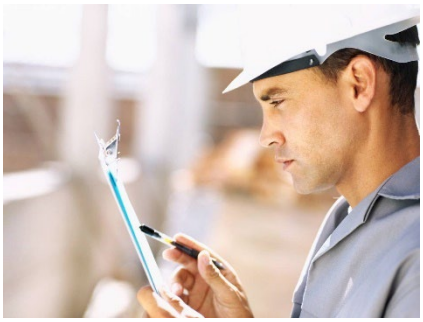
You will also need to consider wind loads if you are working on a particularly windy day.

Check the manufacturer's specifications for all plant and equipment to locate their wind rating.

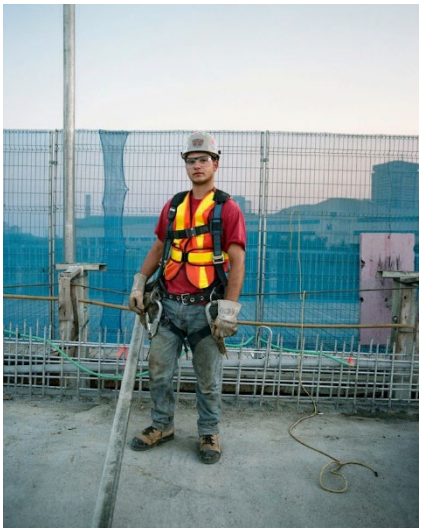
It is extremely dangerous to operate some equipment in high winds, especially when shifting loads.

Once these forces and loads have been determined you are able to make sure that:

1. Any hoists or winches are configured correctly.
2. Lifting equipment and/or load locations (e.g. ground, scaffolds or suspended floors) are capable of handling the load.
3. All associated plant and equipment is capable and appropriate for completing the task.



3.1.6 Fit Safety Equipment



All safety equipment needs to be fitted before starting the rigging work.

You need to make sure it is appropriate for the task and that it fits you correctly.

Never begin a rigging task without the appropriate safety equipment.

Safety systems (such as static lines, work positioning systems and fall-arrest systems) and some plant and equipment (such as elevating work platforms and crane-lifted personnel boxes/workboxes) require the use of a full body fall-arrest harness and installed anchor points.

Safety equipment also includes personal protective equipment (PPE).

Always make sure you are wearing the correct PPE for the task and worksite.

Generally at a minimum this would include:

- Hard hat/safety helmet.
- Safety gloves.
- Steel-capped work boots.
- High-visibility clothing.

Make sure any piece of PPE you are wearing is in safe working condition and is suitable for the job.

If you find any item of PPE that is not in serviceable condition, tag it and remove it from service. Report the fault to your supervisor who will organise the repair or replacement of the PPE.

Check for signage on site or talk to a manager or supervisor if you are unsure of the PPE requirements for the site.

3.1.7 Position Rigging Equipment and Associated Plant

Any equipment and plant that you will be using throughout the rigging work needs to be correctly and safely positioned. This could include positioning hoists or mast climbers or moving equipment into position where it can be safely accessed.

It also includes coordinating resources so that you have everything that you need in or close to the work area. This will allow you to erect, install or disassemble plant and equipment without having to continuously leave the work area, or disrupt operations that may be taking place elsewhere on the worksite.

By planning out the best way to move and position the required tools and equipment, you will reduce the risk of performing unsafe operations or actions on site. For example, the falling of objects or the unsafe carrying of equipment on ladders.

3.2 Temporary Connections

Temporary connections are required frequently during rigging. There are a number of different ways of applying temporary connections.

3.2.1 Applying Temporary Connections

Temporary connections include knots, bends, hitches, splicing and whipping. These are used to secure equipment and loads, and to control the movement and placement of loads with taglines.

As a rigger it is important that you know how to tie a number of knots, bends and hitches and that you are able to slice ropes together or splice ropes to create a safe rope termination (such as an eye or a back splice).

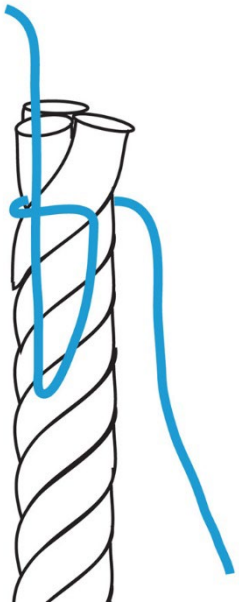
3.2.1.1 Fibre Rope Splices

Splices are the weaving of rope fibres to create connections and terminations in the ends of ropes. They include:

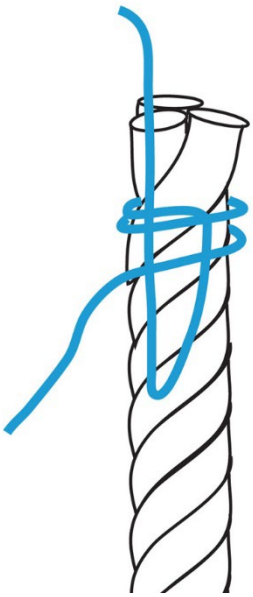
Short Splice	Back or End Splice	Eye Splice
		

Step-by-step directions for these splices can be found at https://www.animatedknots.com/

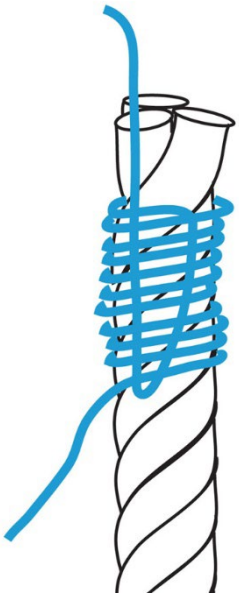
3.2.1.2 Common Whipping



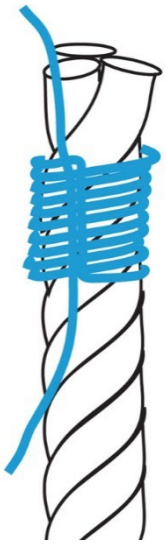
1. Form a loop facing away from the end of the rope, leaving one short end and one long end of whipping twine.



2. Pass the long end of the twine over the short end and around the rope.



3. Keep passing the twine around the rope until the correct length is achieved. Pass the long end of the twine through the loop.

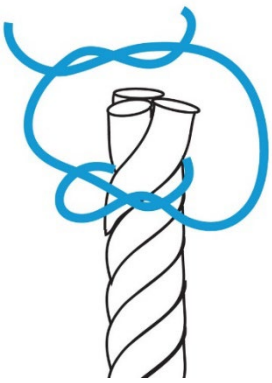


4. Pull the short end of the twine until the long end is buried about half way under the whipping. Now pull each end of the twine with equal strength until the whipping is tight. Trim off the loose ends.

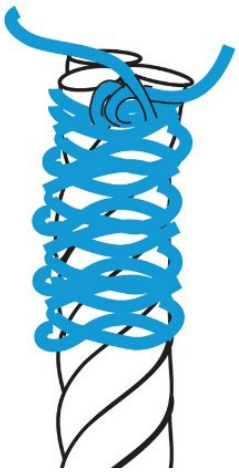
3.2.1.3 West Countryman's Whipping

1. Take a turn around the rope with the twine and form the first overhand knot, ensuring that the two ends of twine left are of roughly equal length.

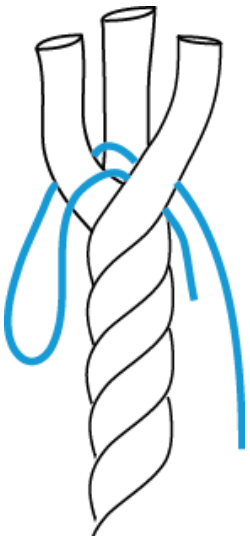
2. Take another half turn around the rope with each length of twine and form a second overhand knot on the other side of the rope.

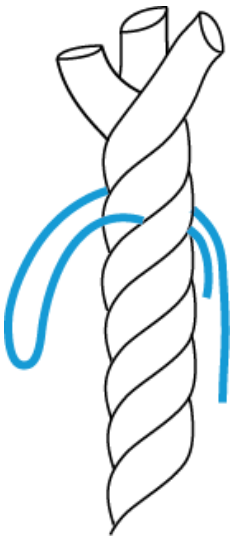


3. Continue tying overhand knots in such a way that the knots alternate all the way up the rope. Finish off with a reef knot – in other words, two overhand knots, one on top of the other.



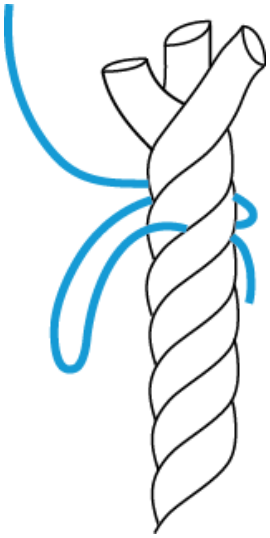
3.2.1.4 Sailmakers' Whipping

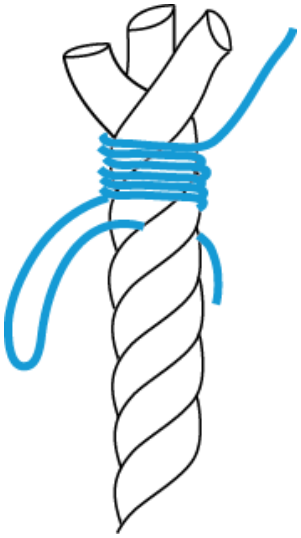




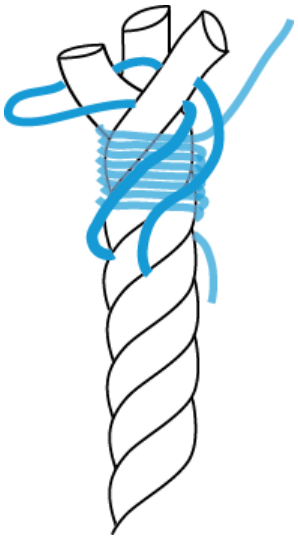
1. Un-lay the rope for about 50mm and form a loop around a strand with the whipping twine. The two ends of the twine should emerge together opposite the strand with the loop.

2. Lay the rope back up and adjust the twine so that the loop and one end of twine are approximately 100mm in length. The other end should be about 400mm in length.

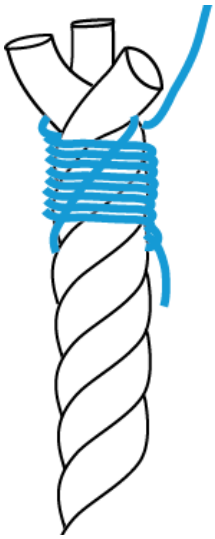




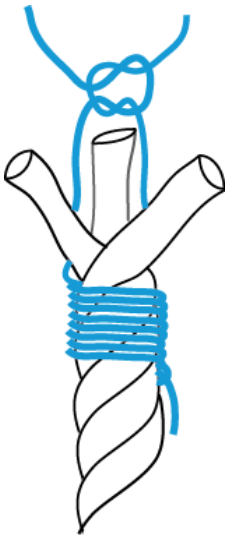
3. Holding the loop and short end of the twine with the rope in one hand, use the other hand to wind the long end of twine around the rope away from the loop and short end of twine.



4. Pass the loop around the end of the strand in such a way that the twine rests in the space between the strands.



5. Tighten the loop by pulling the short end of the twine.



6. Now follow the groove left between the strands with the short end of twine and join the ends of twine with a reef knot in the middle of the rope.

3.2.1.5 Double Bowline

Works the same as a single bowline, but offers more stability for longer loads.

1. Make a loop with the rope.

2. Make a second loop, over the top of the first.

3. Pass the end of the rope under both loops and through the centre.

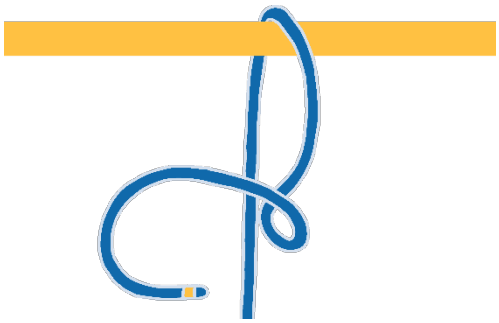
4. Pass it behind the standing part.

5. Pass it back through the centre and under the two loops.

6. Tighten the double bowline around the standing end ensuring a large loop remains below the knot.

3.2.1.6 Running Bowline

Used for making a temporary eye to run along another part of rope.

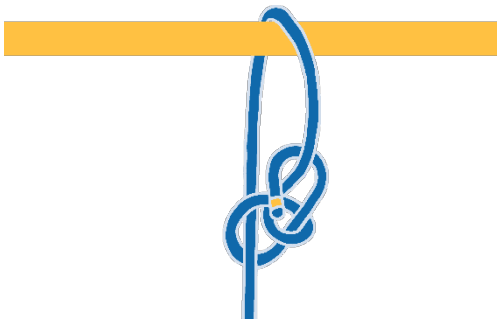


1. Pass the rope over the pole. Form a loop in the tail.

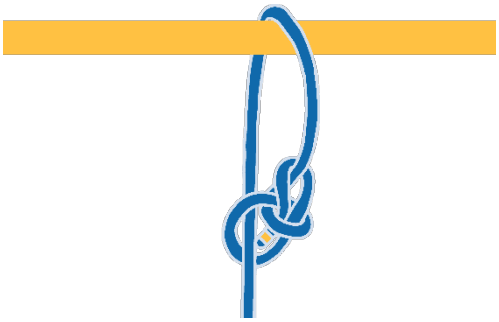
2. Pass the short end around the standing end.

3. Pass it through the loop.

4. Pass it around itself.



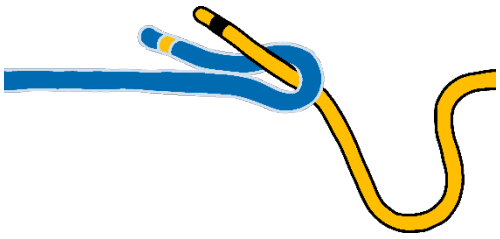
5. Pass it back through the loop.



6. Once the bowline has been formed, pull on the standing end to run the bowline up against the pole.

3.2.1.7 Sheet Bend to Another Rope

Used to join two dry ropes of different sizes. Safer when a double sheet bend is used. The smaller rope must be bent around the larger rope.



1. Form a bight (loop) in the first rope and hold in one hand.

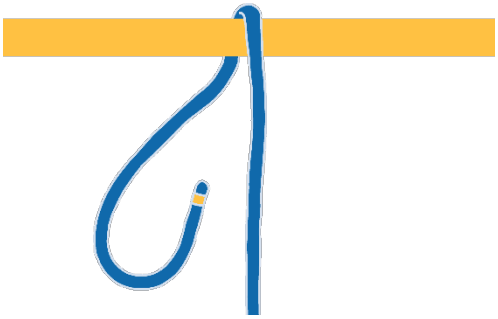
2. Pass the second rope through the loop.

3. Pass the second rope behind the first.

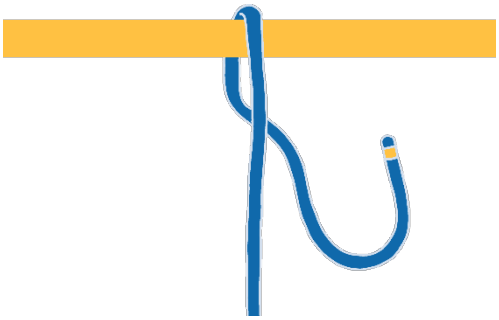
4. Tuck the second rope under itself in the centre of the knot.

3.2.1.8 Becket Hitch

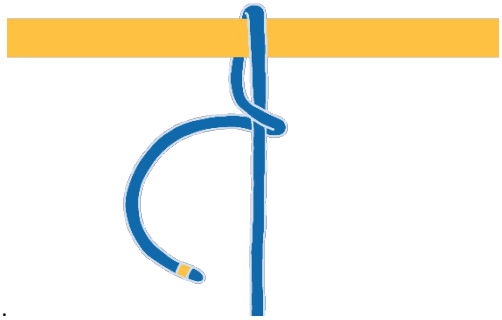
Used to secure the ends of tackles to beckets. Foolproof – cannot come undone like half hitches.



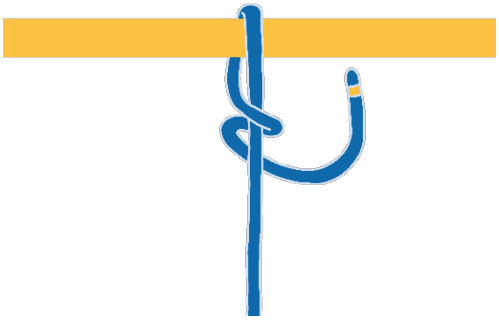
1. Pass the rope over the becket.



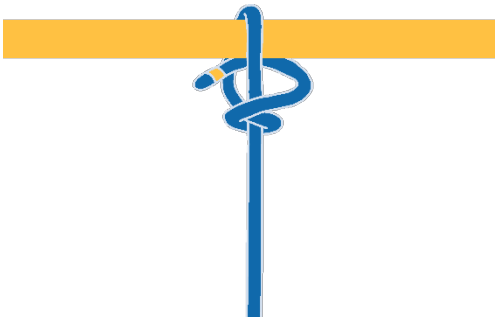
2. Pass the rope behind the standing end creating a loop.



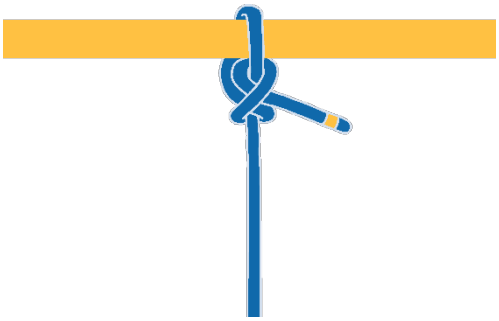
3. Loop the rope around the standing end.



4. Bring the end up towards the becket from behind the standing end.

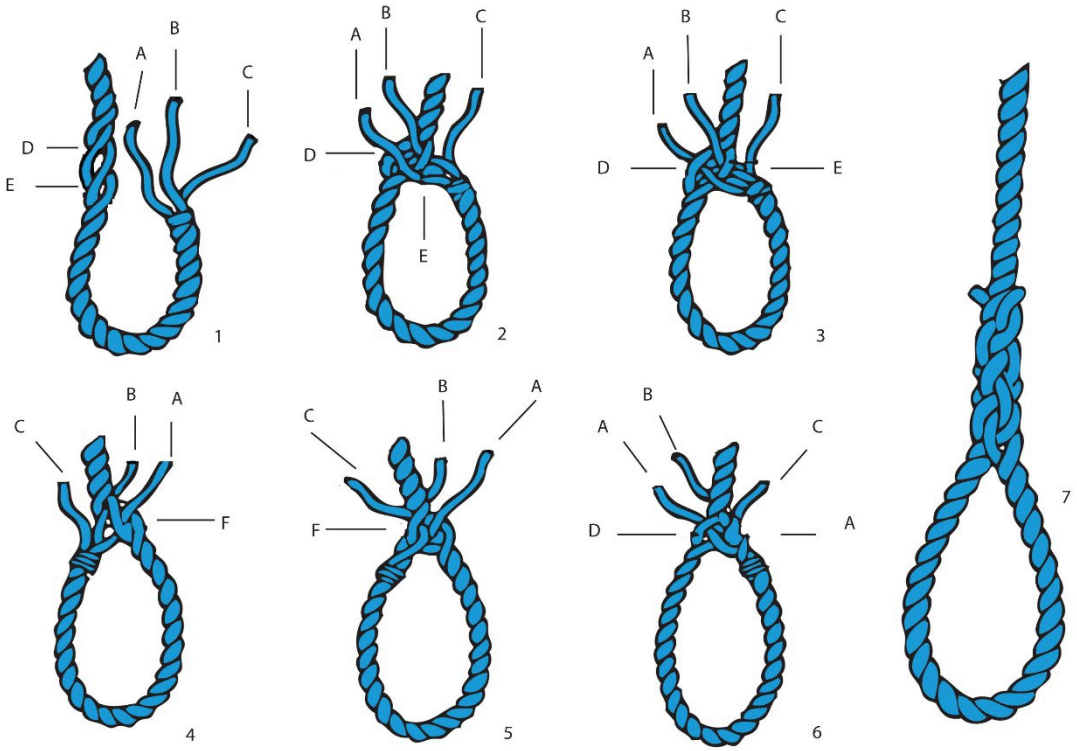


5. Pass the end through the loop and behind the standing end under the becket creating a figure 8.



6. Pass the end over the standing end and under the figure 8 and pull the hitch tight.

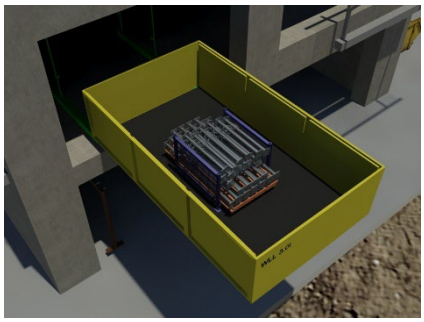
3.2.1.9 Eye Splice



3.3 Erect and Dismantle Structures and Plant

Once all necessary preparations have been made and you are confident that you understand the requirements and scope of the task, you may begin erecting or dismantling structures and plant.

3.3.1 Rigging Tasks



As a rigger with a basic level HRW licence tasks may include:

- Installation of a fall-arrest or work positioning system (including the use of a fall-arrest harness).
- Installation and removal of a cantilevered crane loading platform.
- Installing a safety net.
- Installation and removal of a shutter or safety screen.
- Working at heights.
- Erection or dismantling of structural steel.
- Installation, movement, placement, stabilising and removal of precast panels.
- Setting up a winch for load movement.
- Setting up a materials hoist.
- Setting up a mast climber.

While we will look at each of these tasks individually, you will commonly perform a number of these tasks together in order to complete a rigging task.

For example, while erecting structural steel you will likely also be working at heights, using a fall-arrest harness and work positioning system, and installing a safety net.

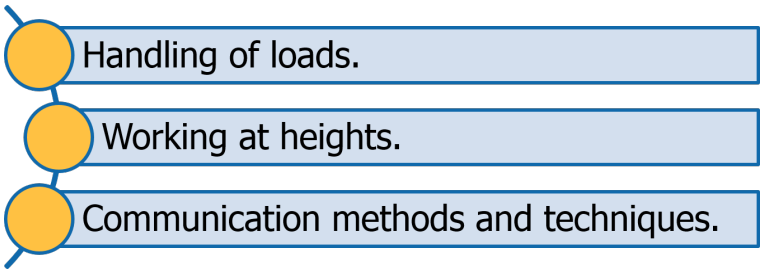
3.3.2 Conducting Rigging Work Safely

Riggers are capable of performing a large number of tasks in a wide range of working environments. As a rigger it is important that you are aware of the general safety requirements that come with such a wide range of tasks.

Throughout all rigging operations make sure all work is carried out according to procedures and standards to maintain the safety of all personnel.

Always refer to organisational and workplace standards, requirements, policies and procedures for rigging. Beyond that, it is important to be aware of commonwealth, state and territory WHS legislation, standards and codes of practice for undertaking rigging activities.

Each job you complete will have a range of factors that need to be considered including:



Planning how you will approach each of these areas is vital to conducting your work safely.

3.3.2.1 Load Handling

Riggers can be responsible for assisting with load handling for crane and hoist operators. When lifting unique or special loads you may need to determine:

- If any stress points exist.
- If there are specific, purpose-designed lifting points.
- The centre of gravity of the load.
- The spread of the load.
- Any specialised slinging requirements.
- Any lifting or landing requirements.

All of this information can be obtained from the manufacturer's specifications or from engineering reports.

Load stability is extremely important to ensure the safety of workers in the area, the load and the load destination.

In order to ensure that the load is stable before lifting it you will need to make sure the load and slings are secure.

It is also important that the slinging method is appropriate for the load during the shift, and that any lifting gear can be removed safely once it has landed.

You need to consider the path of movement for the load and make sure that there is enough clear, unobstructed space to carry out the lift, all the way to the load destination.

If the load destination is a platform such as a suspended floor, temporary formwork or falsework, you will need to ensure that it can handle the weight of the load when it is landed. This information can be obtained from the site information and engineer's reports.

3.3.2.2 Working Safely at Heights

Working at heights includes any situation where a worker, or other nearby person, is exposed to a risk of falling (from one level to another) that is likely to cause injury to the worker or person.

Generally this includes:

- Work conducted in or on plant or a structure that is at an elevated level.
- Work conducted in or on plant that is being used to gain access to an elevated level.
- Work conducted near an opening through which a person could fall.
- Work conducted near an edge over which a person could fall.
- Work conducted on or near a surface through which a person could fall.
- Work conducted on or near a slippery, sloping or unstable surface.

In short, working at heights can be dangerous. Even with the use of safety equipment there is still a danger working up high. Wherever possible an alternative to working at heights should be found.

Where working at heights is unavoidable, safety equipment must be used to prevent personnel and materials falling from a height. Fall arrest systems are suitable for situations where other risk controls will not provide adequate protection from harm.

Do not ever work on the open framework of a structure without fall protection systems in place.

The area below the work should be barricaded or fenced off to prevent unauthorised access by other workers or the general public.

Where this is not possible, overhead protection decks such as temporary gantries, covered ways, cantilevered catch platforms, perimeter safety screens or debris/safety nets may need to be installed.

You need to be aware of the dangers that exist with working at heights. Some conditions can affect the work surface you are on.

Timber, concrete or steel can become very slippery if they are wet, painted or moisture-covered, increasing the chance of a fall.

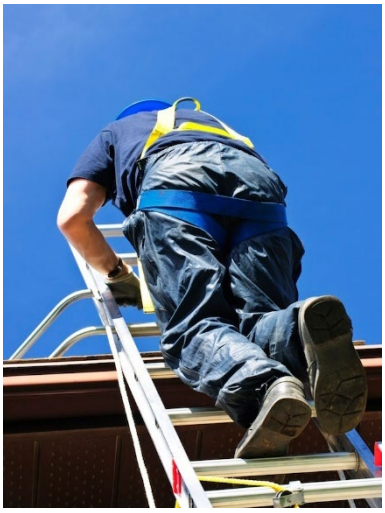
When working at heights:

- Make sure that the work area is kept clean and tidy. Rubbish should be removed regularly in a safe manner. Do not throw rubbish down from the work area to the ground.
- Keep access ways clear of materials, tools and equipment.

3.3.2.3 Working on a Portable Ladder

Portable ladders are available in two grades – Industrial and Domestic.

Never use a domestic grade ladder for industrial use because it is not required to be as robust and strong as an industrial grade ladder.



Do not use a ladder with any of the following faults:

- Timber stiles warped, splintered, cracked or bruised.
- Metal stiles twisted, bent, kinked, crushed or with cracked welds or damaged feet.
- Rungs, steps, treads or top plates which are missing, worn, damaged or loose.
- Tie rods missing, broken or loose.
- Ropes, braces or brackets which are missing, broken or worn.
- Timber members which, apart from narrow identification bands, are covered with opaque paint or other treatment that could disguise faults in the timber.

Whenever using a portable ladder, always keep the ladder positioned at an angle of 75 degrees or 4:1 vertical to horizontal ratio (e.g. 4m up = 1m out).

The ladder should be secured at the top and bottom.

Your feet should never be higher than 900mm from the top of a single or extension ladder, or the third tread from the top plate of a step ladder.

Depending on the type of work, you may be required to use a fall prevention system that is connected to a ladder.

3.3.2.4 Be Aware of Changing Weather Conditions

It is important that you remain aware of changing weather conditions so that you can adjust your operating methods and techniques where appropriate, or stop work altogether if necessary.

Sudden strong gusts of wind may cause workers to lose their balance or cause materials or equipment to be swept over the edge of the work area.

Rain may cause the surface of the work area to become slippery.

3.3.2.5 Communications

Make sure you select the most appropriate communication equipment and methods to co-ordinate the rigging task.

This communication could be between you and plant operators, or other associated personnel.

Riggers must give crane or hoist operators clear signals when directing crane movements. The noise of the crane motor and distortion over the radio can make it difficult to hear directions.

Talk to the personnel you are working with and select the best method of communication.

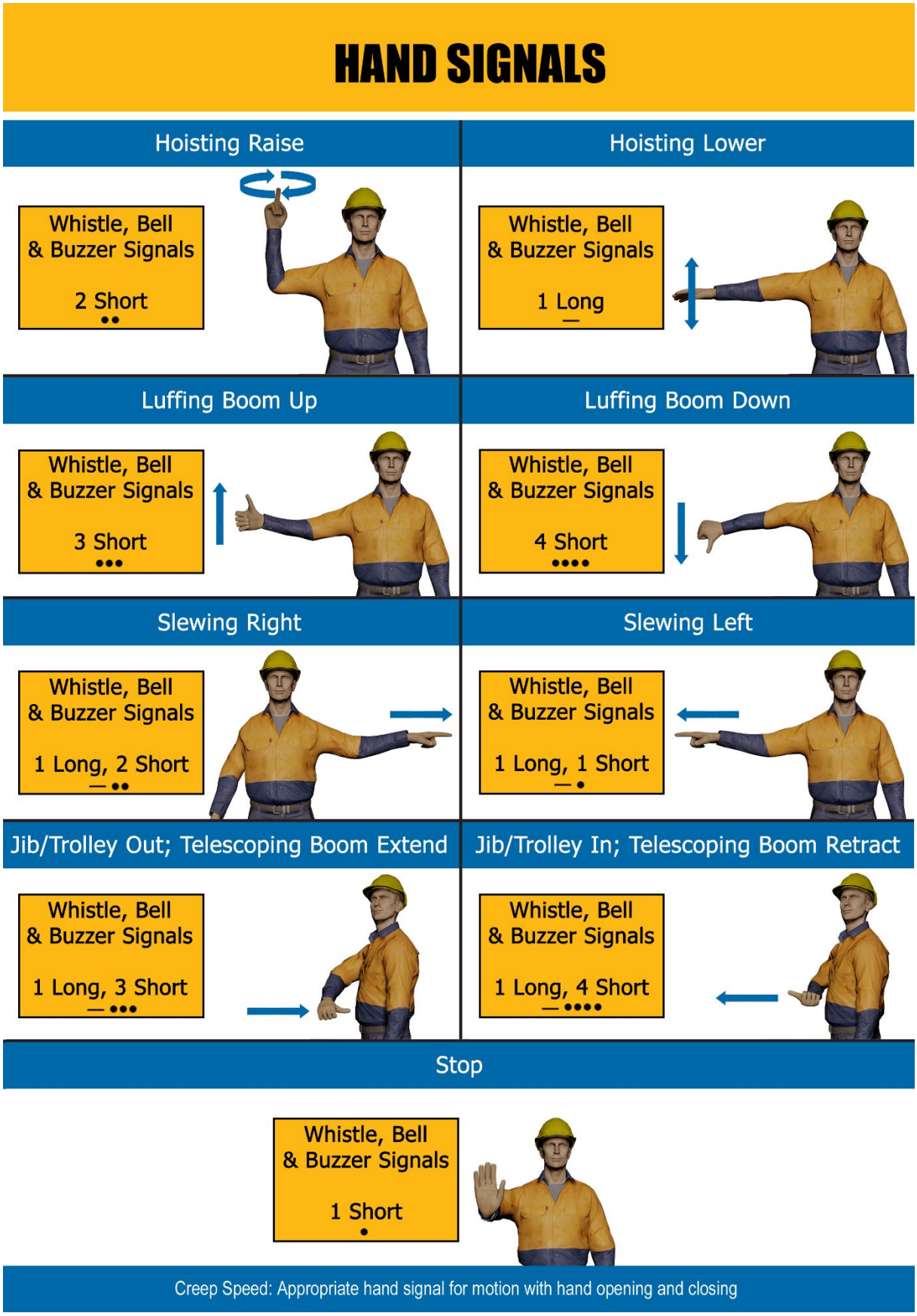
- Hand signals should be used only when the crane operator is always in direct view of the rigger.
- Whistle signals may be used if the crane operator is in or out of view of the rigger.
- Fixed channel two-way radios should be used if:
  - Hand signals can't be seen.
  - Whistle signals cannot be heard or they may be confused with other whistle signals where multiple cranes are in use in the area.
  - It is more efficient than other methods.

The following are the standard directions for crane operators:

Direction Outcome	Verbal Direction to Use
Hook Movement	'Hook up' and 'Hook down'.
Boom Movement	'Boom up' and 'Boom down', 'Boom extend' and 'Boom retract'.
Slewing	'Slew left' and 'Slew right'.
OK to Raise	'All clear'.
Do Not Move	'Stop'.

Speak clearly and say the name of the part of the crane to be moved first – then the direction of movement.

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



3.3.3 Installing a Static Line

There are many types of fall-arrest systems available. One of the most common types associated with rigging operations is called a 'Static Line'.

Static lines are horizontal lines to which a lanyard may be attached and which is designed to arrest a free fall.

These provide a suitable anchor point for a fall-arrest system, while still allowing a limited range of movement along the path of the line.

To install a static line you may need:

- Turnbuckles.
- FSWR.
- Anchors.
- Eye bolts.
- Rope grips.
- Bolts.

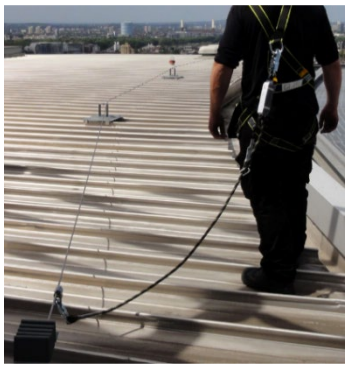
It is important that the static line is properly tensioned. Generally, the maximum allowable length of a single span of static line is 6m. For a static line this long the maximum allowable sag is 300mm (calculated as 50mm per metre).

The following devices can be used to tension the static line:

- Rated Turnbuckle with locking nuts.
- Come-a-long winch.
- Tirfor winch.

A ratchet and pawl can be used to tension the static line IF permitted by the manufacturer or engineer and the amount of tensioning has been specified.

Any tensioning devices should always be locked off or removed from the static line once it is installed and tensioning is complete.



These lines must be installed and checked regularly by a competent person and must only be used in accordance with the manufacturer's specifications, including limits relating to the number of workers connected to the line at one time.

Wherever possible life lines and static lines should be as high as the situation safely allows to limit the free fall distance of workers connected to it. Generally this should not be less than 2.1m from the floor of the work area.

Life and static line anchors must be rated appropriately for the situation and number of workers.

Information relating to the minimum forces that anchor points for static lines have to withstand can be found in manufacturers and engineers specifications.

3.3.3.1 Anchor Points

Anchorage points used should be located as high as equipment permits, as it is safer to work below the point of anchorage. Where the anchorage point is below the harness connection point a shorter lanyard may be required.

You can determine the capabilities of an anchorage by checking the manufacturer's specifications and installation instructions.

Anchorages and lines between supports should be positioned on the inside face of columns where practicable and used to anchor static lines, or the static line may pass through a cavity tube cast in concrete for that purpose.

Static lines between supports must be free of obstructions to allow uninterrupted movement for persons who may be attached to the line. If a line passes around a column, corner, or other sharp edge, it should be packed to prevent damage to the line.

The terminated ends of a wire rope static line may be secured using suitable equipment such as:

- Double saddle clamps.
- Machine splice with thimble eye.
- Suitable wedge sockets.
- Purpose-designed fittings such as swaged or pressed fittings.

However, if the static line is being installed into concrete you must use approved anchorages such as:

- Cast in anchorages.
- Chemical.
- Mechanical – only where assessed and approved by a competent person such as an experienced engineer.

Eyebolts may be used as anchorage points however you must make sure they are collared as these can withstand more sideways pressure than plain or un-collared eyebolts.

Turnbuckles may be used to attach static lines to eyebolts. The benefit of using a framed or open design rigging screw is that they allow for the visual inspection of threads.

3.3.4 Installing a Safety Net

Industrial safety nets are sometimes used as an effective means of fall protection for those working at heights where it is not practicable to provide scaffolds or temporary guard railings. When combined with overlay nets of finer mesh size, they can also be used to contain falling debris.

To install a safety net you may need:

- Fibre ropes.
- Shackles.
- Eye bolts.
- Bolts.
- Turnbuckles.
- Spanners.

All safety nets must be installed in line with manufacturer's specifications.

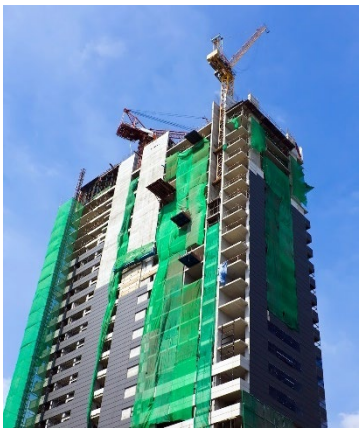
Safety nets must be securely anchored before any work starts. They must also be constructed of material strong enough to catch a falling person or object.

Prior to the installation of a safety net, the intended configuration, method of attachment and strength of the supporting structure should be verified as adequate by a competent person such as an engineer experienced in structural design.

The verification should be in writing and retained on site until the net has been dismantled.

3.3.5 Installing Shutters and Perimeter Safety Screens

Perimeter safety screens and shutters are designed to prevent personnel and any debris, tools or materials falling from a height.



Perimeter safety screens generally extend one floor above the floor they are installed on.

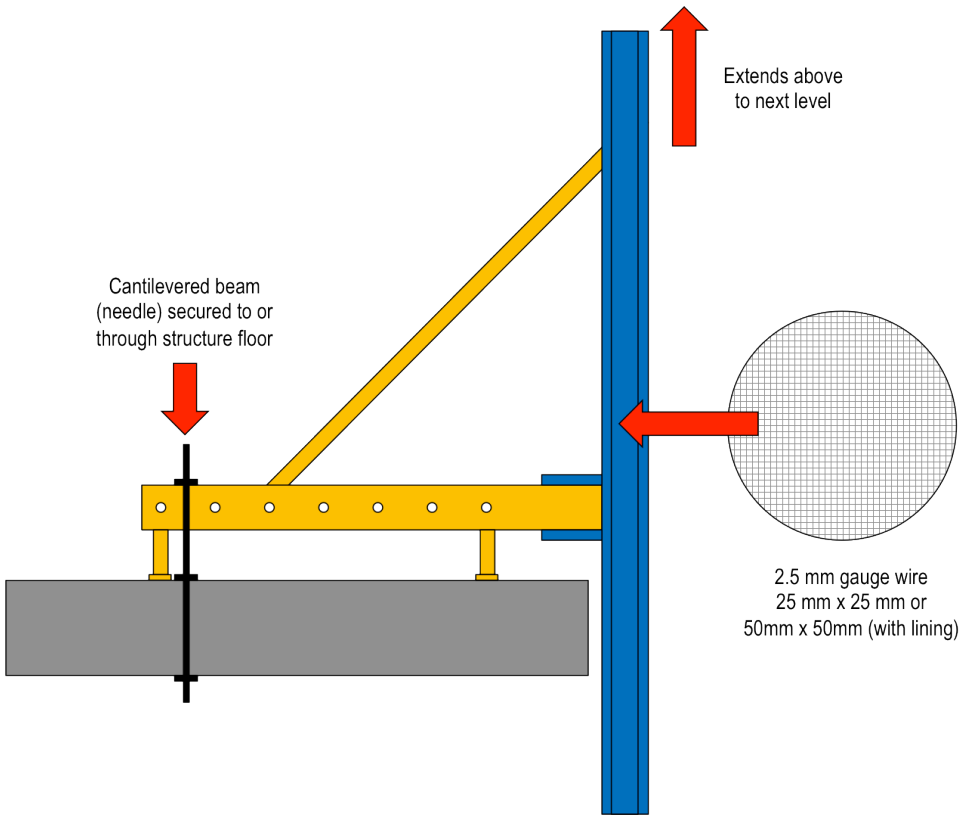
The top of the screen should be high enough to provide edge protection for the floor that is to be built before any personnel can gain access to it.

The framework supporting the screen needs to be able to bear the load of the screen.

The mesh needs to be of minimum gauge 2.5mm, and have a maximum mesh opening size of:

- 25mm nominal where no lining is used.
- 50mm nominal where lining is used.

Gaps between screens and between the screens and the structure should not exceed 25mm.



Perimeter safety screens may be installed using needles or props provided by the manufacturer and designed to be used with a specific safety screen system.

These should be secured adequately to support the weight of the screens.

There may be different options provided by manufacturers to secure any supporting structures to concrete or other structural members.

Always install the safety screen system in accordance with procedures and the manufacturer's specifications.

Always conduct work safely including the use of a fall-arrest system whenever working near an exposed edge during the installation or removal of safety screens and shutters.

3.3.6 Installing Cantilevered Crane Loading Platforms

Cantilevered Crane Loading Platforms (CCLPs) are used to place loads with a crane into work areas high up off the ground. These platforms may only be installed by a person with the following licences:

- A Basic Rigging High Risk Work Licence.
- An Intermediate Scaffolding High Risk Work Licence.

CCLPs should be installed in accordance with procedures and the supplier's or manufacturer's specifications and recommendations for that particular model.

CCLPs need to be braced and secured into place to prevent movement. There are two common methods for doing this:

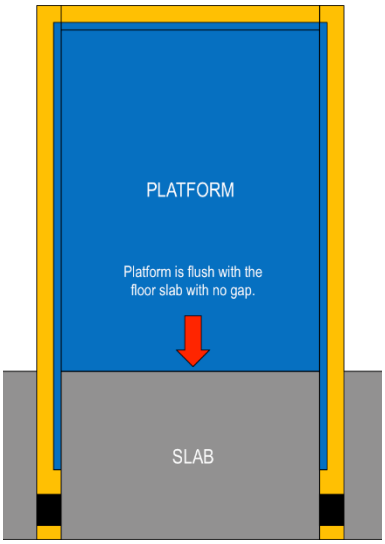
1. Anchoring the needles supporting the CCLP into place using bolts through the needle and the structure it is placed on.
2. Using props that are secured at the roof and base to prevent the platform from shifting laterally (up and down) under load.

In some circumstances it may be necessary to use both methods at the same time.

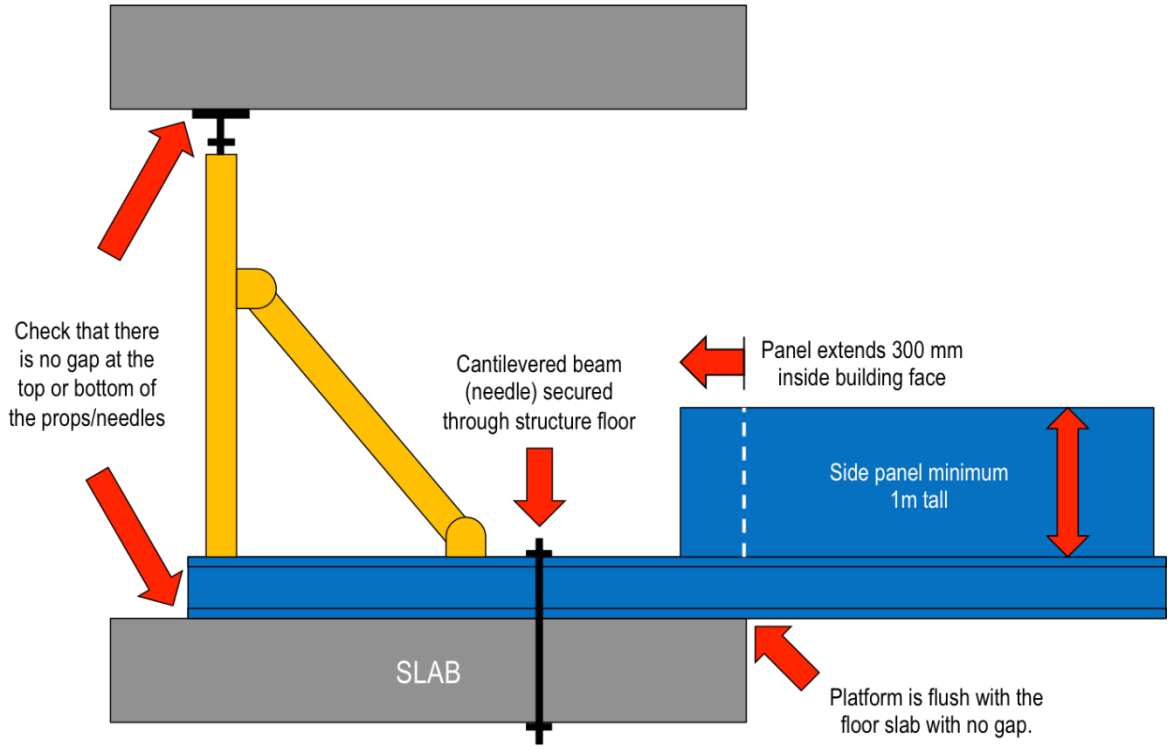
Once in position the platform decking should be flush with and flat on the floor slab. If this cannot be achieved, suitable ramps must be fitted to the platform to assist with the transfer of materials.

Solid panels not less than 1m high should be fitted to the sides of the landing and extend at least 300mm inside the building's face.

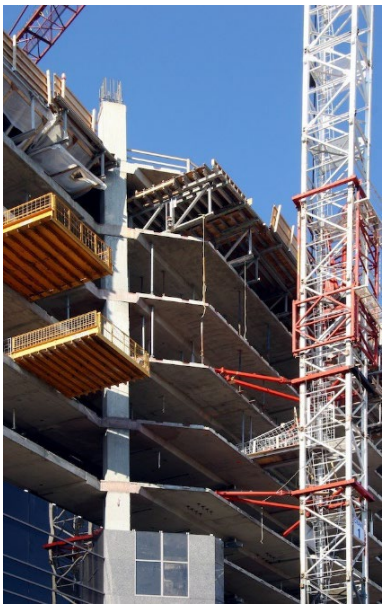
Platforms facing a public access or roadway should not extend beyond the line of the overhead protection provided for the public.



You need to conduct an inspection once the platform has been installed, before it can be used.



Make sure you check for the following:



- All bolts or connectors are secured and tightened in position.
- All props are plumb and have secure rear ties in position.
- There is no gap between the platform floor and the floor slab.
- Adjustable props are set to ensure minimal jack extension.
- Rear handrails are in position.
- Side panels and gates are positively fixed into position.
- Any required engineering approval is obtained.
- A minimum of two signs in clear view stating both:
  - The maximum uniformly distributed load that the platform can carry (WLL).
  - The maximum concentrated load that the platform can carry.
- The tare weight is identified.

If a CCLP needs to be moved to another floor, you need to ensure control measures have been implemented to reduce the risk of falling. Appropriate control measures include:

- Fall protection (fall arrest equipment or static lines with harness/lanyard equipment worn by workers).
- Edge protection.
- Barricades.
- Exclusion zones.

3.3.7 Installing a Materials Hoist

Materials hoists run up and down the outside of a tower using a wire rope hoisting system for raising and lowering the platform.

Under no circumstance can these hoists be used to carry passengers.

Only certificated personnel carrying out erection, dismantling and maintenance can ride on the platform of a materials-only hoist.

To set up a materials hoist you may need:

- FSWR.
- Fibre ropes.
- Anchors.
- Wire and synthetic slings.
- Shackles.
- Levels.
- Braces.
- Bolts.
- Spanners.

The hoist must be set up on solid timber packing.

Clear signage should indicate that no persons are allowed to ride on the materials hoist platform.

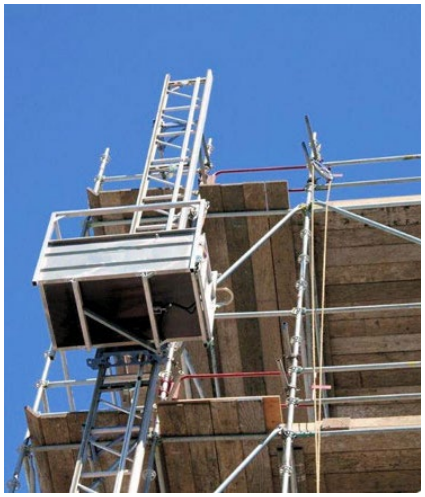
Always refer to the manufacturer's operating manual for directions on how to set up and operate the materials hoist safely.

When setting up near a trench, the distance between the base of the tower and the edge of the trench must be greater than the depth of the trench (e.g. 3m away from a 2m trench or 5m away from a 4m trench).

At the base of the tower a handrail, with a moveable or sliding rail to allow access to the platform, must be set back at least 600mm from the working platform to stop people from leaning over and being hit by the moving platform.

The landing gate for the platform must be a minimum of 1.8m high.

On the floors above, a handrail must be placed 600mm from the edge of floors to prevent people falling off.



There must be an overhead guard to protect the operator from falling objects.

The hoist must not be set up in front of any access way to a building (such as a doorway or a window) unless it is blocked off to stop people leaning out and being hit by the passing platform.

The gap between the platform floor and the building floor must be no less than 25mm and no more than 100mm.

The tower must be guyed or tied every 6m and have no more than 3m free standing above the top tie. Guy ropes must be at least 9mm in diameter for hoists to 500kg capacity and at least 12mm for more than 500kg (and 6 x 19 construction).

The minimum over-run distance between the hoist rope attachment and the head sheave is 1.5m.

Once the hoist is completed check that it complies with the installation specifications. You also need to make sure you install signage displaying the rated capacity of the hoist.

3.3.8 Setting Up a Mast Climber

Always refer to the manufacturer's manual before starting to erect a mast climber. To set up a mast climber you may need:

- FSWR.
- Fibre ropes.
- Anchors.
- Wire and synthetic slings.
- Shackles.
- Levels.
- Braces.
- Bolts.
- Spanners.

The base of the mast climber can be placed either with the mast outwards for free standing or with the mast inwards where the mast is tied to the building.

Always make sure that the sequence of installation does not put any personnel in any danger and that no part of the equipment is overstressed or overburdened.

The outriggers must be extended and locked as per manufacturer's specifications for the actual setup of the machine.

Packing must be used depending on the ground conditions, and to ensure that the towers are level, plumb and aligned. A free standing mast should not be used in high winds.

The mast must be anchored at the top to ensure stability because high winds can occur suddenly.

The building must be checked to ensure that it can withstand the strain that may occur in high winds.

If a mast climbing work platform is going to be installed or erected on a suspended concrete slab, a certificate of compliance will need to be obtained from an engineer confirming that the slab is capable of holding the intended loads.

3.3.9 Erecting a Portal Frame with Structural Steel

Structural steel is the skeleton of a building or structure. To erect structural steel you may need:

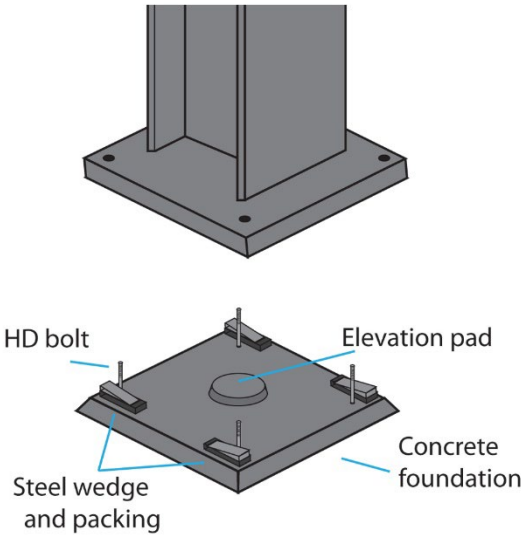
- Levels.
- FSWR.
- Fibre ropes.
- Shackles.
- Spreader bars.
- Chains.
- Wire and synthetic slings.
- Braces.
- Bolts.
- Wedges.
- Spanners.
- Podgers.

When erecting steel members, the first section must be fully plumbed/level and braced to make sure the rest of the framework will stay stable.

There should be a packer (elevation pad) underneath every column. Packers are used to ensure that the column is plumb or vertical and that the load of the column is evenly distributed on the concrete foundation (called a plinth or pedestal).

If the column bases are not level the steel will not be plumb. It can be very difficult to wedge up steel especially if the steel is heavy.

Steel packers approximately the same height as the elevation pad should be placed adjacent to each holding down bolt. Use steel wedges if necessary for plumbing purposes.

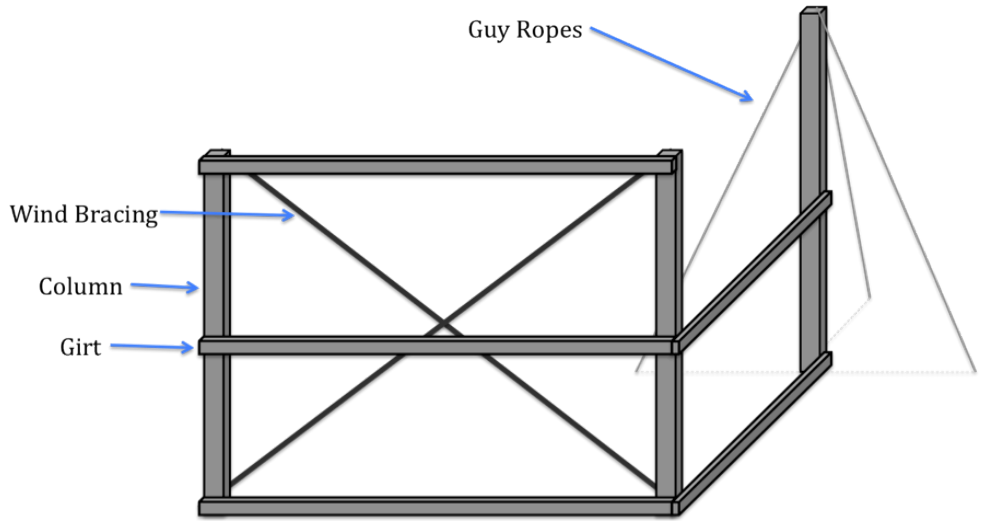


Steel columns can be levelled and plumbed using a range of tools and equipment including:

- Hammers.
- Tirfors.
- Packers.
- Guys.
- Come-along devices.
- Steel wedges.
- Levels.

As the work progresses, the bracing must be fitted. In some cases the building may have to be guyed for support until each brace bay is erected. Steel columns should be guyed to prevent the holding down bolts from pulling out causing the column to collapse.

Guys must be constructed of Flexible Steel Wire Rope (FSWR).



When positioning and fixing wall girts you should always start from the bottom of the structure and work your way up to the top. This allows for standing room while you work.

Only use one hand to locate a steel beam or column – you need the other hand to hold onto the beam or column.

When field bolting or linking beams together you should always fasten the first two bolts at diagonally opposite corners to ensure alignment and to stop the beam from rolling.

If the beam is in a tight position while being held and supported by the crane, you need to make sure it is securely in place before the crane boom moves. Failure to do so could result in the beam coming loose and falling, uncontrolled movement, risk to the health and safety of workers or structural damage occurring to the crane and lifting gear.

3.3.9.1 Slinging Steel Columns

To make sure that columns hang vertically they should be slung as near to the top as possible.

When lifting columns with a reeved sling ensure that the sling is wrapped around twice then nipped (round turn). As the sling is wrapped around, incline the sling toward the nip, stopping the sling from slipping when the column becomes vertical.

The column must be packed to prevent the sling from being damaged by the sharp edges of the column.

The packing has to be tied or secured to prevent it from dropping out when the slings slacken as the column is landed.

To keep the work conducted at heights to a minimum during steel erection, you should prefabricate as much as possible on the ground first and use a crane to put the structure into position.

Using remote release shackles wherever possible can also reduce the need to work at heights. Using an EWP will eliminate the need to climb the structure.

3.3.9.2 Slinging and Installing Roof Trusses

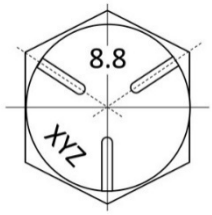
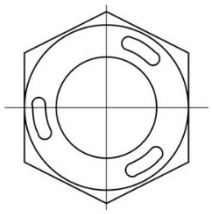
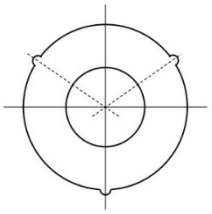
Flat pitched gable roof trusses are particularly dangerous to lift. They should be bridled and slung with a central vertical sling and the weight of the truss should be evenly distributed across the slings. This will help to prevent the truss from bending while it is being moved into position with the crane.

To maintain stability you should attach the holding down bolts and fit tag lines to the ends before lifting the truss into position.

Once in position you must fit temporary guys to the apex of the first roof truss, using temporary bracing. The guys need to stay in place until wind bracing is fitted.

3.3.9.3 High Strength Structural Fasteners (Bolts, Nuts and Washers)

Part of your responsibility as a rigger is to know which fastenings have been specified by the structural designer for the various members.

Fastener Type	Description	Example
Bolts	High strength structural bolts have their heads marked '8.8'. They also carry three radial lines and the manufacturer's identification or trademark.	
Nuts	High strength structural nuts can be identified by the three arcs indented on the non-bearing face. With some brands of nuts, the markings may appear on both faces.	
Washers	Washers are designed to be used with high strength structural bolts and nuts and are manufactured with three protruding nibs around the edge.	

If the wrong nuts, bolts and/or washers are used, the strength or stability of the steel structure can be seriously affected.

3.3.9.4 Hand Tools Used During Steel Erection

Hand tools may include podgers, spanners and hammers, it is important you select the right tools for the job.

When working at heights, all hand tools should be securely stowed on a rigger's belt.

Some safety harnesses also include loops for storing tools and pouches for storing nuts, bolts and washers. One-handed tools should be fitted with wrist straps or lanyards.

To tighten bolts, you should use the correct sized ring or open-ended spanners. Do not use shifting spanners.

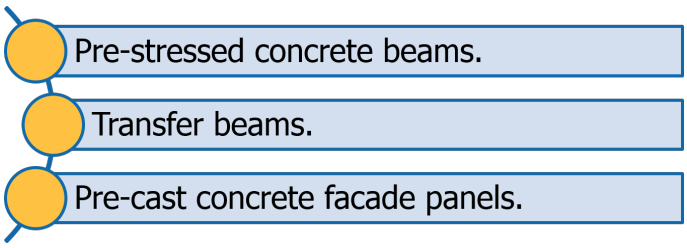
Podgers or drifts are especially useful during steel erection.

They can be used to assist with locating and pinning a beam or column, allowing for easier fastening.

3.3.10 Installing Pre-Cast Panels

Pre-cast concrete is commonly used in a wide range of modern building and construction projects.

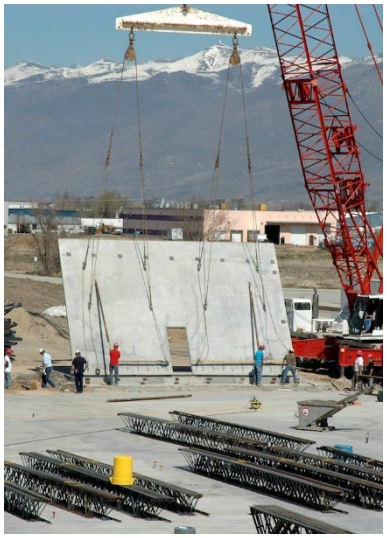
Pre-cast concrete can come in the following types:



Pre-cast concrete panels/slabs are manufactured at an off-site manufacturing facility, or at a different location on the construction site. Some construction projects may require tilt-up concrete panels/slabs which are manufactured on site at their final place of installation at the construction site.

To install, move, position and land pre-cast or scenery panels you may need:

- Spreader bars.
- FSWR.
- Wire and synthetic slings.
- Shackles.
- Eye bolts.
- Rigging screws.
- Levels.
- Load equalising gear.



Setting up a rigging system for erecting pre-cast concrete elements requires careful and thorough pre-planning.

For general pre-cast elements, such as beams or flat slabs, care should be taken to determine if it is necessary to equalise loads between lifting points on any element.

All pre-cast or scenery panels should be handled in accordance with the manufacturer's instructions.

The manufacturer will determine:

- The lifting points on a pre-cast concrete beam.
- How to attach lifting equipment to pre-cast concrete panels.
- The lifting angle between inserts for pre-cast panels and beams.

The lifting angles and points may also be advised by an engineer and will be documented in the lifting plan.

Lifting clutches are used to lift concrete slabs and beams. The lifting clutch is connected to an insert (anchor) embedded in the concrete panels. Slings can then be attached to the lifting clutch with hooks.

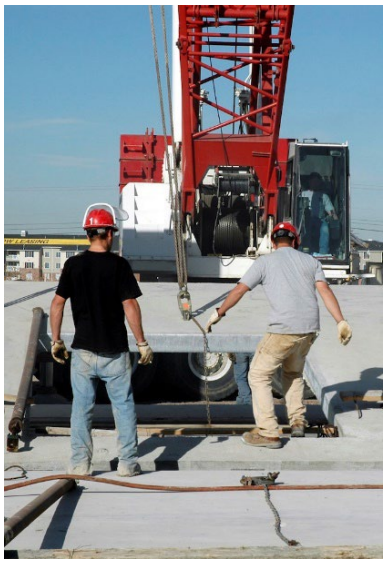
Before engaging on an insert, you will need to check the lifting clutch for:

- Suitable identification markings (either permanently marked on the lifting clutch or on an attached durable tag), including:
  - A unique identifier.
  - The manufacturer's symbol or name.
  - Its WLL or compatible anchor identifier.
- Damage, cracks or distortions.
- Foreign matter or debris in the mechanism.
- Correct functioning.
- Compatibility (e.g. a 5 tonne (WLL) lifting clutch should not be put on a 2.5 tonne (WLL) insert as this may result in the clutch disconnecting or being damaged from the insert due to their different sizing).

Lifting clutches need to be proof tested every twelve months.

Coordination is extremely important while handling pre-cast or scenery panels.

If at any time radio communications fail during the positioning of panels you must immediately stop work.



It is important that you follow the necessary emergency procedures and only continue on with the positioning of the panels once communications are re-established.

It is extremely important, for the safety of all workers involved, that pre-cast beams and panels are handled correctly during any lifting, moving, positioning and landing procedures. Crane operators should lower panels as slowly as possible while they are being positioned.

Pre-cast or scenery panels can be damaged or collapse if they are inappropriately handled. If pre-cast beams are turned on their side there is a risk of collapse.

All pulling force placed on the inserts of pre-cast or scenery panels and beams needs to be vertical. Horizontal pull can cause unplanned movement of the panel, damage or failure of the lifting inserts.

If an insert breaks or pulls loose it is important that you stop work and if possible, lower or support the panel and isolate it from use.

You will need to contact the manufacturer or designer and have the insert repaired.

Once in position, temporary bracing or guys may need to be applied to stabilise the panels. Always follow site procedures and engineer's directions when stabilising the beams and panels.

Always confirm the finished structure with the plans to ensure that it meets with the design specifications and instructions.

3.3.11 Setting Up a Winch for Load Movement

Winches are used to shift loads using a series of sheaves and a purchase or tackle arrangement.

Depending on the requirements of the task they may consist of a number of sheaves, reeved in a variety of configurations to gain mechanical advantage.

Before lifting a load with a winch you will need to complete a number of calculations to determine the minimum requirements to carry out the lift safely.

This includes calculating:

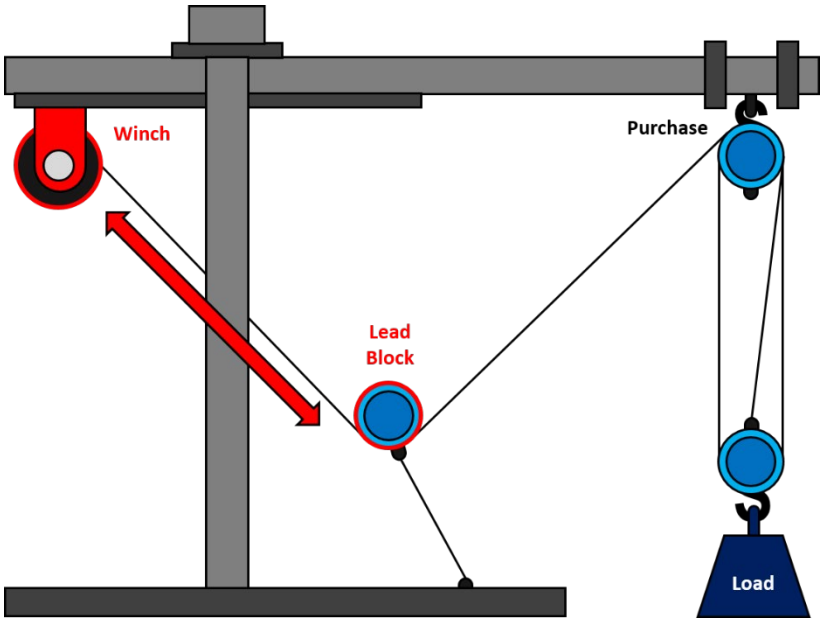
- The minimum distance to the lead block.
- The load in the running gear.
- The minimum size rope you will require.
- The minimum requirements for supporting the purchase and lead block safely while under load.

These calculations will be based on the size and type of the winch drum, the number of sheaves in the configuration and the weight of the load to be lifted.

3.3.11.1 Distance to Lead Block

If the rigging task requires you to use a powered winch to lift a load you will need to work out the distance between the lead block and the winch drum to get the correct fleet angle for the wire rope.

If the lead block and the winch are too close together the fleet angle will be incorrect, causing damage to the wire rope and the sheaves.



In order to work out the correct minimum distance from the winch to the lead block (to get the right fleet angle) you need to know:

- The width of the winch drum.
- The type of drum (grooved or plain).

You can use the formula below to calculate the required minimum distance:

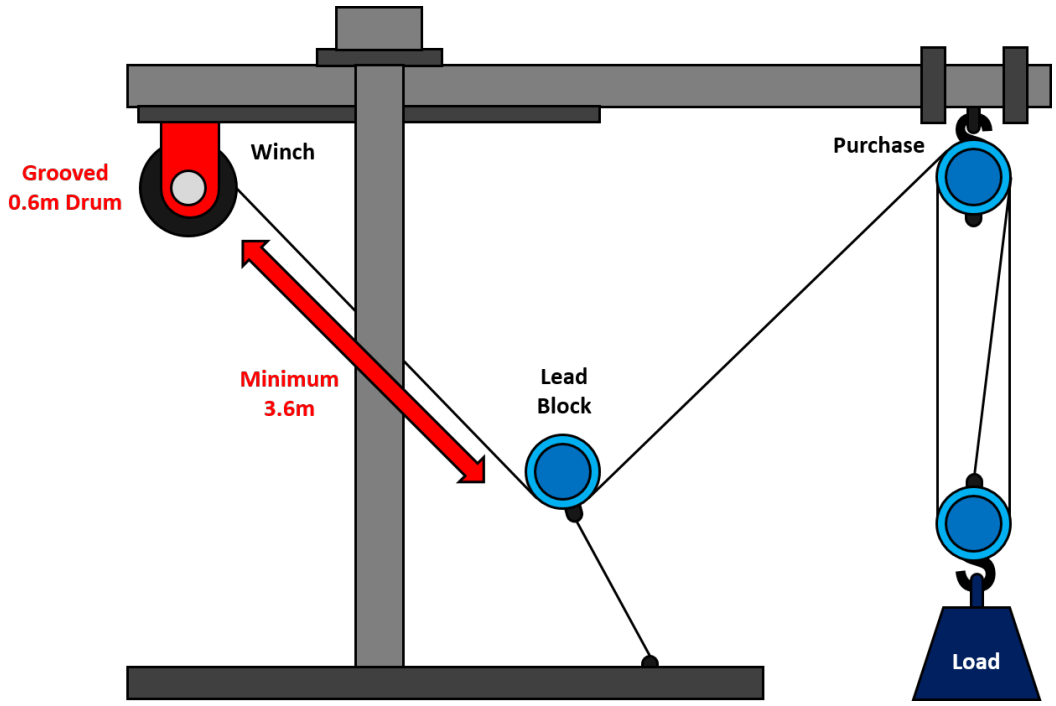
Distance to Lead Block (DLB) in metres = (Drum Width (metres) ÷ 2) x Fleet Angle Ratio (FAR)

The Fleet Angle Ratio (FAR) is different depending on the type of drum being used.

- FAR for Grooved Drums = 12
- FAR for Plain Drums = 19

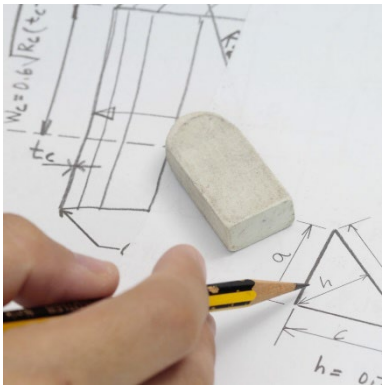
So if a drum is 0.6m wide and grooved the formula would be:

DLB (m) = (Drum width in metres ÷ 2) x Fleet Angle Ratio
= (0.6 ÷ 2) x 12
= 0.3 x 12
= 3.6m



3.3.11.2 Load in the Lead Rope

The other factor that needs to be calculated when working with a powered winch is the load in the lead rope during hoisting.



You need to calculate this weight to make sure the lead rope is capable of lifting the load.

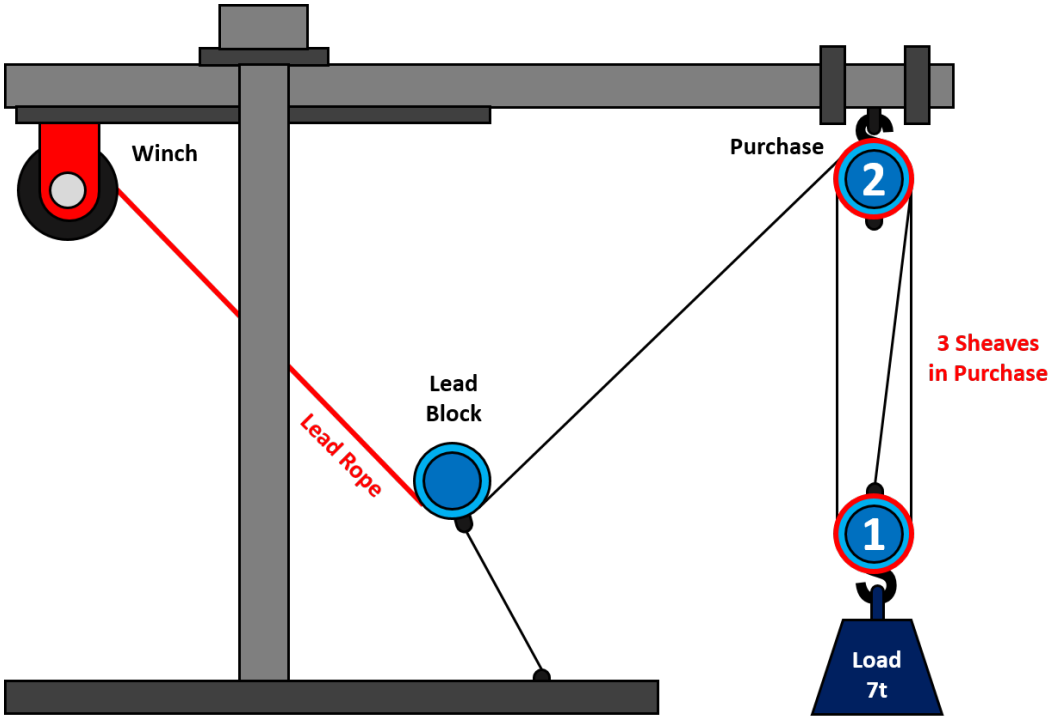
To determine the load in the lead rope you will need to find out:

- The total load on the lower block.
- The number of sheaves in the purchase.

Sheaves can be used to gain mechanical advantage in the lifting of a load allowing more weight to be handled safely. However a reduction for the friction (known as the friction allowance) needs to be included in the calculations to properly determine the load that can be lifted.

In the example below there is:

- A friction allowance of 5% per sheave.
- The load on the lower block is 7 tonnes.
- There are 3 sheaves in the purchase.



To work out the load in the running gear you need to figure out the 'Becket Load'. The Becket Load is the total load on the lower block divided by the number of parts in the purchase (sheaves) as shown in the formula below:

Becket Load (BL) = Total Load on Lower Block (tonnes) ÷ Number of Parts in Purchase

Using the previous example this is calculated as:

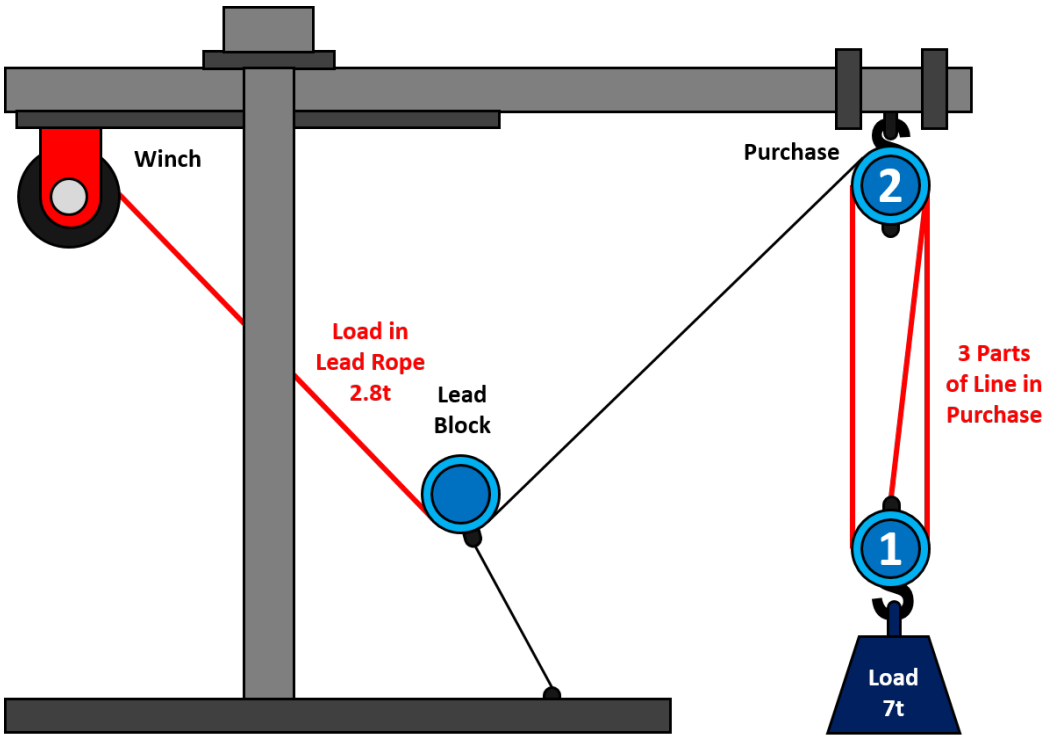
Becket Load (BL) = Total Load on Lower Block (tonnes) ÷ Number of Parts in Purchase
= 7 ÷ 3
= 2.33 tonnes

The load in the lead rope can then be calculated using the formula:

Lead Load = BL + (BL x Number of Sheaves ÷ Friction Allowance)

Don't forget to add the lead block sheave as well!

Lead Load = BL + (BL x Number of Sheaves ÷ Friction Allowance)
= 2.33 + (2.33 x 4 ÷ 20)
= 2.33 + 0.466
= 2.796 tonnes
= 2.8 tonnes (rounded up)



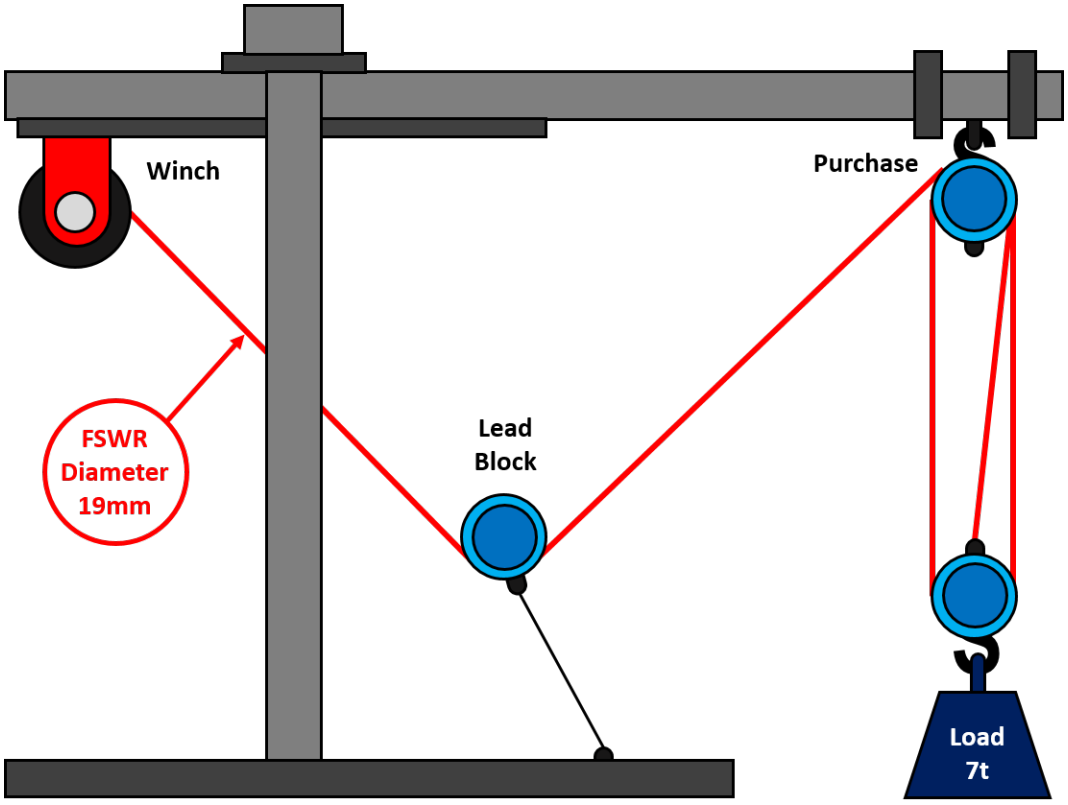
3.3.11.3 Calculate the Minimum Size of FSWR

Once you have determined the load in the lead rope you will need to calculate the required size of FSWR for the winch. This is done using the formula:

D (Diameter of Rope) = √Lead Load (kg) ÷ Factor of Wire Rope (8)

Using the weight from the last section this is calculated as:

D = √ Lead Load ÷ Factor of FSWR of 8
= √ 2796 ÷ 8
= √ 349.5
= 18.695
= 19 mm FSWR (rounded up)



3.3.11.4 Calculate the Head Load for the Purchase Support or Sling

In order to lift a load with this particular winch configuration you will need to have the purchase supported in place using a purchase support or sling.

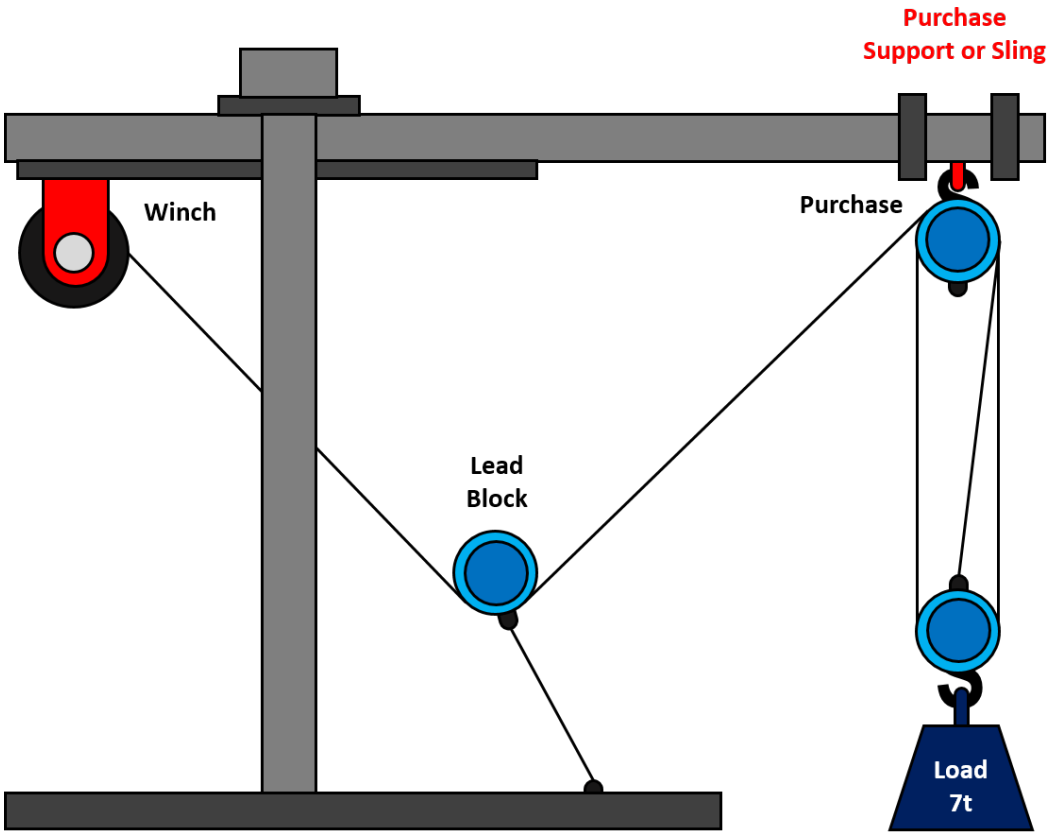
Before you can safely put any weight through the purchase you need to determine the minimum requirements to support any weight that is being placed on the purchase arrangement.

This is calculated by using the formula:

Purchase Head Load (PHL) (tonnes) = Lead Load (LL) + Total Weight on Purchase (tonnes)

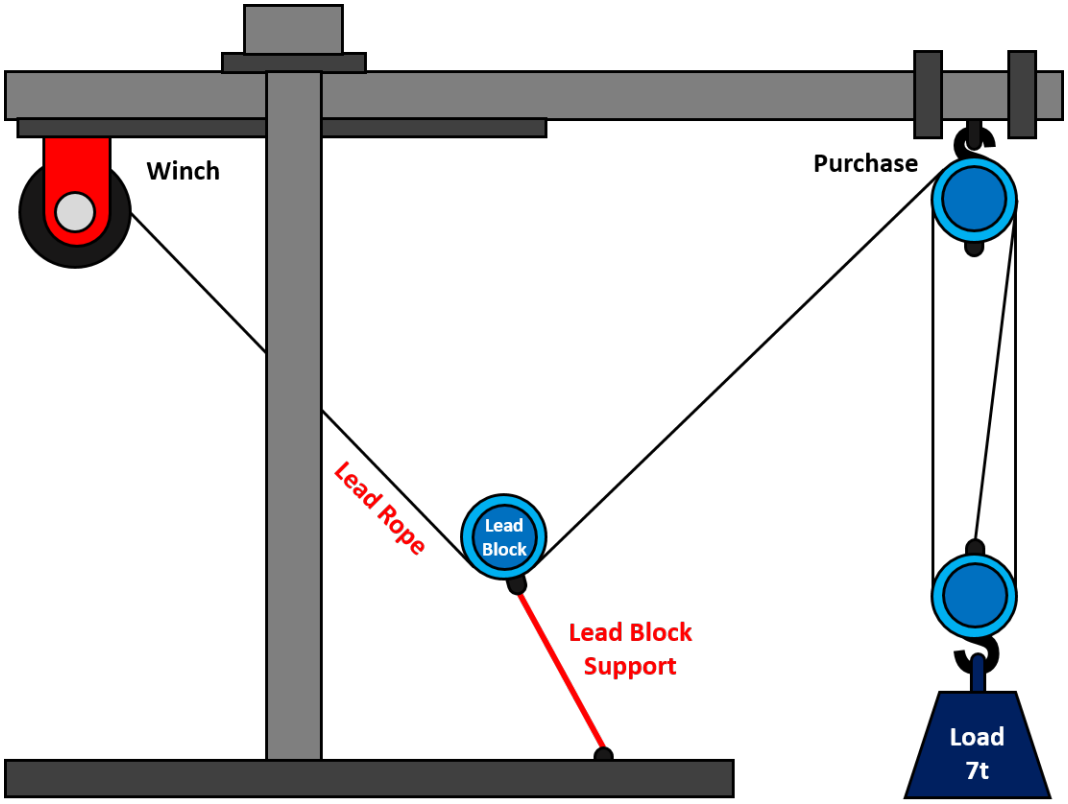
Using the weights from the previous examples this is calculated as:

PHL in tonnes = Lead Load + Total Weight on Purchase in tonnes
= 2.796 + 7
= 9.796 tonnes



3.3.11.5 Calculate the Head Load for the Lead Block Support or Sling

The final calculation is to determine the minimum requirements for the support for the lead block. If this point is not secured the entire configuration can fail under load.



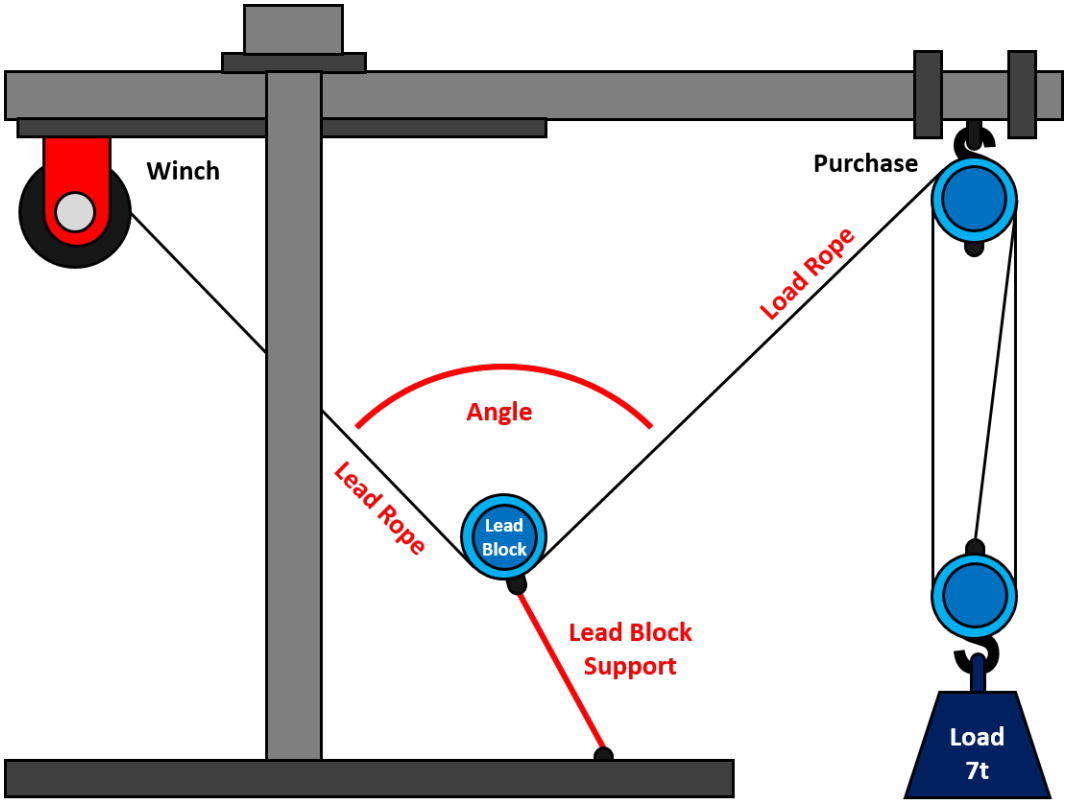
In order to calculate the minimum requirement for the lead block support or sling you use the following formula:

Lead Block Support Load (LBSL) (tonnes) = Lead Load (LL) x Angle Allowance

Depending on the configuration there are different angle allowances that need to be considered:

Included Angle	Angle Allowance
90 degrees	1.41
60 degrees	1.73
45 degrees	1.85

The angle we need to consider is the angle between the lead rope and the load rope:

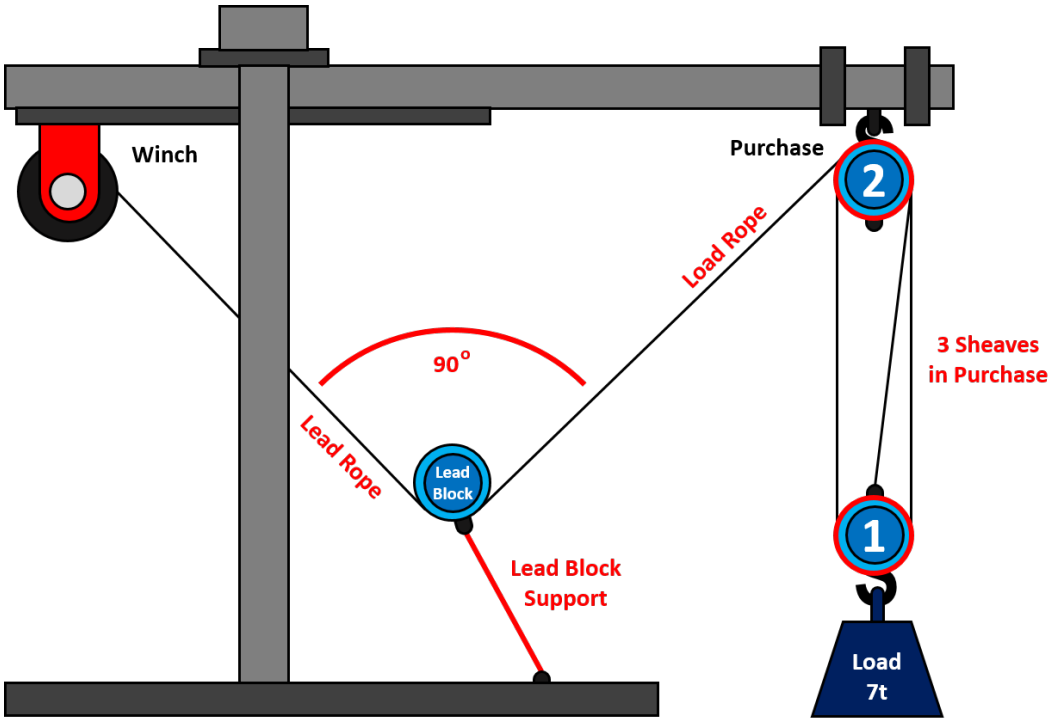


Using a 90° angle and the lead load from the previous examples the lead block support requirements can be calculated as:

Lead Block Support Load (LBSL) (tonnes) = Lead Load (LL) x Angle Allowance

Using the weights from the previous examples this is calculated as:

LBSL in tonnes = Lead Load x Angle Allowance
= **2.796 x 1.41** (the angle allowance for a 90° angle)
= **3.942 tonnes**



3.4 Inspecting the Completed Work

Once the rigging work has been completed you will need to inspect the job to make sure everything has been done properly in accordance with task plans and schedules and structural drawings/plans.

Review the work method statement used and make sure all steps have been completed.

3.4.1 Tidy the Work Area

Once the work has been completed you need to clean up the work area. Remove any leftover materials and debris created by the task.

Litter and other building debris can cause a tripping hazard for personnel. Make sure all rubbish is collected and disposed of correctly.

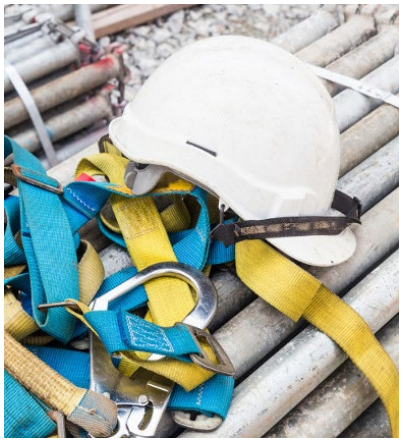
Dispose of any debris properly without impacting negatively on the environment. Make sure all materials are collected and removed properly.

Divide up recycling and other waste materials for correct removal and processing.

3.5 Dismantling Structures and Plant

Once all operations have been completed you may be required to dismantle or remove plant, safety and associated equipment from the work area.

3.5.1 Disassembling Equipment



Always follow the manufacturer's instructions when disassembling equipment to ensure the safety of all personnel in the area, to maintain stability during the process and to prevent any damage to the plant and equipment.

Continue to work safely at heights while equipment is dismantled.

Once they are no longer needed, safety systems such as static lines, fall-arrest harnesses and safety nets should be dismantled according to the correct sequence and procedures. They should then be removed from the work area.

Always work methodically and follow site procedures to avoid any unplanned collapse of plant and equipment.

Unplanned collapse can result in serious injuries to personnel and damage to equipment and materials.

3.6 Incidents and Emergency Response

Emergencies can happen quickly and without warning when work is being done at heights.

If all necessary precautions, hazard control measures and safety equipment have been used then the risk of serious consequences is reduced.

However you should always be prepared to take action in an emergency situation, even if that action is as simple as calling for help.

3.6.1 What is an Incident?

An incident is:

1. An accident resulting in personal injury or damage to property.

OR

2. A near miss or dangerous occurrence which does not cause injury but may pose an immediate and significant risk to persons or property and needs to be reported so that action can be taken to prevent recurrence.

All incidents MUST be reported!

3.6.1.1 Responding to an Incident

If an unsafe incident or event occurs during rigging operations you should:

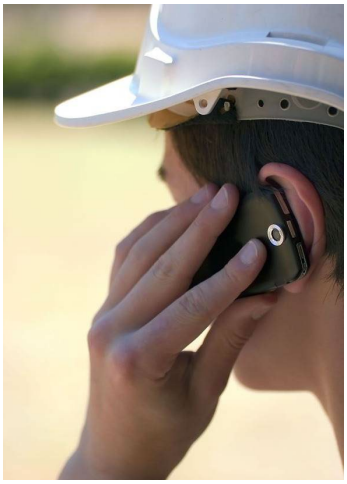
- Stop, assess and resolve the issues (if possible).
- Get advice and assistance where required.
- Report the incident in line with workplace requirements.

3.6.2 Workplace Emergencies

Site emergencies may include:

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

3.6.2.1 General Emergency Response



In the case of an emergency:

1. Remain calm.
2. Raise the alarm with your supervisor and/or first aid officer and make sure you inform any personnel of unsafe areas.
3. Get help from emergency services (Dial 000 or 112).
4. Evacuate if necessary (refer to site emergency plans).

3.6.2.2 General 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.

3.6.3 Incidents Relating to the Use of Fall-Arrest Systems

If a worker who is using an individual fall-arrest system falls from an edge, the system may act as a pendulum.

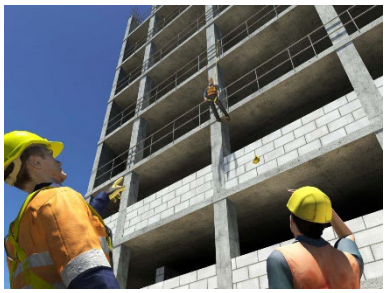
This may result in the worker hitting the ground (called 'swing down') or swinging back into the building or structure (called 'swing back').

These situations may also be referred to as 'the pendulum effect'.

Swing down can occur if the lanyard slides back along the perimeter edge of the roof as a worker falls, until it is vertical.

When this happens, the worker may hit the ground (or lower level), or the lanyard may break from being dragged across the edge of the roof.

3.6.3.1 Suspension Trauma



Suspension trauma can occur with a fall-arrest system when a person has an arrested fall and is suspended in an upright, vertical position with the harness straps causing pressure on the leg veins.

The lower legs' capacity to store large amounts of blood reduces the return of blood to the heart, slowing the heart rate, which can cause the person to faint.

This may lead to renal failure and eventually death, depending on a person's susceptibility. This condition may be worsened by heat and dehydration.

3.6.3.2 Preventing Suspension Trauma

The following techniques can be used to help prevent suspension trauma in a person who is hanging in a fall arrest harness:

- Never work alone when using a harness as fall protection.
- Wherever possible use a fall-arrest harness that allows the legs to be kept horizontal.
- If possible keep the time a worker spends in suspension after a fall limited to less than five minutes. This can be achieved by providing foothold straps or a way of placing weight on the legs.

If you find yourself in a situation where you are suspended in a fall-arrest harness after a fall attempt the following action:

1. Move your legs in the harness and push against any footholds to relieve pressure on your upper legs.

2. Move your legs as high as possible and tilt back so that you become as horizontal as possible.

The quick rescue of a person suspended in a full body harness, as soon as is possible, is vital.

For this reason, workers should be capable of conducting a rescue of a fallen worker and be familiar with onsite rescue equipment and procedures.

If a worker has fallen and is hanging suspended in a safety harness for a prolonged period of time (5 to 30 minutes) it is absolutely vital that first aid procedures are implemented as quickly as possible.

3.6.3.3 First Aid for Suspension Trauma

In accordance with Australian Resuscitation Council (ARC) guideline 9.1.5, first aid management of suspension trauma should be carried out as follows:

1. Call for an ambulance (dial 000 or 112).

2. If unconscious, manage the victim according to basic life support principles. If conscious, rest the victim in a comfortable position, ideally lying down, and provide reassurance.

3. Loosen or remove the harness.

4. Administer oxygen if available.

5. Look for and manage associated injuries in the victim, especially if they have fallen or been electrocuted.

6. Monitor the signs of life at frequent intervals.

Remember, care of the airway takes precedence over any injury.

3.6.4 Report all Hazards, Incidents and Injuries

Depending on the nature and severity of the situation you may need to report to:

- Your supervisor.
- Emergency services (e.g. police, ambulance, fire brigade and emergency rescue).
- WHS regulatory authority (e.g. WorkSafe, WorkCover).

Ask your WHS representative or supervisor at the site office for the relevant forms and procedures for reporting hazards, incidents and injuries.

3.7 Conclude Rigging Operations

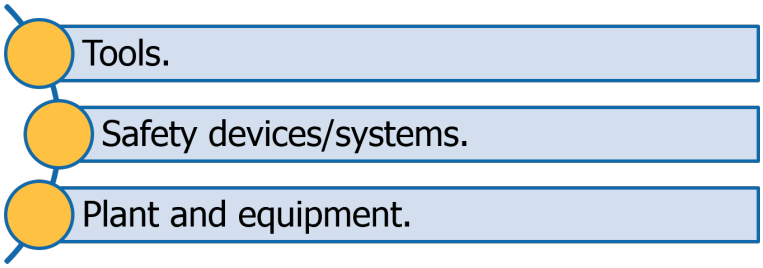
Once all rigging work is completed and signed off you need to make sure all equipment is made ready for the next task.

This includes:

- Inspecting and storing all rigging and associated equipment.
- Removing and storing hazard control measures/treatments that are no longer required on site.

3.7.1 Inspect and Store all Rigging Equipment after Use

Inspect all tools and equipment that you have used during the rigging work. This includes:



Isolate any defective equipment. Record the fault and report it to an authorised person in accordance with procedures.

All serviceable equipment should be stored according to procedures and manufacturers' specifications.

3.7.2 Remove Hazard Control Measures

Remove all hazard controls that are no longer required and complete any documentation related to the job (work permit sign-off and incident reports).

Advise the appropriate personnel of the completion of the job and carry out any remaining requirements as per site procedures.