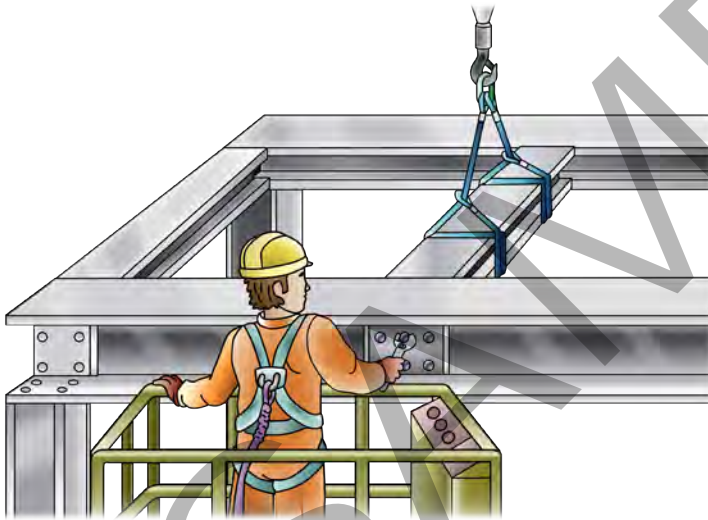


RIGGING – BASIC SAFETY AND LICENCE GUIDE

Training support material for:

CPCCLRG3001

Licence to perform
basic rigging



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INTRODUCTION TO RIGGING – BASIC



What is rigging?

Rigging work means the use of mechanical load shifting equipment (and associated gear) to:

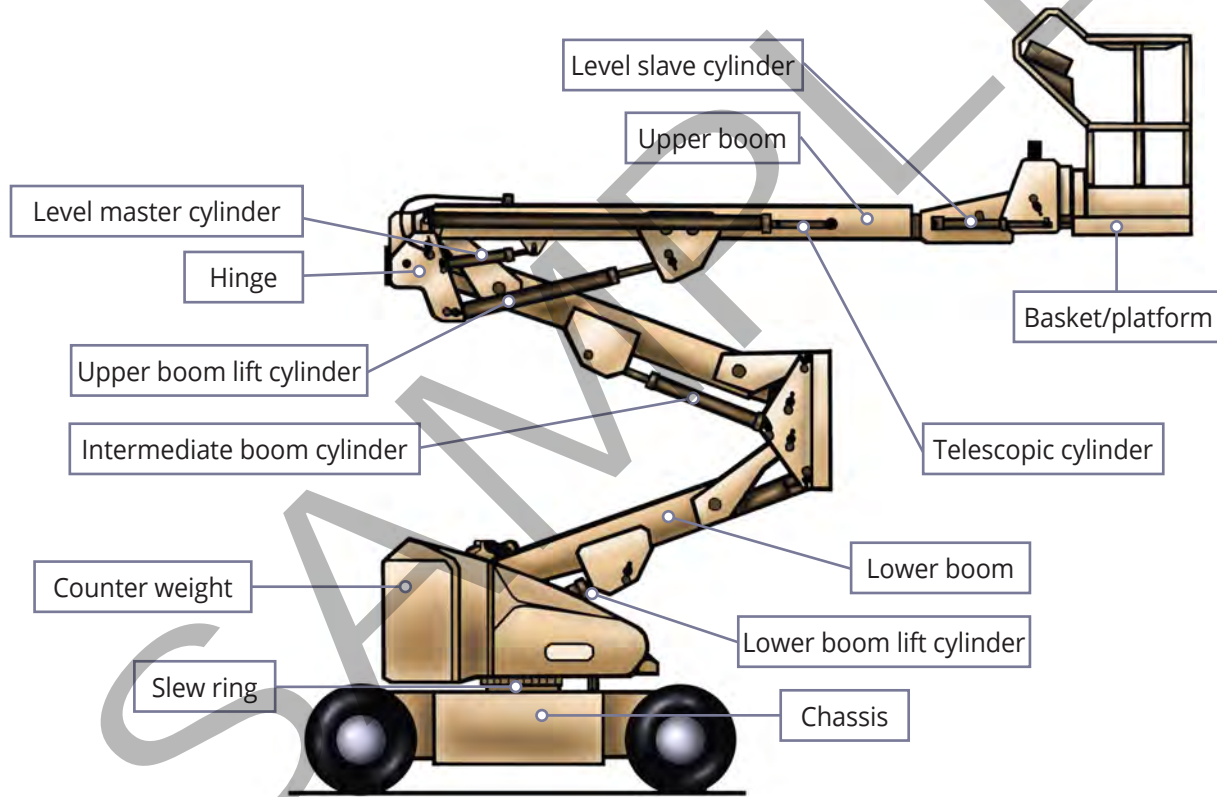
- Move, place or secure a load using plant, equipment or members of a building or structures to ensure the stability of those members
- The setting up or dismantling of cranes or hoists.



Boom-type elevating work platform

Riggers often perform their work from Elevated work platforms (EWP).

You must hold the correct High Risk Work License to operate an EWP with a boom length of 11 metres or more.



PLAN TASK

Element 1

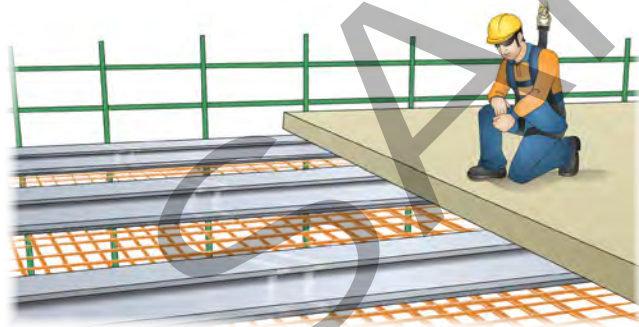


Common tasks

The first thing to think about is the task (meaning job) you are going to do.

Common tasks or jobs done by someone with a basic rigging licence are:

- Dogging work such as slinging loads and directing movement of plant and equipment
- Erecting steel structures
- Placing pre-cast concrete
- Setting up and dismantling safety nets and static lines
- Erecting mast climbers
- Installing cantilevered crane loading platforms
- Installing perimeter safety screens and shutters.



Assess the task

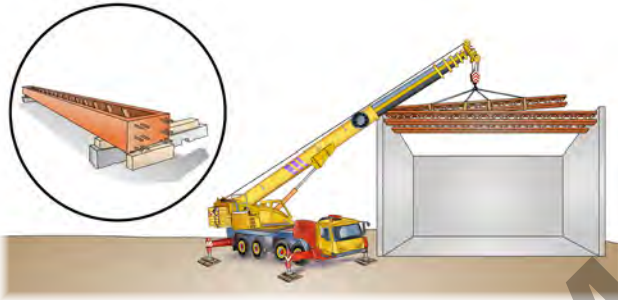
There are a number of things to think about when you plan your task.

These include:

- Task plans/drawings
- Entry and exit points
- Location of task
- Specifics of task
- Plant and equipment needed for task
- Availability of equipment
- Weights
- Permits.



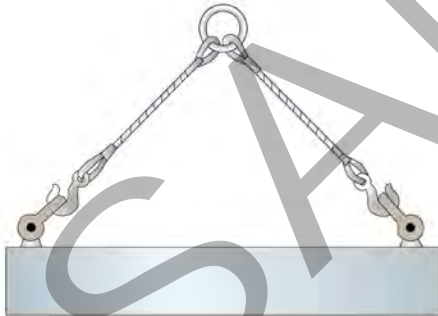
Have you chosen the right plant to use?
For example, crane.



How much does the load weigh?



Is the equipment available and suitable for the job?



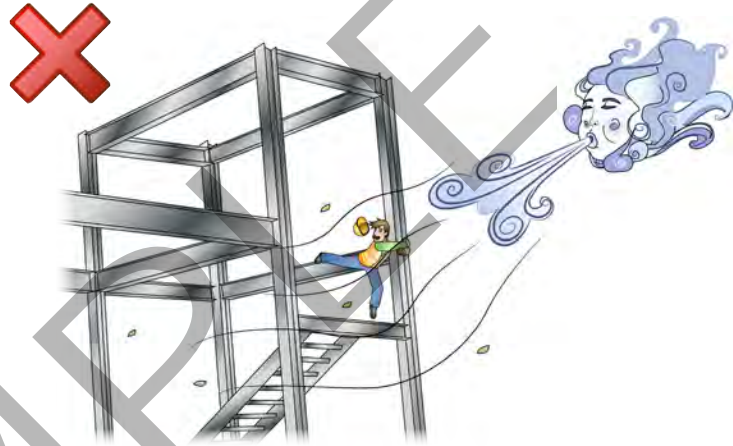
Any plans for doing the job.



Working in high winds

Working in high winds on steel structures is very **dangerous**.

- There is a risk you could be knocked over
- There is also a risk you might be blown off the structure.



Lifting a beam that won't move

You must always take care if a crane is lifting a beam near you. But if the crane's boom is being lifted and the beam doesn't move, stand clear.

The beam might **suddenly** move.

- This could damage the crane
- It might also injure you.



Identifying workplace hazards

Workplace hazards need to be notified **before** you start work.

Take a good look at your workplace and decide if anything could possibly cause injury to you or anyone else in the area.

Zones/areas to check for hazards:



Above eye level

You should check above eye level for:

- Powerlines and transmitters
- Buildings
- Trees
- Clearance heights
- Other obstructions
- Other overhead services
- Bridges.

Ground to eye level

You should check around eye height for:

- Other equipment
- Machinery/plant
- People/pedestrians
- Things in the path of travel
- Insufficient lighting
- Weather conditions (eg. strong winds)
- Dangerous materials
- Surrounding structures
- Other obstructions
- Facilities.

Ground level (and below)

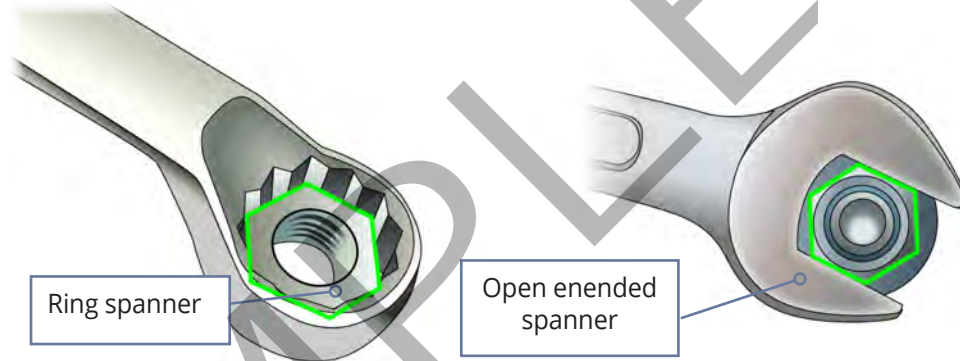
You should check the ground to see if:

- The surface is stable and level
- There is debris or rubbish in the way
- Spills or wet surfaces
- The surface is strong enough to support the weight of any equipment or materials
- If there are any open trenches or recently filled trenches
- Unstable ground
- Underground services
- Suspended slabs.

QUESTION 1

What type of spanner must you use when working high off the ground?

A ring or open spanner that is the right size.



QUESTION 2

What kind of spanner must never be used?

A shifter must never be used.



Review the action you have taken

1. Eliminate the hazard (remove)

If possible, it is best to **remove the hazard** entirely.
This is the best option for hazard control.

For example, remove dangerous materials from the work area.



2. Substitute the hazard (use something else)

If you are unable to remove the hazard, use something else.

For example, use a pallet cage to lift a pallet of bricks instead of lifting the pallet without a cage.



3. Isolate the hazard (keep apart)

Put up barriers or fencing around the hazard to lower the risk of damage or harm. You call this restricting or preventing access to the hazard.

For example, put up barriers or fencing, restrict access to the area for an amount of time or put a distance restriction in place.



6. Use personal protective equipment (PPE) (wear safety clothing)

Wear safety clothing and PPE to control hazards. Avoid relying on these as the only way to control hazards. Make sure the PPE is right for you and the company has trained you in how to use it. For example, wear high-visibility clothing so workmates can see you more easily.

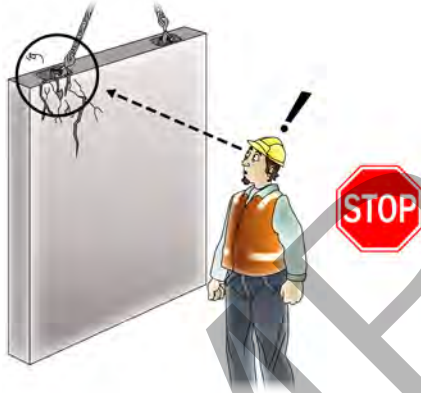


As a minimum, a rigger should wear a safety helmet, rubber-soled boots, a hi-vis vest/clothing and gloves.

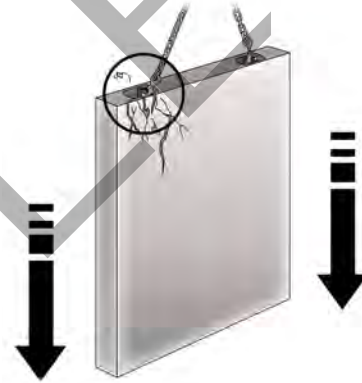
QUESTION 3

You are using a lifting insert and it breaks.
What do you do?

Stop working



Safely lower or support the load if possible



Tag the equipment out of service



Do not use the lifting insert. Report the defect to the manufacturer of the panel. They might fix or replace it.



Associated plant

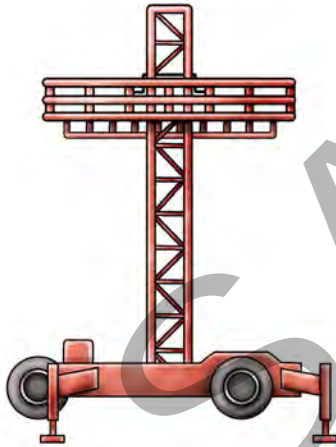
You will also need to think about any associated plant and the forces applied to them. This may include:

Mast climbers

A mast climber is a platform raised for temporary access to heights.

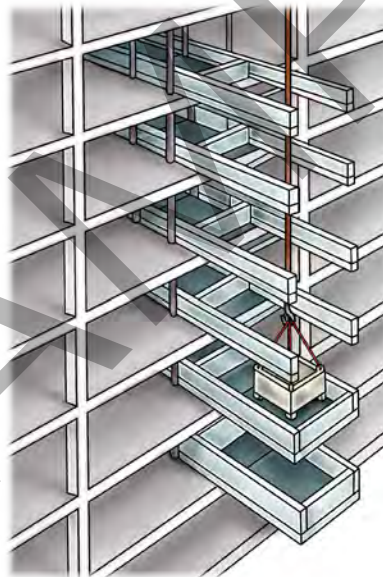
A dead load is a mast climber weight on the ground with no elevation or movement.

A dynamic load is a mast climber being elevated with workers, tools and materials on it.



Cantilevered crane loading platform

A temporary loading bay cantilevered from the face of a building or structure to land or lift crane-handled loads.

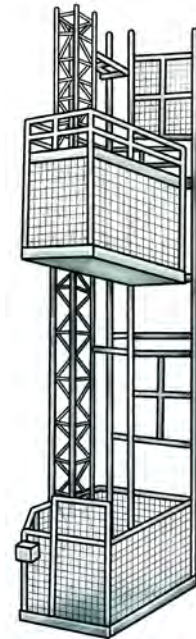


Materials hoist

A materials hoist is a powered elevator you use to move materials up and down a building.

A wind load is the wind force on the materials hoist.

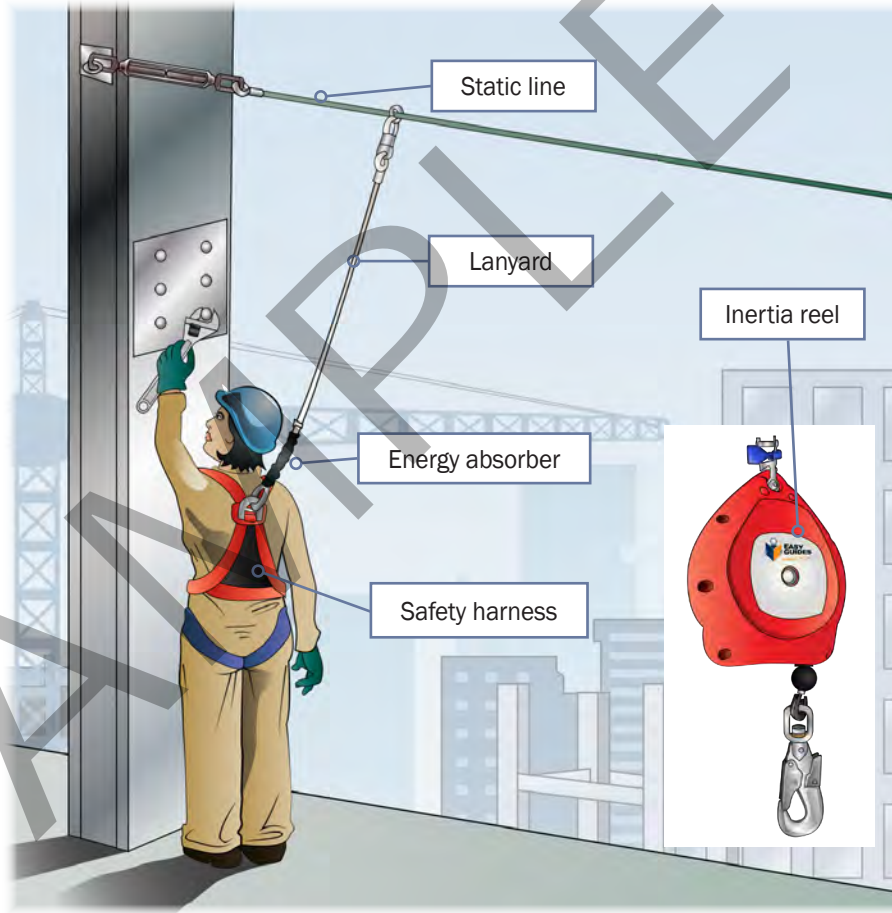
A dynamic load is a barrow hoist with a wheelbarrow of sand.



QUESTION 9

When you are doing rigging work you need safety gear. There is basic gear like boots and vests.

What other safety gear can a rigger use?



SELECT AND INSPECT EQUIPMENT

Element 2

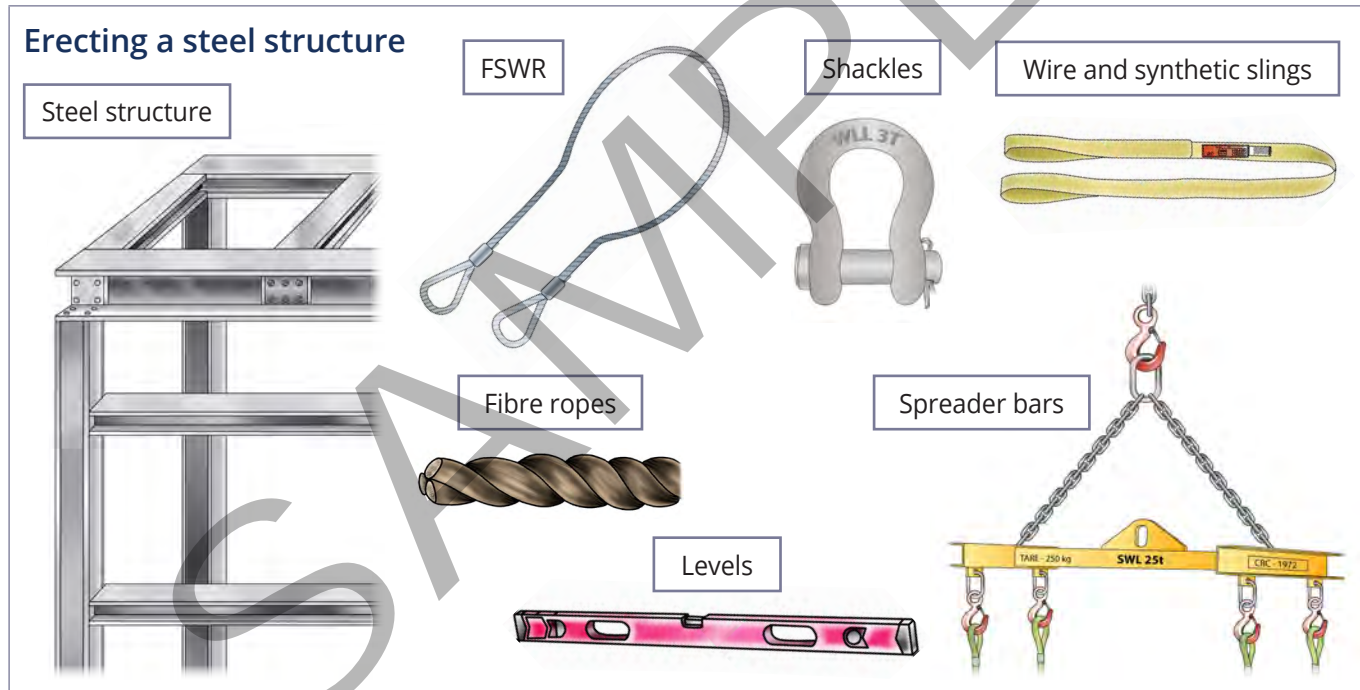


Select and inspect rigging equipment

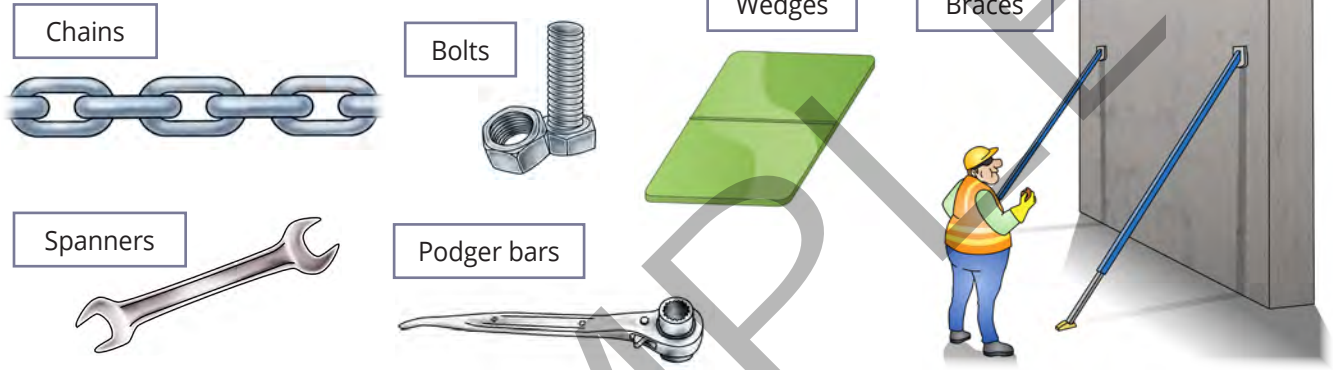
When you start a job you need to select and inspect the right rigging equipment.

Choosing the right equipment for the task

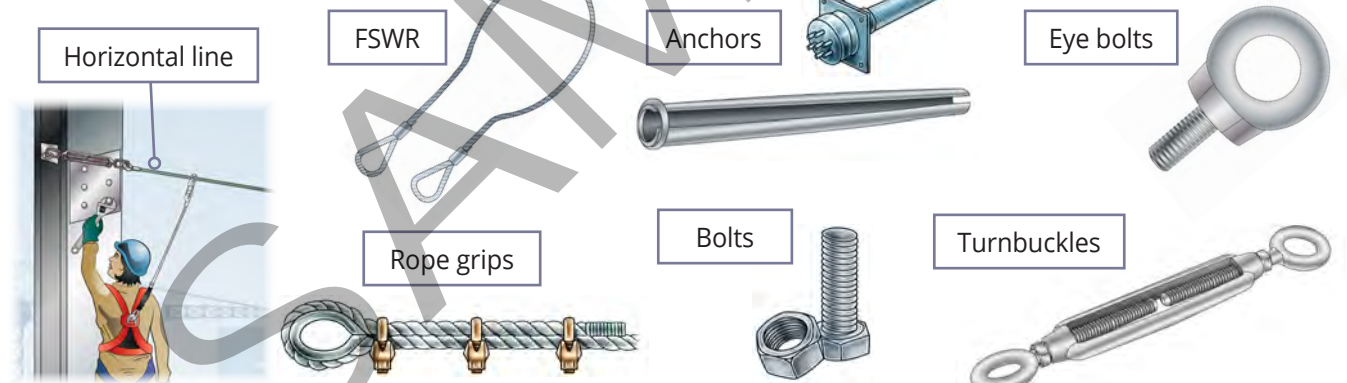
There are many different rigging tasks you will have to do. For each task, there are common pieces of equipment you will need. The following details show some examples of common basic rigging tasks and the equipment needed for them.



Erecting a steel structure (continued)



Setting up horizontal lines



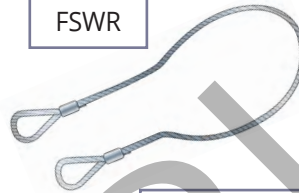
Choosing the right equipment (continued)

Working with precast selections

Precast selection



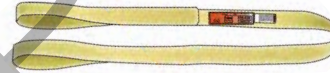
FSWR



Eye bolts



Wire and synthetic slings



Shackles



Levels



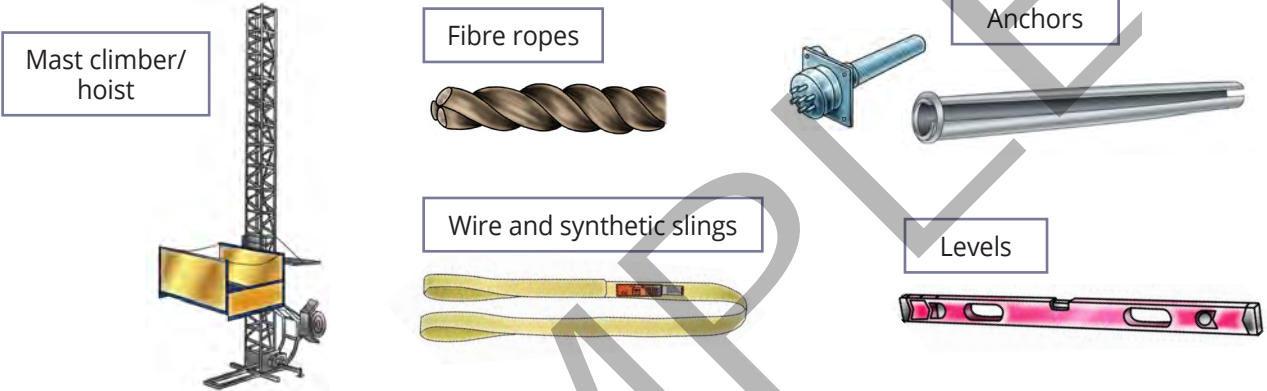
Spreader bars – Chains should be attached to points you are lifting from



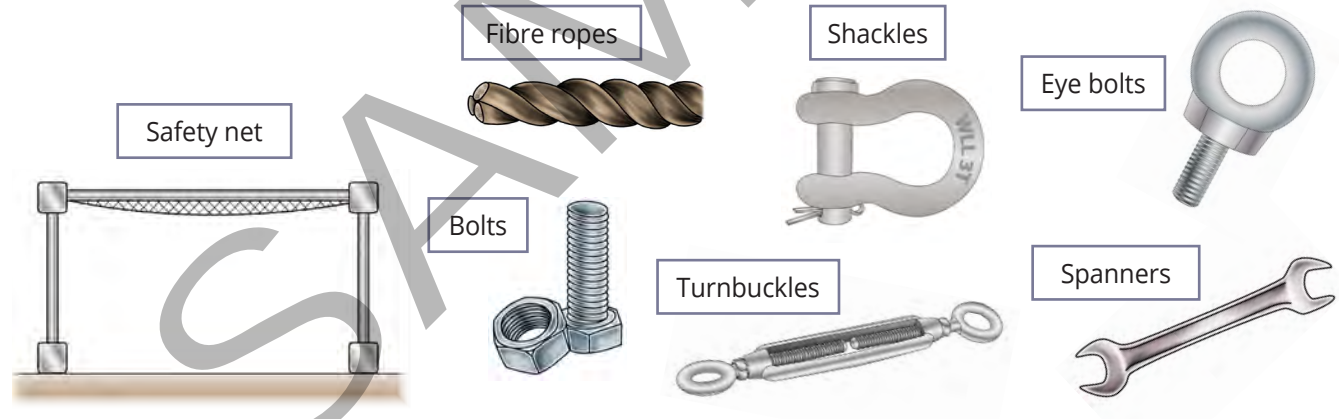
Braces





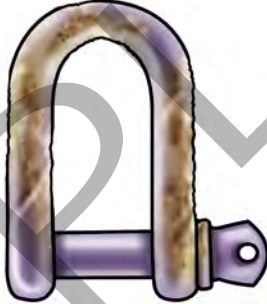

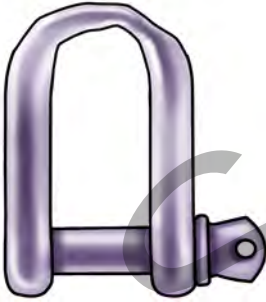
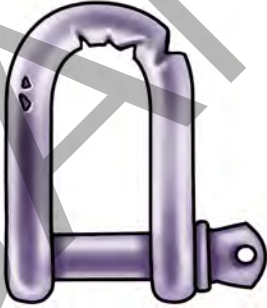
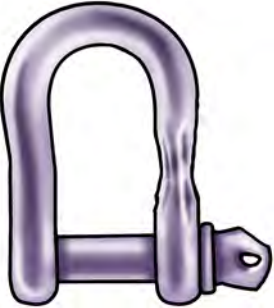
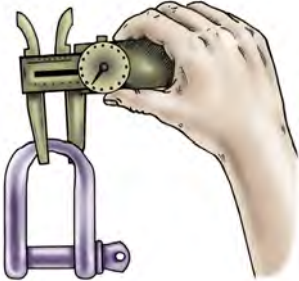
Setting up mast climbers/hoist



Working with safety nets



Checking the condition of chains and shackles

<p>Cracks or spot welds</p> 	<p>Twists, knots and kinks</p> 	<p>Too much rust</p> 	<p>Locked or stretched</p> 
<p>Pitting</p> 	<p>Gouge marks or cuts</p> 	<p>Heat damage</p> 	<p>The link has over 10% wear in the diameter.</p> 

Checking the capacity of equipment

Check the Working Load Limit (WLL) and Safe Working Load Limit (SWL) of the lifting gear and crane you will use to make sure it can lift and move the load safely.

Working load limit (WLL)

The working load limit (WLL) is the legal maximum amount of weight a sling can lift in a straight vertical direction.



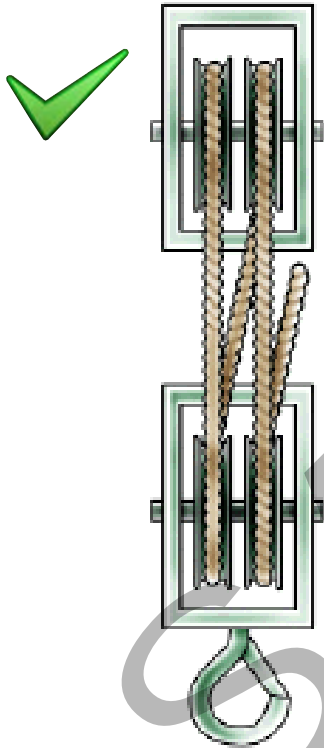
Safe working load (SWL)

The safe working load limit (SWL) is the maximum amount sling/s can lift in a given slinging configuration/method.

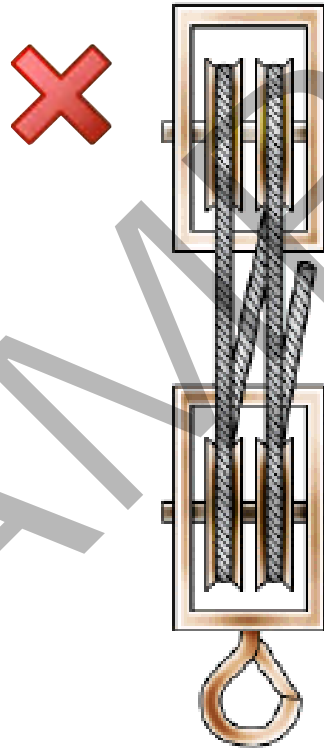


Ropes and blocks

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



FSWR **cannot** be used safely in a fibre tackle block.



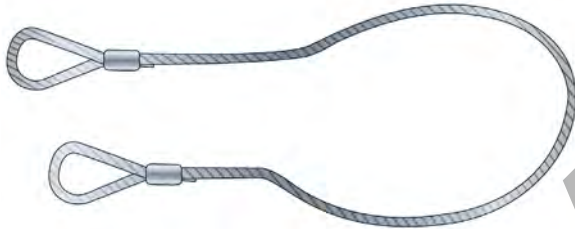
When a load is held by hand the minimum diameter of the fibre rope in a fibre rope tackle block is 12 mm.



Calculating the WLL of slings

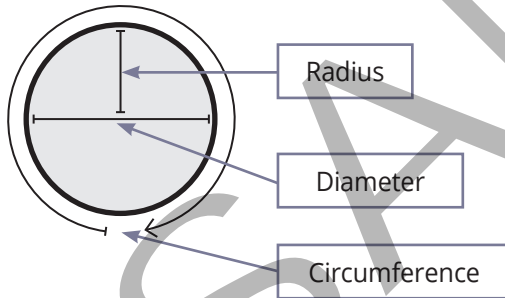
There are several 'rule of thumb' formulas for working out the WLL of slings.

Calculating the WLL of a flexible steel wire rope



The formula to calculate the WLL of FSWR is:

$$\text{WLL (kg)} = \text{Diameter}^2 \text{ (mm)} \times 8$$



For example, a FSWR with a diameter of 20 mm:

$$\text{WLL} = D^2 \times 8$$

$$\text{WLL} = 20^2 \times 8$$

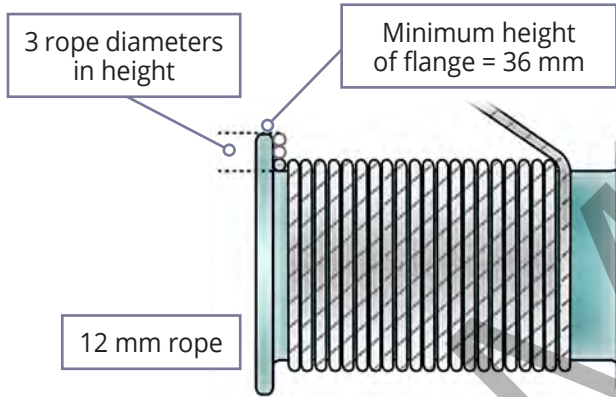
$$\text{WLL} = 20 \times 20 \times 8$$

$$\text{WLL} = 400 \times 8$$

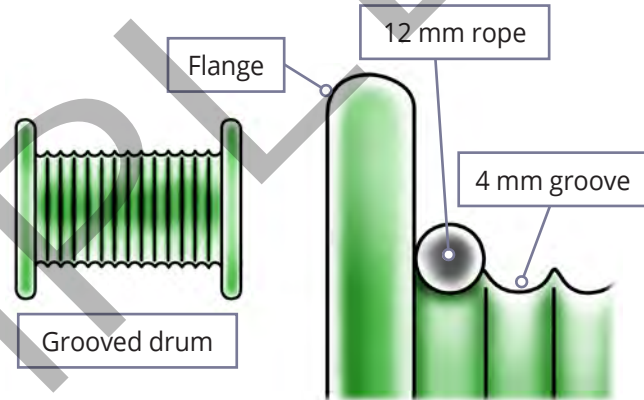
$$\text{WLL} = 3200 \text{ kg (3.2 tonnes)}$$

Drums

The flanges of a drum (grooved or ungrooved) should be at least three rope diameters in height (two rope diameters above the last layer of rope).

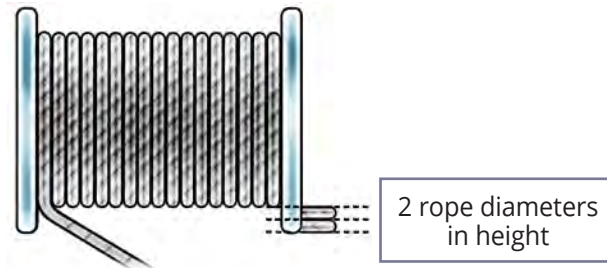


On a grooved drum the depth of each groove should be at least a third of the rope's diameter.



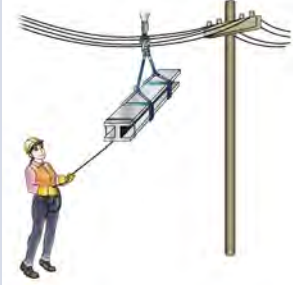
Always check for manufacturer's specifications to find out the limitations of the equipment and to get instructions on the safe use of the equipment.

The top layer on a multi-layered drum must **not** be closer than 2 rope diameters to the top of the flange when drum is full.



QUESTION 12

What kind of tagline should you use near powerlines?



Use a non-conductive rope such as dry fibre rope.



QUESTION 13

You must select your safety equipment (including PPE).

When must you do this?

When you are planning the job.



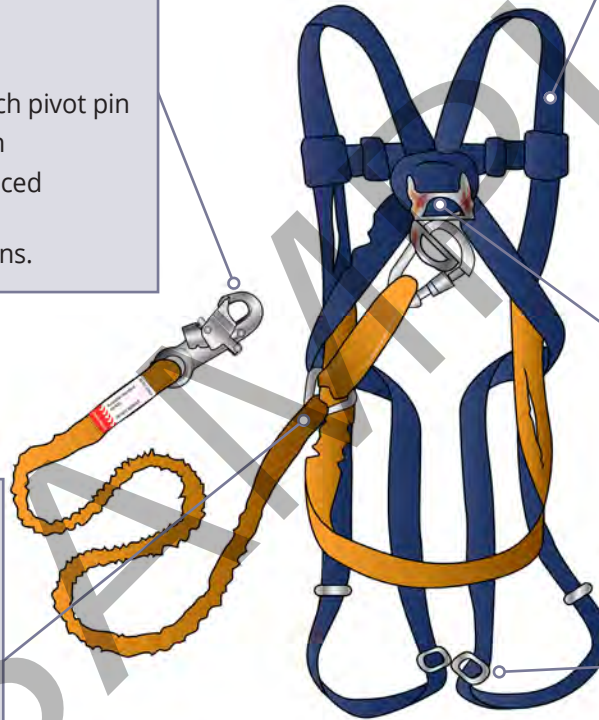
Harness defects

Snap hooks

- Distortion of hooks/latch
- Cracks or forging folds
- Open rollers
- Wear at swivels and latch pivot pin
- Free movement of latch
- Broken, weak or misplaced latch springs
- Dirt or other obstructions.

Sewing

- Broken, cut or worn threads
- Damage or weakening of threads due to contact with heat, corrosives, solvents or mildew.



Webbing

- Cuts or tears
- Abrasion damage
- Excessive stretching
- Damage from heat, corrosives or solvents
- Damage from rotting or mildew
- Ultraviolet exposure.

D-rings

- Too much vertical movement of straight part of D-ring
- Cracks
- Distortion
- Wear to cross-section.

Buckles and adjusters

- Distortion
- Cracks and forging laps
- Open rollers
- Bent tongues.

SET UP TASK

Element 3



Setting up safety control measures

Before you start any rigging work, you need to put in place safety control measures to prevent and control hazards. This could include but is not limited to:

- Restricting access to an area
- Removing any hazards
- Moving equipment, plant or vehicles that are not involved in the rigging work
- Setting up warning signs and barricades
- Erecting overhead protection
- Creating pedestrian exclusion zones
- Perform any control measures listed on the JSEA or SWMS.



Trenches

Cover any trenches in the area to stop workmates falling in.



PPE

Make sure all people involved in the rigging work wear the appropriate personal protective equipment (PPE.)



Too dark

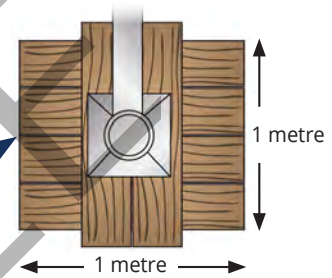
Make sure there is enough lighting to do the work safely. You may need to set up lights.



Load-bearing capacity of the ground

You will have to work on different types of ground. This chart shows the load-bearing capacity of different ground types. Different types of ground can take different amounts of weight. The pressure a certain type of ground can take is called its **bearing capacity**.

This table shows the nine different types of ground and their bearing capacity from weakest to strongest.



Ground type	Maximum bearing capacity P_{MAX} (Tonnes per m^2)	Sample of soils
Wet clay	Less than 10	
Loose sand	10	
Soft clay (dry)	10	
Stiff clay (dry)	20	
Compacted sand	20	
Asphalt	20	
Compacted gravel (with up to 20% sand)	40	
Shale rock and sandstone	80	
Hard rock	200	

Check the forces and loads used

Make sure you review and consult with other workers on the site about the forces and loads used in the work you do.

Setting up a winch and purchase

A purchase is a device which increases the amount you can lift or pull. This is called a mechanical advantage.

A wire rope runs from the winch to the load through a number of sheaves.

This is called a **purchase** and increases the pulling effect of the winch.

2 parts or falls -
for example
Load 2 tonne
Effort 1 tonne

1 tonne pull

This purchase provides a mechanical advantage ratio of 2 when hoisting a load upwards

Different purchases provide different mechanical advantage ratios when a load is hoisted.

3 parts or falls -
for example,
Load 3 tonne
Effort 1 tonne

1 tonne

3 tonne

This purchase provides a mechanical advantage ratio of 3 when hoisting a load upwards

A typical winch and purchase

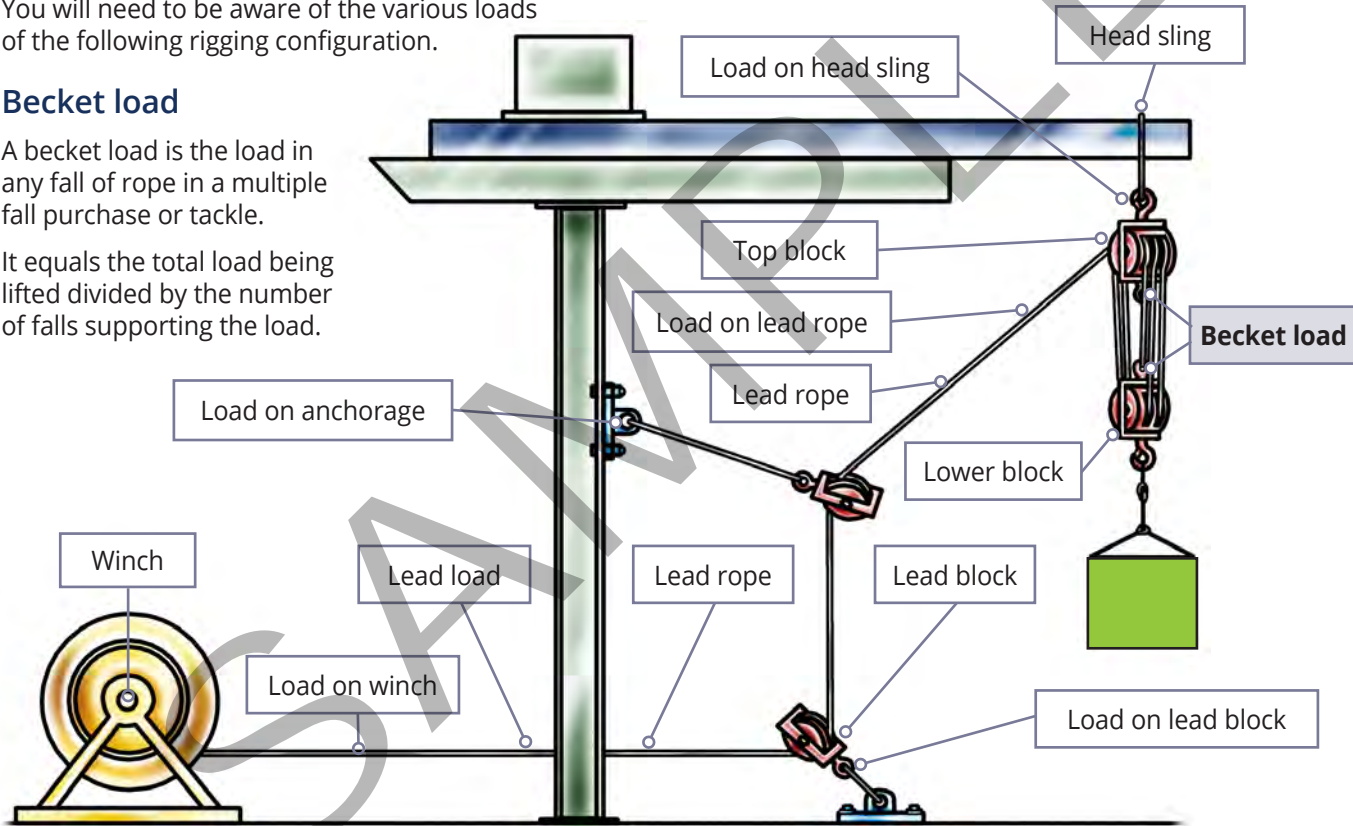
A winch is a device which enables a load to be hoisted or hauled. A wire rope runs from the winch to the load through a number of sheaves. This is called a **purchase**.

You will need to be aware of the various loads of the following rigging configuration.

Becket load

A becket load is the load in any fall of rope in a multiple fall purchase or tackle.

It equals the total load being lifted divided by the number of falls supporting the load.

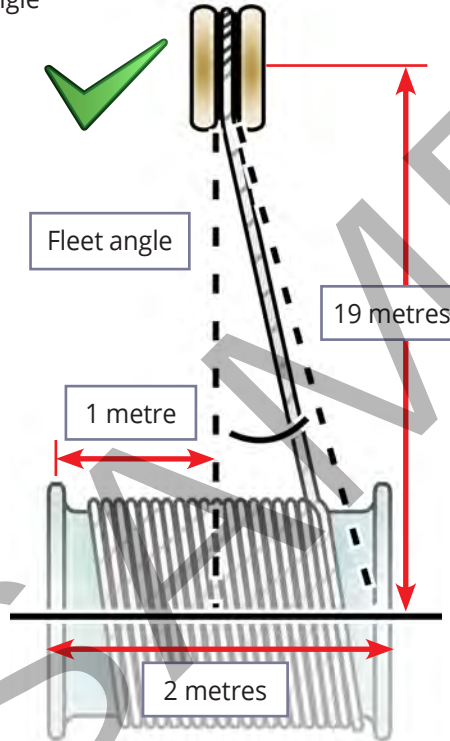


Fleet angles

The fleet angle is the angle formed from the centre line of the drum to the centre of the first lead sheave then back to the inside centre of the drum flange.

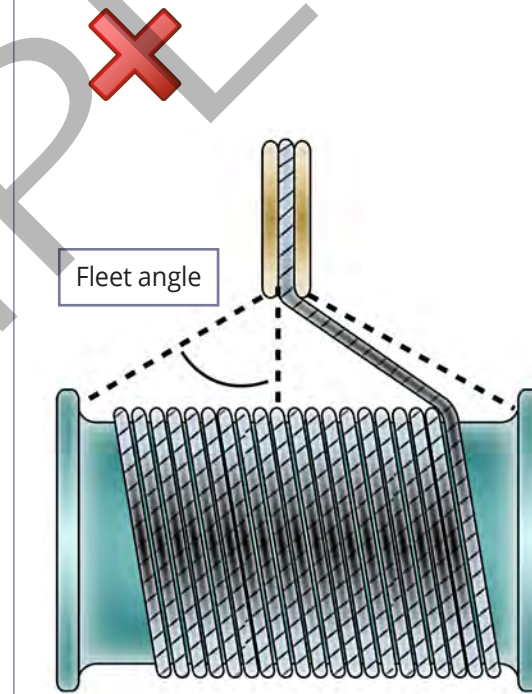
The maximum fleet angle for a grooved drum is 5 degrees (1 in 12).

The maximum fleet angle for an un-grooved drum is 3 degrees (1 in 19).



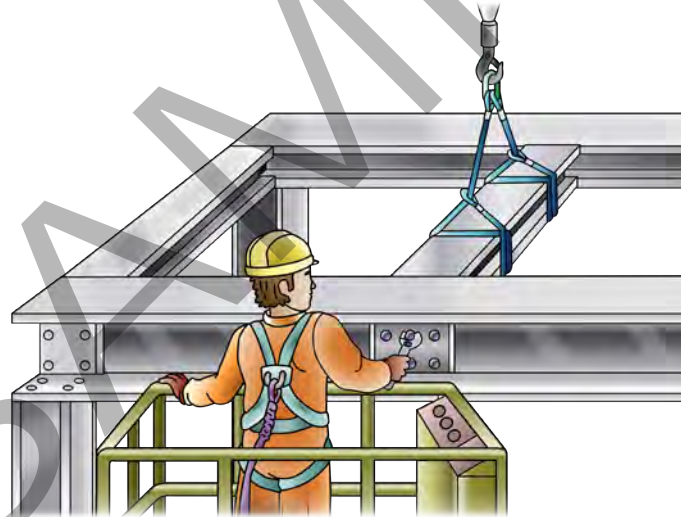
Angle too large

If the angle is too large then it can cause wear on the rope or sheave flange or uneven spooling of the rope on the winch drum.



UNDERTAKE BASIC RIGGING ACTIVITIES

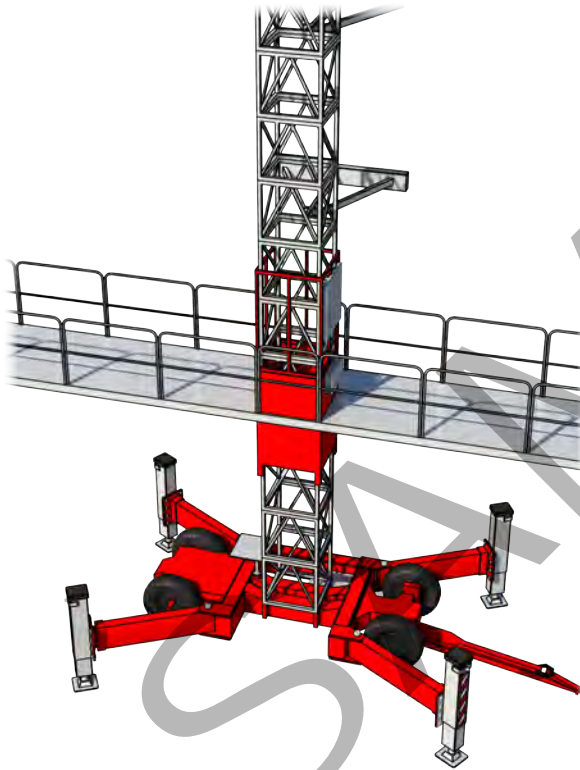
Element 4



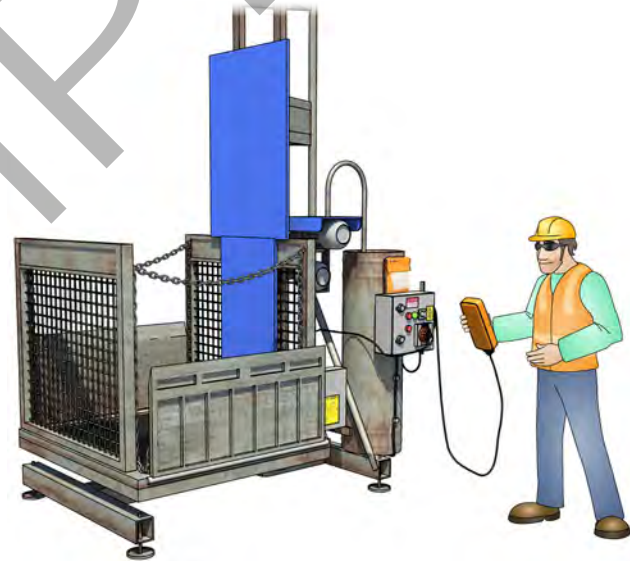
Erect associated plant

Associated plant includes:

Mast climbers



Materials hoists



Erect associated plant (continued)

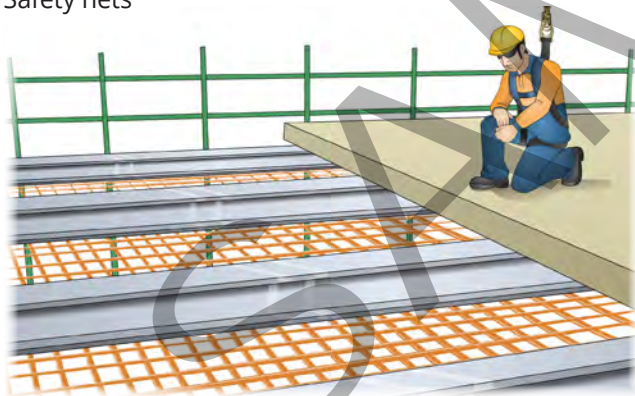
Static lines



Loading platforms



Safety nets

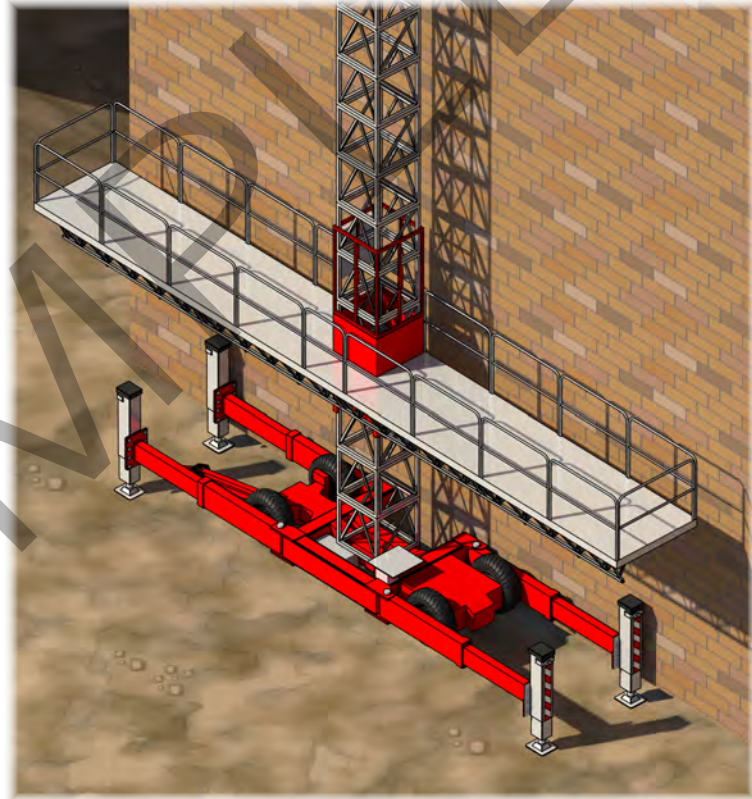


Following are some examples of how these are erected.

Erect a mast climber

When erecting a mast climber make sure you:

- Check ground conditions/bearing pressure
- Check for powerlines in the area
- Read the manufacturer's specifications
- Barricade the area
- Extend, lock and pack outriggers
- Anchor the mast
- Keep the platform fully lowered when not in use
- Install and test limit switches
- **Do not** erect in high winds.

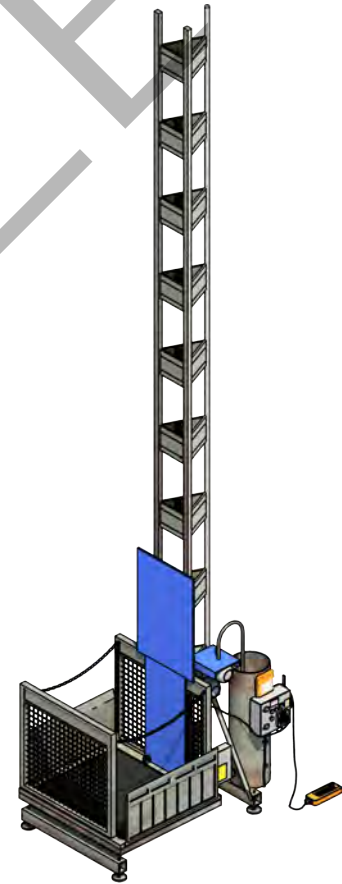


Erect associated plant (continued)

Erect a materials hoist

A few important points to remember when erecting a materials hoist are:

- People should never ride in a materials hoist unless they are a licensed rigger
- The minimum and maximum horizontal clearance between the moving platform of a cantilevered hoist and any landing or floor is 25 mm and 100 mm.
- The tower must be guyed or tied every 6 metres with no more than 3 metres free-standing above its top tie
- The minimum height of a landing gate for a cantilevered platform hoist is 1.8 metres
- The handrail should be placed 800 mm from the base of the hoist tower to stop people leaning over the handrail and being hit or crushed by the platform as it comes down.
- Handrails should be placed on the floors to prevent falls
- Install and test limit switches
- Display signs showing WLL (Working load limit) and SWL (Safe working load).

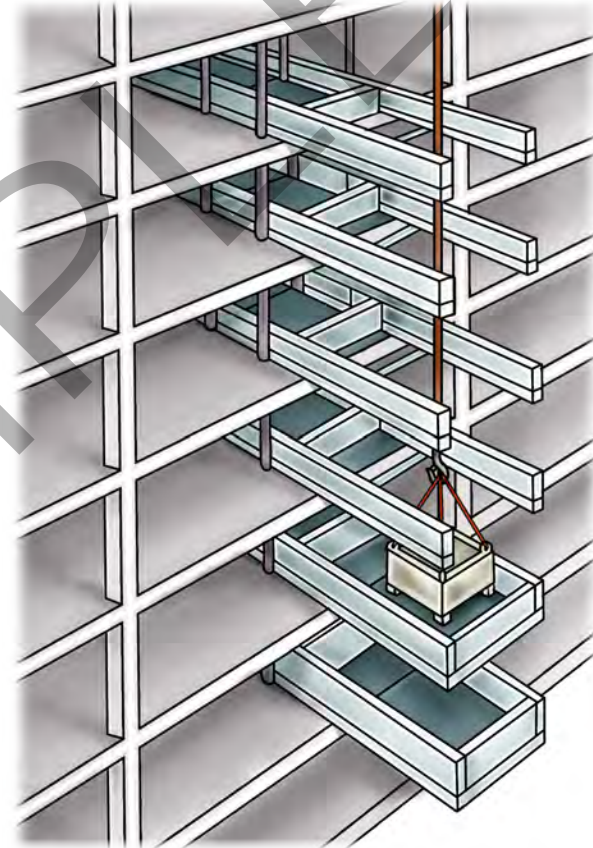
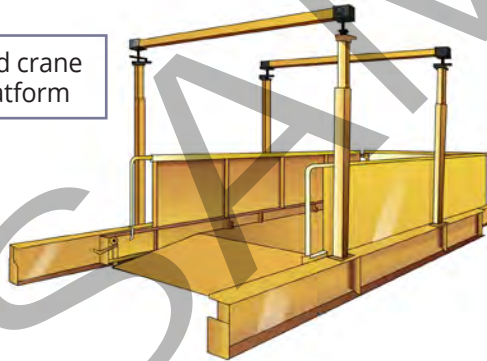


Erect a cantilevered crane loading platform

A few important points to remember when erecting a cantilevered crane loading platform are:

- The platform should be used only for its designed purpose. Any alterations or different use should be an engineered design.
- All bolts and connectors should be secured tightly (no friction anchors)
- Platform landings should be flush with the floor slab or suitable ramps should be fitted
- All props must be plumb with rear ties positioned
- Rear handrails should be in position

Cantilevered crane loading platform

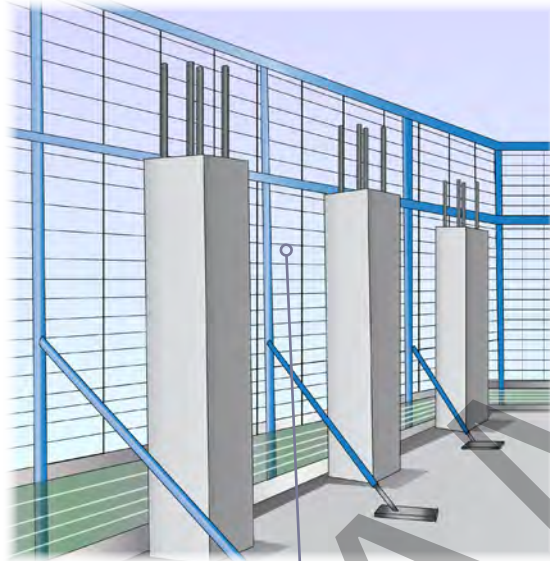


Erect a cantilevered crane loading platform (continued)

- There should **not** be any gap between the side of the platform and the site handrails
- Platforms facing a public roadway should not extend beyond the line of the overhead protection provided for the public
- The platform needles should be secured against lateral displacement
- Side panels and gates should be fixed in position
- The platform decking should be flush with and butting the floor slab. If this is not possible then ramps should be fitted.
- Adjustable props must be adjusted to make sure of minimal adjustable jack extension
- Engineer's approval may be required
- Signs showing the maximum load information should be clearly shown
- Only a person with a basic rigging or intermediate scaffolding licence can directly supervise the installation and dismantling of a cantilevered crane loading platform.



Set up shutters and safety screens

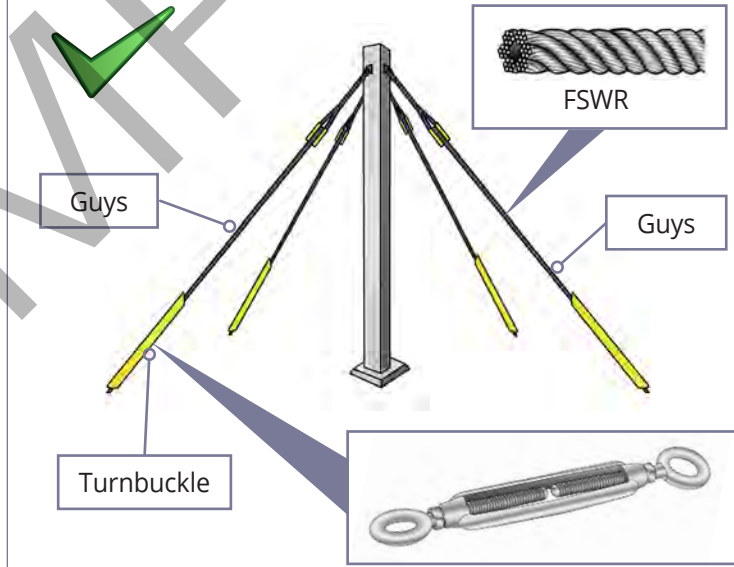


Safety screens

Stabilise free standing column

A free standing column needs to be stabilised.

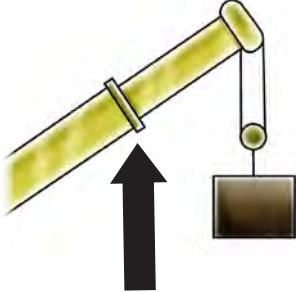


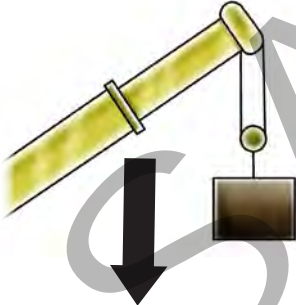
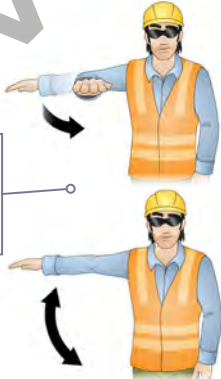

- Use guying, lashing or bracing to keep structures stable during erection
- If guys are to be left overnight, the right guys to use are flexible steel wire rope (FSWR)
- **Do not** leave a lattice section or steel truss unsupported once erected.



Hand and whistle signals

There is a series of hand and whistle signals that fall under AS. 2550.1 - 2002 (Australian Standard). The dogger and the crane operator need to check that they understand the signals that are going to be used.

Signals can vary on different sites.

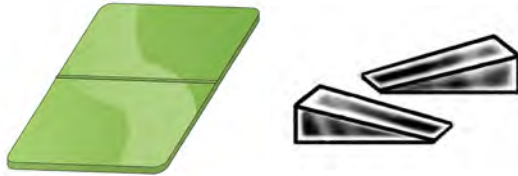
Hoisting raise					
Motion		Hand signal		Whistle	 ● ● 2 short
Hoisting lower/down					
Motion		Hand signal	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 10px;">Commonly used signal (not Australian Standard)</div> 	Whistle	 ■ 1 long

Connecting temporary ties, guys, propping and shoring Tools for setting up initial columns (structural steel)

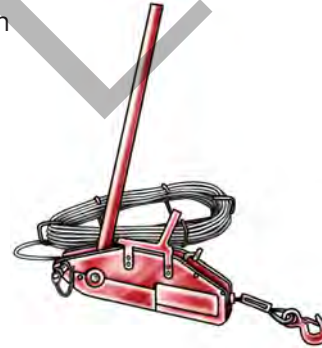
You are setting up some structural steel. The initial columns need to be plumbed and levelled.

There are some tools you can use to make sure the initial columns are set up properly. They are:

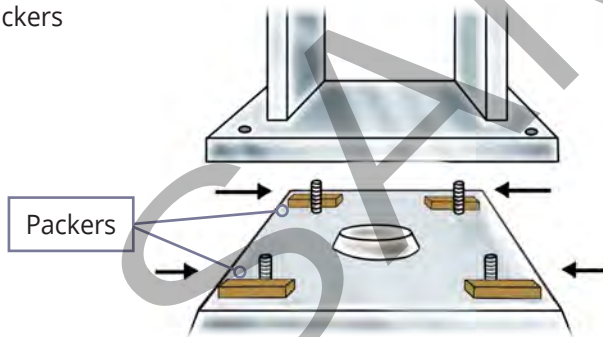
Wedges



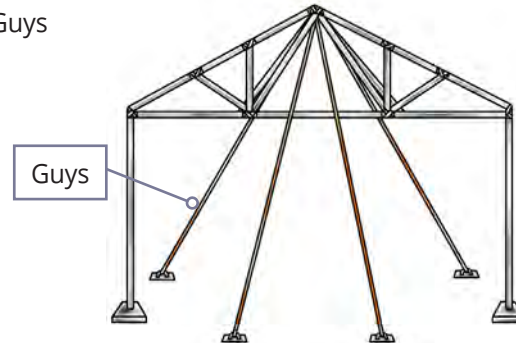
Tirfors - winch



Packers



Guys



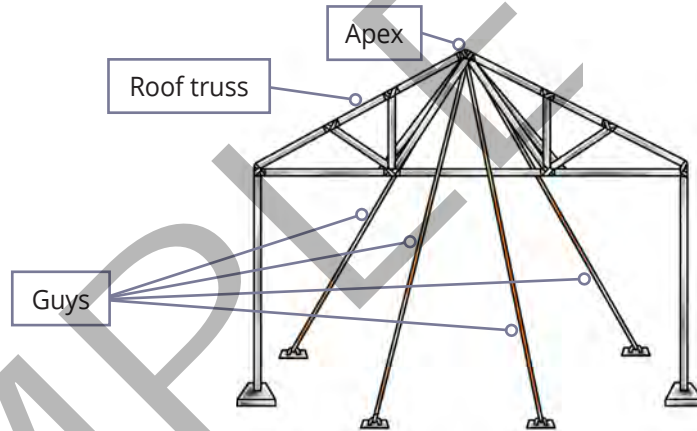
Installing the first roof truss

You are installing the first roof truss.

You must support the truss until the wind brace is fitted.

This is done by attaching guys to the apex (top) of the truss.

You will take the guys away when the wind bracing is set up.

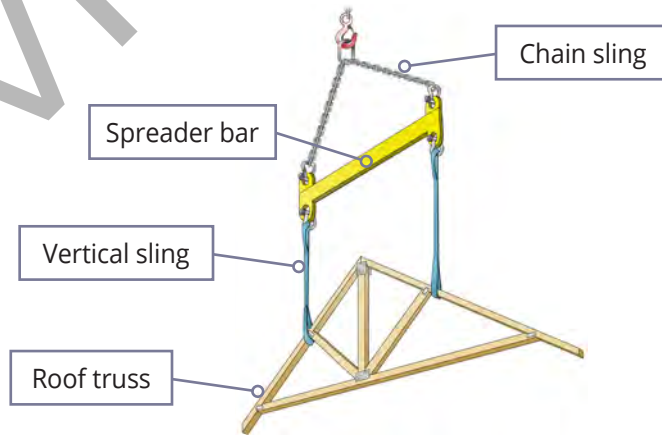


Lifting a pitched gable roof truss

A flat pitched gable roof truss must be lifted.

You must stop the truss bending.

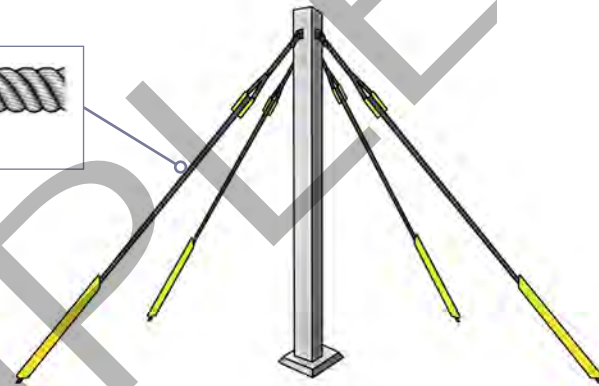
This is done by bridling and slinging the truss with a vertical sling.



Connecting temporary ties, guys, propping and shoring (continued)

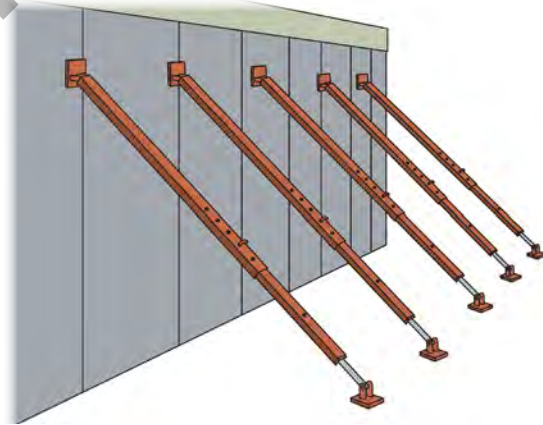
Wire ropes

Use wire ropes for guys as fibre ropes shrink when wet and stretch when dry.



Support for precast panels

Prop or shore up unsupported precast concrete panels while finishing construction work.

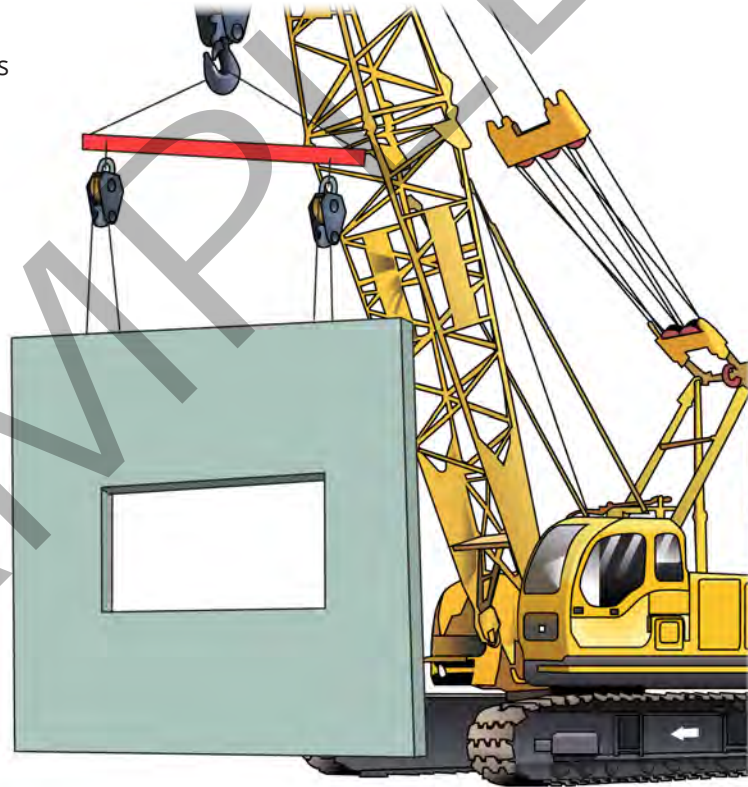


Work with associated equipment

You must always work with associated equipment in the right way. This includes working safely with the equipment.

Lowering beams and panels

The crane operator must lower beams or panels into position as slowly as possible.



Work with associated equipment (continued)

Checks before you use a Cantilevered crane loading platform (CCLP)

All the following checks should be done before you use a CCLP.

- Check all connectors and bolts are tight and in position
- Check adjustable props are set up to prevent the jack extending too much
- Check handrails are in the right position
- Make sure the platform floor and floor slab have no gaps
- Check props are plumb and the rear ties are in position
- Check if an engineer's permission is needed.

Check with an engineer



Minimum jack extension

Props plumb

Connectors and bolts

Handrails

Platform floor

COMPLETE TASK

Element 5



Dismantle structures and associated plant

Always check the manufacturer's specifications when you dismantle (meaning take apart) any structures and associated plant.

Make sure you pack up and store the parts properly.



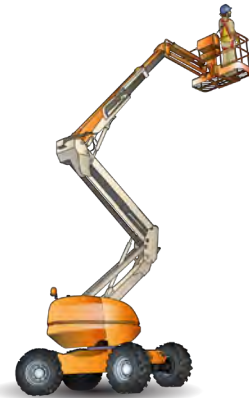
Separating the lifting gear without climbing

There are ways to separate the lifting gear from the load without climbing. Some ways you can do this are:

Remote release shackles



Elevating work platform (EWP)



Talk to other workers

Before you start to dismantle (take apart) structures or equipment, talk with the other workers who will help you.

Safely conducting work at heights

To work safely at heights you should:

Wear the right personal protective equipment (PPE) for the job



Ensure you anchor the lanyard and inertia reel correctly



Use clear, easy-to-understand words and hand signals with other workers.



Communication

Make sure you communicate clearly with other personnel when you dismantle structures and plant.



Working safely at heights when dismantling structures

It's important to make the dismantling of structures as safe as possible.

Because you will work at heights, there are things you can do to make this safer.

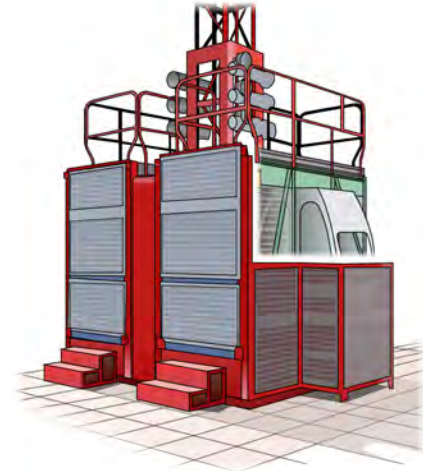
Use an elevating work platform (EWP)



Use horizontal (static) lines



Use a personnel and materials hoist



Dismantling structures safely

Check the manufacturer's information before you take apart equipment.

You need to do this to make sure you dismantle equipment safely.



Sometimes you will need to use equipment (including braces, guys and lashing) to keep the structure safe and stable.

