LEARNER GUIDE

CPCCLDG3001

Licence to Perform Dogging

ELITE LICENSING

CERTIFY WITH CONFIDENCE, WORK SAFELY.

This guide will assist learners with achieving the required knowledge and performance outcomes described by the unit of competency above.

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Content

Purpose

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This Student Guide provides the content which will assist you in achieving the required knowledge and performance outcomes described by the following units of competency:

- CPCCLDG3001 Licence to Perform Dogging

It may be used either as a guide when undertaking self-paced learning or as a handout during a formal course of instruction delivered by a Trainer working with a Registered Training Organisation (RTO).

This Student Guide will not be collected at the end of the program, enabling you to retain and revise the knowledge and skills that you have been introduced to.

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Overview

Learning outcomes

At the end of this module, you will be able to:

- Plan the job
- Assess load and select lifting gear
- Shift the load

Section One: Plan the Job

1.1 Introduction

This training course is based on the National High Risk Licence Unit of Competency CPCCLDG3001 Licence to Perform Dogging.

You will learn about:

- Planning the job.
- Selecting and inspecting equipment.
- Preparing the site and equipment.
- Shifting loads.
- Shutting down the job and cleaning up.

1.1.1 What is Dogging?

A licensed Dogger can carry out the following work:

- The application of slinging techniques.
- The selection and inspection of lifting gear.
- Directing a crane or hoist operator in the movement of a load when the load is out of the operator's view.
- Assessing the weight of a load.
- Communicating with the crane operator in regards to the capabilities of the crane.

You must have a dogging licence, or be under direct supervision of a person with a dogging licence as part of a training program to be able to do the following tasks:

- Selecting slings.
- Inspecting slings.
- Choosing how to sling the load.
- Directing the crane operator while the load is being moved.

1.1.2 High Risk Work Licence Requirements

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

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

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

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

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

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

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

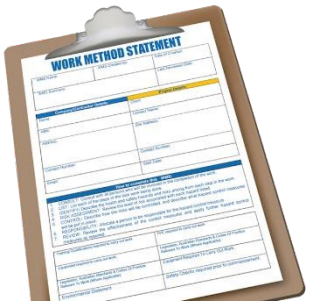
Your employer might ask you for evidence that you have a high risk licence before you start any high risk work. You can show them:

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

1.2 Gather Site Information and Plan Job

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

1.2.1 Work Method Statements



Many worksites require a work method statement before any 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.

1.2.2 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.

Before you start a job remember to think about:

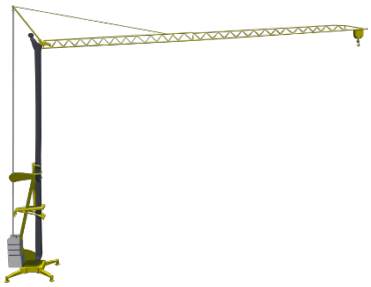
- **Job or Task Requirements –** Think about everything the job involves such as: What is the job? Where is the job? What do I need for the job? What type of crane will be used? What are its functions, capabilities and limitations?
- **Priorities or Sequencing –** Break the entire job into tasks and 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:
  - Incident and accident reporting.
  - Equipment fault reports.
  - Equipment maintenance requirements.
  - Communication methods and equipment use.
  - Supervision requirements.
  - Emergency response.
- **Risk Management–** This involves managing any risks or hazards that are present throughout the worksite and in relation to your task.

Areas that you should consider when planning dogging tasks should include:

- Communications are safe and adequate.
- Access and egress to and from the work area.
- Location and specifics of the task.
- Permits or licences required to carry out the work.
- Equipment required for the task.
- Availability of equipment for the task.
- Type, capacity and capability of the crane.
- Safe work procedures that need to be followed.
- The type, condition, size and configuration of the load that is being moved.

1.2.3 Types of Cranes

Cranes that you may work with could include:

		
Tower Cranes	**Self-Erecting Tower Cranes**	**Portal Boom Cranes**
A boom or jib is mounted on a tower structure.	A tower crane where the tower structure and boom/jib elements are not disassembled into component structures and can be transported between sites as a complete unit. The erection and dismantling processes are an inherent part of the crane's function.	The boom/jib is mounted on a portal frame, which is supported on runways along which the crane may travel.
		
Mobile Cranes (Slewing)	**Non-Slewing Mobile Cranes**	**Vehicle Loading Cranes**
A crane capable of travelling over a supported surface without the need for fixed runways. Relies only on gravity for stability.	A mobile crane incorporating a boom/jib that does not slew.	A vehicle-mounted crane. Principal purpose of loading and unloading the vehicle.
		
Bridge Cranes	**Gantry Cranes**	**Derrick Cranes**
Consists of a bridge beam or beams that are mounted to end carriages at each end. Capable of travelling along elevated runways and has one or more hoisting mechanisms arranged to traverse across the bridge.	Consists of a bridge beam supported at each end by legs mounted on carriage ends. Gantry cranes are capable of travelling on supporting surfaces or deck levels, whether fixed or not and has a crab with one or more hoisting units arranged to travel across the bridge.	Has a slewing strut-boom with the boom pivoted at the base of a mast which is either guyed (guy-derrick) or held by backstays (stiffleg derrick) and which is capable of luffing under load.

1.2.3.1 Crane Movements

Different cranes have different capabilities and move in different ways. These capabilities will affect the way loads are moved around the site, and the way you direct the crane operator.

- **Slewing –** The side to side, rotating movement of the boom.
- **Luffing –** The up and down movement of the boom.
- **Telescoping or Trolley In/Out –** Telescoping is the extension and retraction movement of a hydraulic type boom. Trolley in/out refers to the movement of a hoist assembly along the length of a boom (relevant to bridge, gantry and some tower cranes).
- **Hoisting –** The raising and lowering of the hook block using the hoist rope.

1.3 Identify and Manage Hazards

Hazards create risk. Check for hazards.

A **risk** is the chance of a hazard hurting you or somebody else or causing some damage.

A **hazard** is a thing or situation that has the potential to cause injury, harm or damage.

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.
- 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 include:

- Ground conditions:
  - Underground services.
  - Potential non-weight bearing surfaces.
- Poor lighting.
- Traffic:
  - Pedestrians.
  - Vehicles.
  - Other plant.
- Overhead hazards:
  - Power lines.
  - Overhead service lines.
  - Obstructions. – Trees.
- Weather:
  - Lightning.
  - Storms. – Wind.
- Surrounding structures: – Buildings.
  - Obstructions.
- Workplace-specific hazards: – Other workers.
  - Equipment and machines.
  - Facilities.
  - Other equipment.
- Dangerous materials.
- Working at heights.

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).
- 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

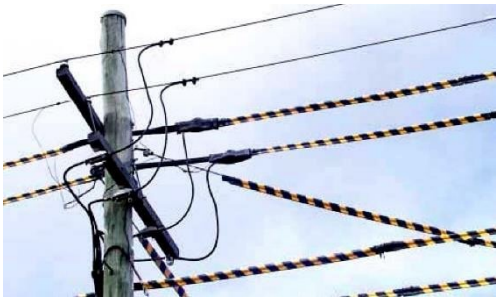
Northern Territory

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 Tiger Tails

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



1.3.3 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:

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

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

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

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

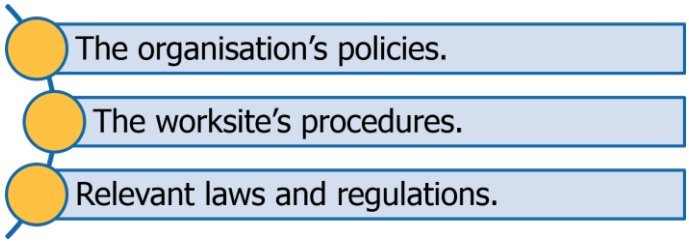
	Consequence				
Likelihood	**1. Insignificant**	**2. Minor** First Aid Required	**3. Moderate** Medical Attention and Time Off Work	**4. Major** Long Term Illness or Serious Injury	**5. Catastrophic** Kill or Cause Permanent Disability or Illness
1. Rare	Low	Low	Moderate	Moderate	Moderate
2. Unlikely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

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

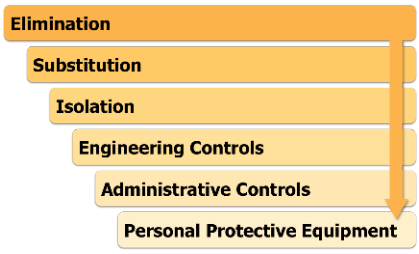
The table below is an example of a site risk policy:

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

The action you take will depend on:



1.3.4 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

Personal protective equipment (PPE) can help to reduce the effects or chance of being hurt. All people carrying out dogging need to wear:

- Safety helmet (hard hat)
- Safety footwear.
- Safety gloves.
- Safety glasses.
- High visibility clothing. • Ear plugs or earmuffs.
- A mask or respirator.
- Clothing that protects you from the sun or from the cold.

Any other safety equipment required by the workplace.

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.

1.3.4.2 Working at Night or in Darkened Areas

If dogging operations are being carried out at night, or in darkened areas, adequate lighting needs to be provided across the entire work area.

This is to make sure that the all workers can see properly and carry out their work safely.

1.3.4.3 Working Around People

If personnel are working around a slewing crane and are close to the outriggers or chassis there is a risk that they might be struck or crushed by the crane or load as it is being slewed.

An exclusion zone should be set up to keep personnel a safe distance away from the crane during operations.

Section Two: Assess Load & Select Lifting Gear

2.1 Assess the Load

2.1 Assess the Load

Before you try to shift a load, you (the dogger) will need to accurately assess the load to be moved.

2.1.1 Load Assessment

You (the dogger) will need to assess the following before shifting a load:

•The weight of the load (to decide what crane and slings to use). To determine the weight of the load you can:

- Obtain content or weighbridge notes or other information.
- Weigh the load.
- Estimate the load through calculations.

– Check whether the weight appears on the load itself or the packaging that it is delivered in.

•The dimensions of load (to decide what slinging techniques to use).

•The centre of gravity of the load (so that you can have the crane positioned correctly to pick up the load).

The crane operator is responsible for telling you what the capacity of the crane is.

2.1.2 Calculating Load Weight

If you are required to calculate the load of the weight you should have an understanding of the weights of common loads. The following table is a guideline of the density of common load materials:

Remember that 1 tonne = 1,000kg

Load Material	Approximate Weight
Aluminium	2.7t per m^3
Bricks	4.0t per 1000 bricks
Bronze	8.5t per m^3
Cast Iron	7.2t per m^3
Cement	1.0t per 25 bags
Clay	1.9t per m^3
Coal	864kg per m^3
Concrete	2.4t per m^3
Copper	9.0t per m^3
Earth	1.9t per m^3

Load Material	Approximate Weight
Granite	2.6t per m^3
Gypsum	2.3t per m^3
Iron, ore	5.4t per m^3
Lead	11.2t per m^3
Steel	7.85t per m^3
Poly Pipe	1.1t per m^3
Timber (hardwood)	1.1t per m^3
Timber (soft)	0.6t per m^3
Water	1.0t per m^3 1L = 1kg

For example, if you had a load containing 3 cubic metres of steel you could work it out using this table.

A cubic metre of steel weighs approximately 7.85 tonne. Therefore 3 cubic metres of steel weighs 3 x 7.85 = 23.55 tonnes or 23550kg.

If you are working with a load of water then the ratio to work out the weight of the load is one kg to every litre.

For example, if you have 400L of water in a load then the load would weigh approximately 400kg. It is important to note that this ratio does not apply to all liquids.

In most cases loads aren't always a perfect cubic metre and if this is the case you will need to find the area of the load before obtaining the weight:

Step 1 – Work Out Area

Square/Rectangular
Length x Width = Area (m^2)

Round/Circular
Radius x Radius x π = Area (m^2)

Step 2 – Work Out Volume

Area x Height/Thickness = Volume (m^3)

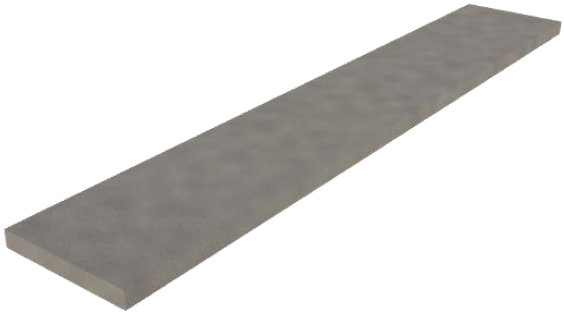
Step 3 – Work Out Weight

Volume x Density (kg) = Weight (kg) [Load]

We can use this formula to work out more complex weights. For example, we know that a cubic metre of concrete weighs 2.4 tonne (2,400kg) but using these steps we can work out more complex configurations.

Example 1 – Solid Concrete Block

What is the weight of a solid concrete block measuring 3.5m long, 1.2m wide and 0.6m high?



Working out:

Step 1 – Area

Area = Length x Width
= 3.5m x 1.2m
= **4.2m^2**

Step 2 – Volume

Volume = Area x Height
= 4.2m2 x 0.6m
= **2.52m^3**

Step 3 – Weight

Weight = Volume x Density =
$2.52m^3$ x $2400kg/m^3$ =
6048 kg

Example 2 – Concrete Pipe

What is the weight of a concrete pipe measuring 1.2m outside diameter, 1.125m inside diameter and 3.5m long?

Working out:

Using Outside Diameter:

Step 1 – Area

Area = radius x radius x π
= 0.6m x 0.6m x π
= **$1.13m^2$**

Step 2 – Volume

Volume = Area x Height
= $1.13m^2$ x 3.5m
= **$3.96m^3$**

Using Inside Diameter:

Step 1 – Area

Area = radius x radius x π
= 0.56m x 0.56m x π
= **$0.99m^2$**

Step 2 – Volume

Volume = Area x Height
= $0.99m^2$ x 3.5
= **$3.48m^3$**

Step 3 – Volume (Overall)

Volume of Pipe = Outside Volume – Inside Volume
= $3.96m^3$ – $3.48m^3$
= $0.48m^3$

Step 4 – Weight

Weight of Pipe = Volume of Pipe x Density of Material
= 0.48 x 2400kg
= 1152kg

Example 3 – Bin of Mixed Materials

You may also be required to calculate the weight of a load that is made up of different parts. In this situation it is important to calculate the weight of each item and add all of these together to work out the total weight.

A bin contains the following materials:

- 3 universal beams each 6m long.
- 12 scaffold planks each 3m long.
- 3 mild steel plates 3.5m long and 0.7m wide.

You have the following information:

- The bin weighs 300kg.
- The universal beams weigh 145kg per metre.
- The scaffold planks weigh 6.5kg per metre.
- The steel plate weighs 156kg per metre squared.

The table below shows how to work out the total weight of the load:

Item	Calculation
Bin weight	1 x 300kg = 300kg
Universal beams weight	3 x 6 x 145 = 2610kg
Scaffold planks weight	12 x 3 x 6.5 = 234kg
Steel plate weight	3.5 x 0.7 x 3 x 156kg = 1146.6kg
Total Weight of the Load	**300 + 2610 + 234 + 1146.6 = 4290.6kg**

Every load is different. Other things to consider are if the load is solid or liquid. Liquid loads have a centre of gravity that moves as the load does. These loads may require a tagline to help keep them stable.

2.1.3 Determine Special Requirements and Lifting Points of Load

You need to check and see if the load has any specific lifting points. This will give you a better idea of the types of lifting gear you should use and how you should sling the load.

The manufacturer may have specifications or information relating to the load and how it should be handled, especially in the case of hazardous, fragile or unstable loads.

You should access the manufacturers' specifications or engineers' reports and specifications for details on special or unique loads including:

- Load centre of gravity.
- Stress points.
- Lifting points.
- Spread of load.
- Travel path of load.
- Special slinging requirements.
- Lifting and/or landing requirements.

2.2 Prepare Lifting Gear

Once you have finished assessing the load to be shifted, you will need to select and inspect the lifting gear required to complete the lift.

2.2.1 Select and Inspect Lifting Gear

The load and working environment will determine the type of lifting gear that you need to use.

Mark in your plan the lifting gear that you intend to use along with the details of how you intend to sling and control the load during the lift.

Lifting gear includes all equipment associated with the lifting and moving of the load from the hook down.

Lifting gear includes:

- Ropes.
- Chains.
- Slings.
- Shackles.
- Beams.
- Clamps.
- Other attachments that can be used to lift or secure a load.

When assessing the lifting gear needs you will also need to consider whether the load requires packing and dunnage.

The use of packing, padding, lagging, edge protection, dunnage and corner pads can protect the lifting gear from sharp corners on a load and increase the safety of the lift.

Packing protects the load and lifting gear from damage during the lift, and also allows for safer attachment and detachment of the lifting gear.

It is important that you select the correct lifting gear for each load that you are lifting. Here are some examples:

Load Type	Suggested Lifting Gear
A pallet of bricks	A brick or block cage.
Steel plates	Plate or lifting clamps.
A single gas bottle	A suitable stillage or lifting box that ensures the load is stable and secure.
A load of loose pipes	Suitable stillage, pallets or slings.
Pre-cast panels	Lifting clutches.
A timber truss	Lifting beam and/or long sling or wire.
A load that is easily damaged	Synthetic webbing slings.
A bulky load or a load with uneven weight disbursement	Lifting beam.

It is extremely important that you carefully inspect all lifting gear before you use it to ensure that all items are safe to use and are appropriate for the task. As a licenced dogger you are responsible for the inspection of lifting equipment.

You must also make sure that you keep an accurate record of all checks and maintenance that is carried out. 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.

2.2.2 Natural and Synthetic Fibre Ropes

Fibre rope is used extensively for taglines, whips, tackles and lashings.

There are two main types of fibrous ropes:

- Natural fibre rope.
- Synthetic fibre rope.

2.2.2.1 Natural Fibre Ropes

Natural or vegetable fibre ropes are grouped into those made from hard fibres and those made from soft fibres.

When using natural fibre ropes for dogging there are a few things you need to remember:

- Manila and sisal are the only types of natural fibre rope that can be used for dogging and rigging purposes.
- Other natural fibre ropes such as cotton, jute, flax and hemp can only be used for lashing and tying.
- A 16mm dry natural fibre rope is usually used as a tagline as it is non-conductive.

2.2.2.2 Synthetic Fibre Ropes

Synthetic fibre ropes are generally made from filaments twisted into yarns, the yarns twisted into a strand then three strands into the rope, similar to natural fibre ropes.

Synthetic ropes can be much thinner and yet have a greater rated capacity than natural fibre rope because they do not have overlapping fibres and some filaments are also stronger than natural fibres of the same thickness.

Synthetic fibre ropes have a smooth slippery surface, which can cause slip and failure of most bends and hitches. They are therefore not suitable for hand haulage. Prevent slip and failure with additional half hitches or seize the tail with yarn, twine or marline.

Under some conditions synthetic fibre rope can conduct electricity and therefore should not be used as taglines near power lines – only non-conductive ropes should be used.

When using synthetic fibre ropes, you need to remember:

- Synthetic Fibre Ropes are widely used for slinging, however, to be used for any sling they must have a rated capacity tag attached. NO TAG means NO USE.
- Most synthetic rope slings can and will stretch under load.
- The primary types of synthetic fibre ropes are Poly Propylene, Polyester and Nylon. Organic solvents will destroy Polypropylene rope. Alkalis will destroy Polyester rope. Acids will destroy Nylon rope. Nylon rope can also lose 10% of its strength when wet.

2.2.2.3 Inspection Criteria for Fibrous Rope

You must check any fibrous ropes carefully before using them. The checklist below outlines what you are looking for. If a rope shows any of these it is unsuitable for dogging.

Possible fibrous rope defects:	
Missing or illegible rated capacity markings.	Chemical exposure.
Broken fibres/strands.	Brittleness.
Stretched rope (overloading).	Discolouration due to excessive heat.
Excessive wear.	Sun rot.
Abrasion.	Mildew.
High stranding.	Knots.

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

2.2.3 Flexible Steel Wire Ropes

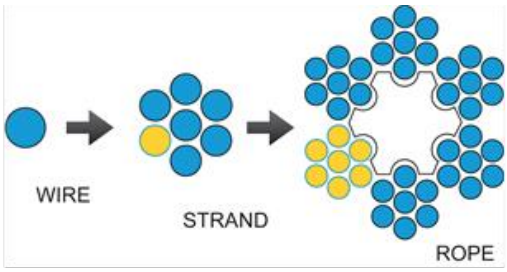
There are two principle grades of flexible steel wire rope (FSWR):

- **Grade 1570** – This rope is galvanised in appearance and usually has a fibre core.
- **Grade 1770** – This rope is blackish in appearance and usually has an independent wire core.

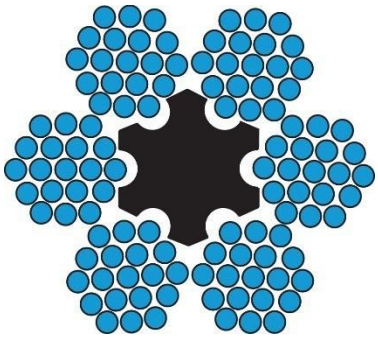
The smallest diameter of FSWR that can be used for lifting purposes is 6mm.

The maximum temperature exposure for fibre core FSWR is not to exceed 95°C.

FSWR is constructed of wires and strands laid around a central core.



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



It is important not to confuse wires and strands. If a strand is broken, the rope is unusable. A single broken wire in a sling is not as important unless broken immediately below a metal fitting or anchorage.

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.

2.2.3.1 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 then it is unsuitable for 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 **FSWR MUST NOT BE USED!**

2.2.3.2 Rated Capacity of FSWR

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) = D2 (mm) x 8

= D (mm) x D (mm) x 8

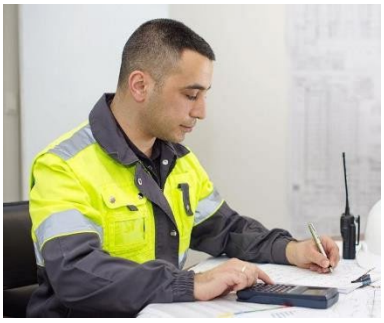
= 12 x 12 x 8

= 1,152 kg Therefore:

Rated Capacity (t) = 1.15 tonnes

Calculate the Required Diameter of FSWR

The above equation can be reversed to calculate the diameter (D) in millimetres of FSWR needed to lift a given load. To do this, divide the load (L) in kilograms by 8 and find the square root of the result.



For example:

Load = 1,152 kg

Diameter of FSWR (mm) = √(1,152 / 8)

= √144

= 12 (mm)

Therefore:

A FSWR sling of at least 12 mm in diameter is needed to lift a 1,152 kg load for a straight lift.

2.2.4 Chains

Lifting chains and chain slings are marked with different letters. These letters tell you what grade the chain is:

- Grade 30 (L) = 30(L) or 30 or 3. This is the minimum grade chain used for safe lifting of loads.
- Grade 40 = M or 40 or 4 or 04 (High tensile chain).
- Grade 50 = P or 50 or 5 or 05.
- Grade 60 = S or 60 or 6 or 06.
- Grade 80 = T (Higher tensile/High grade Herc-Alloy chain used extensively for all load lifting uses).
- Grade 100 = V (Very high tensile chain – Usually pink in colour).

The following types of chains MUST NOT be used for lifting a load:

- Wrought iron chain.
- Grade 75 (transport lashing chain).
- Proof coil chain.
- Approved grade chains under allowable diameter.
- Mild steel chain.

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.

Grade markings or letters denoting the grade are stamped or embossed on the chain at least every metre or every 20 links, whichever is less.

Grade 80 (T) chain is the minimum grade of chain that can be used for general load lifting uses, such as wrapping and reeving.

2.2.4.1 Inspection Criteria for Chains

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

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 you are using sling shorteners you must ensure they do not have more than 10% wear. More than 10% wear condemns them for use and they must not be used.

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

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 manufacturer's tag must be fixed on all chain slings. The tag must detail the rated capacity of the sling under all conditions and configurations of use.

If you cannot find a legible manufacturer's tag the chain sling should be taken out of service, in line with safe work procedures.

2.2.4.2 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.

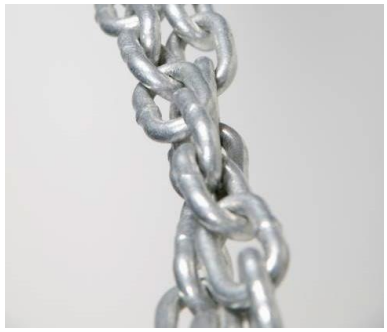
Calculate the Rated Capacity of Grade 80 Chain

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) = D2 (mm) x 80 x 0.4

= D2 (mm) x 32

= D (mm) x D (mm) x 32

= 10 x 10 x 32

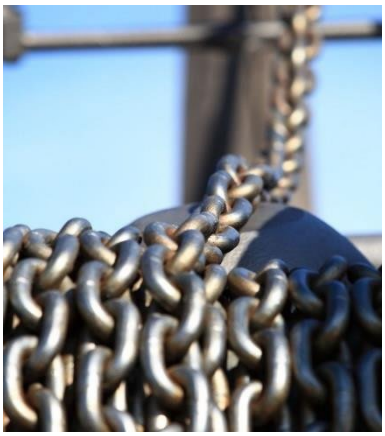
= 3200 kg

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

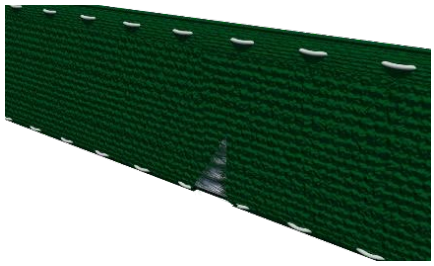
Therefore:

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

2.2.5 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 their rated capacity.



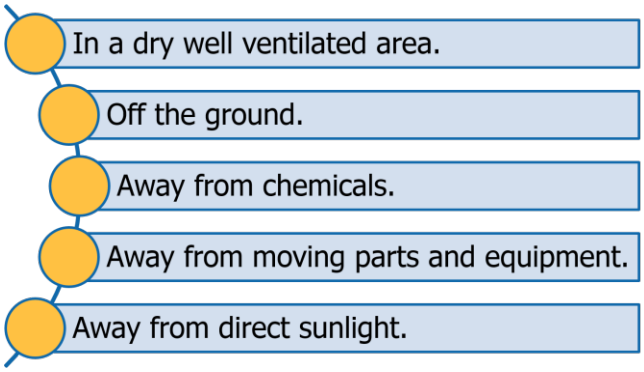
Ensure that synthetic web slings are not twisted when being used to support or lift loads, as this will decrease the rated capacity of the sling.

Round synthetic slings are one of the most DANGEROUS types of lifting sling available to doggers and riggers. This is mainly because the fibres inside the sling do the lifting instead of the outside webbing sleeve.

This is dangerous because you cannot see the condition of the internal fibres. Therefore it is extremely important that you check these types of slings thoroughly for cuts, burn marks and tears on the outer sleeve.

You should only ever use round synthetic slings for round loads or loads with edges that have been packed with soft packing materials, e.g. car inner tube or carpet.

Synthetic webbing slings must be stored:



Synthetic slings are colour coded, however you must always go by 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.

2.2.5.1 Inspection Criteria for Synthetic Slings

You must check any synthetic slings carefully before using them. The checklist below outlines what you are looking for. If a synthetic sling shows any of these then it is unsuitable for dogging and should be tagged, separated from usable equipment and reported to the appropriate person.

Possible Synthetic Sling Defects:	
Missing or illegible Rated Capacity tag.	Damage to stitching.
Stretched or damaged sleeve.	Burn marks on outer sleeve.
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.	

2.2.6 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.

In some shackles, the pins pass clear through both eyes and are secured by a split pin forelock (i.e., split flat cotter pin) or nut and split pin.

If you are using a shackle to support multiple slings ensure that you use a bow shackle. Always use the correct size of shackle pin. Do not use a nut and bolt in place of the proper shackle pin. A bolt that does not fit tightly is likely to bend and break.

Shackles must have their rated capacity stamped on the shackle (not on the pin).

Bow Shackle **Dee Shackle**

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

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.

2.2.7 Eyebolts

Eyebolts are used extensively as lifting lugs on set pieces of equipment. The safest eyebolt is a collared eyebolt. Uncollared eyebolts should only be used where the pull on the eyebolt is vertical.

Collared eyebolts can be used where the pull is at an angle or a vertical lift. The underside of the eyebolt should be machined and the seating upon which the eyebolt is tightened should also be machined.

The eyebolt should be tightened so that both faces meet in a neat tight fit. If both faces are apart the collar is of no use.

Where two eyebolts are used to lift a load, a pair of slings should be shackled into them. Do not reeve a single sling through two eyebolts and then put both eyes on the hook.

Uncollared Eyebolt

Collared Eyebolt

2.2.8 Hooks

There are many different shapes and sizes of hooks. They range from mild steel to very high-grade alloy steel. Hooks used with chain to make chain assemblies are usually Grade T or Grade 80 strength.

All hooks must be marked with their rated capacity and have a safety latch fitted to stop slings from dislodging.

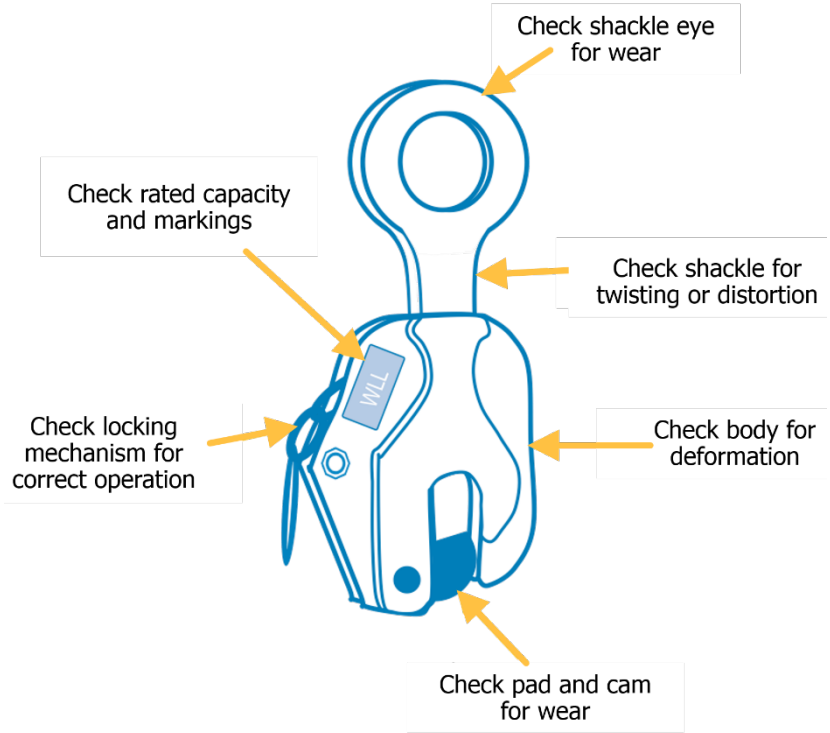
Hooks must not be used if there is over 10% wear in the bite.

2.2.9 Plate Clamps and Beam Clamps

Plate clamps are designed to increase the purchase on the plate as it is lifted. All plate clamps must be marked with their rated capacity and the relevant compatible plate size.

You must check for:

- The cleanliness of all the biting teeth.
- Cracks in the body.
- The locking mechanism.
- Also check for stretching of the lifting ring and for security of all the bolts/pins.



2.2.10 Spreader and Lifting Beams

Spreader and lifting beams are devices which spread the load evenly for a given lift. They are generally made to suit a particular job.

Most have a central lifting point for the crane or lifting medium, and have two or more lugs underneath to take the load slings. All spreader beams must be suitable to lift the particular load and must be branded with the rated capacity.

The rated capacity must include the weight of the load plus all lifting gear (slings, shackles etc.). The spreader beam must also display the weight of the beam and its serial number.

2.2.10.1 Lifting Beam

Lifting beams have a centre-lifting lug at the top to accommodate a crane hook and a bottom lug at each end for connecting slings. Headroom for the lift is reduced, as no top slings are required.

2.2.10.2 Spreader Beam

A spreader beam literally "spreads" a two-legged top sling. A spreader beam has better stability than a lifting beam and a higher potential capacity for a given size of steel section used. Spreader beams require more headroom than lifting beams due to the two-legged sling arrangement at the top.

2.2.11 Lifting Lugs

Lifting lugs are components that are found in some lifting gear and loads to assist with lifting.

Lugs are built with an opening in the centre so that cables can be attached, through these openings, for lifting purposes.

Lifting lugs may be:

- **A permanent attachment** – such as in a box with built in lugs or a spreader beam.
- **A temporary attachment** – such as the addition of eyebolts to a load.

If a load or piece of lifting equipment is fitted with lifting lugs, ensure that you:

- Visually inspect the lugs, making sure that there is no evidence of:
  - Welds splitting or cracking.
  - Damage, splitting, separation or stretching.
- Check that the rated capacity is suitable for the job.
- Check the lugs for positioning in relation to the centre of gravity of the load being lifted.

2.3 Lifting Personnel

Never, under any circumstances, allow a person to ride on the hook of the crane. If workers are required to carry out work whilst suspended from a crane, they should be lifted in an approved suspended workbox that meets all of the necessary requirements of the workplace, crane manufacturer and AS 2550 and AS1418.17. If a workbox is used to hoist a worker, the person dogging must be positioned in the workbox with them.

2.3.1 Working Safely at Heights

You must follow all safety rules and instructions when performing any work at heights. Only trained and experienced personnel should complete operations at heights. It is important that you have a clear understanding of the types of equipment and their limitations before undertaking any work at heights.

2.3.1.1 Fall Prevention Devices

If there is no other way to avoid working at heights, the safest equipment you can use is a fall prevention device.

Fall prevention devices are designed to stop you from falling by not letting you get too close to an unprotected edge while you work. Fall prevention devices include:

- Temporary work platforms.
- Edge protection systems.
- Fall protection covers and safety mesh.

2.3.1.2 Fall-Arrest Systems

Fall-arrest systems are designed to stop a worker or materials that has fallen off an edge from hitting the level below.

Fall-arrest systems include:

- Catch platforms.
- Safety nets.
- Individual fall-arrest systems.

Before you use any equipment, tools or plant you must check that the equipment is in safe working order.

2.4 Communication Methods and Equipment

As a dogger you need to be able to communicate with those around you while you work, and you need to be able to understand the instructions to use the lifting gear safely.

2.4.1 Determine Communication Requirements

Before starting work you will need to determine the best communication methods for the situation.

Talk to the crane operator before you start and select the methods that you are going to use to communicate during the lift. This may include:

- **Hand signals** – should be used only when the crane operator is always in direct view of the person dogging the load.
- **Whistle signals** – may be used if the crane operator is in or out of view of the person dogging the load.
- **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.

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

HAND SIGNALS

Hoisting Raise

Whistle, Bell & Buzzer Signals

2 Short

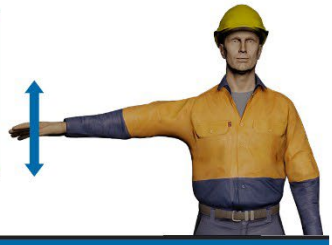
••

Hoisting Lower

Whistle, Bell & Buzzer Signals

1 Long

—

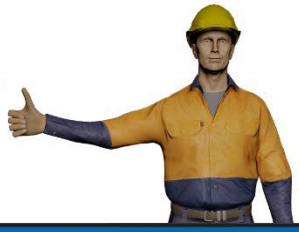


Luffing Boom Up

Whistle, Bell & Buzzer Signals

3 Short

•••

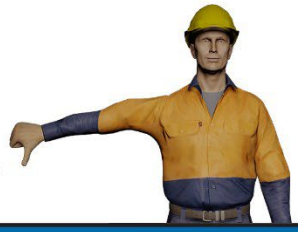


Luffing Boom Down

Whistle, Bell & Buzzer Signals

4 Short

••••



Slewing Right

Whistle, Bell & Buzzer Signals

1 Long, 2 Short

— ••

Slewing Left

Whistle, Bell & Buzzer Signals

1 Long, 1 Short

— •

Jib/Trolley Out; Telescoping Boom Extend

Whistle, Bell & Buzzer Signals

1 Long, 3 Short

— •••

Jib/Trolley In; Telescoping Boom Retract

Whistle, Bell & Buzzer Signals

1 Long, 4 Short

— ••••

Stop

Whistle, Bell & Buzzer Signals

1 Short

•

Creep Speed: Appropriate hand signal for motion with hand opening and closing

2.4.2 Select and Inspect Communication Equipment

If you are using any communication equipment (such as fixed channel two-way radios) make sure that it works before starting the job. This includes checking that radios are charged up and will not stop working half way through the task.

2.5 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.

2.5.1 Report all Defects

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.

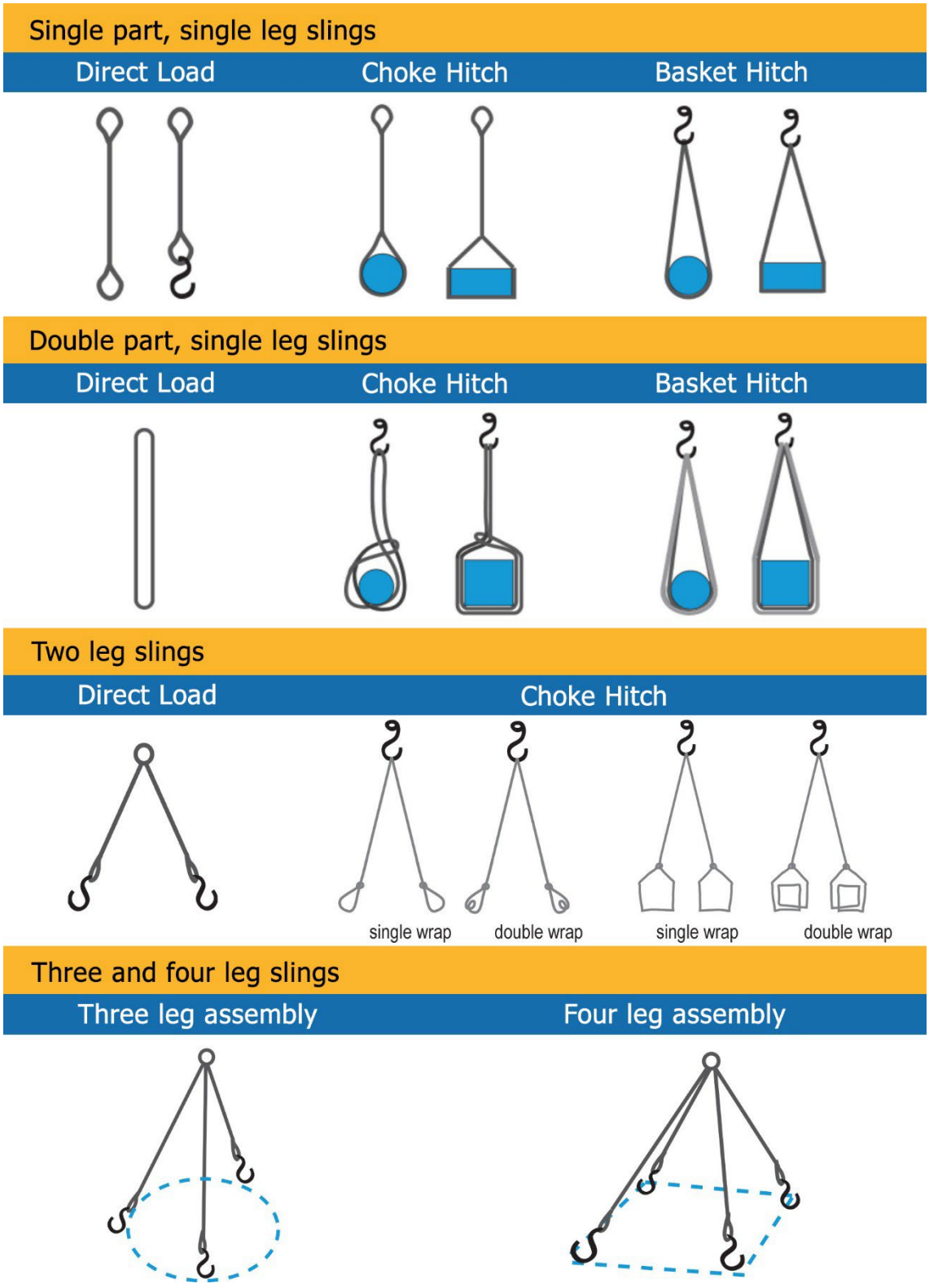
Faulty lifting equipment may need to be labelled and rejected, destroyed or returned to the manufacturer (depending on the type and severity of the fault).

2.6 Select Slinging Method

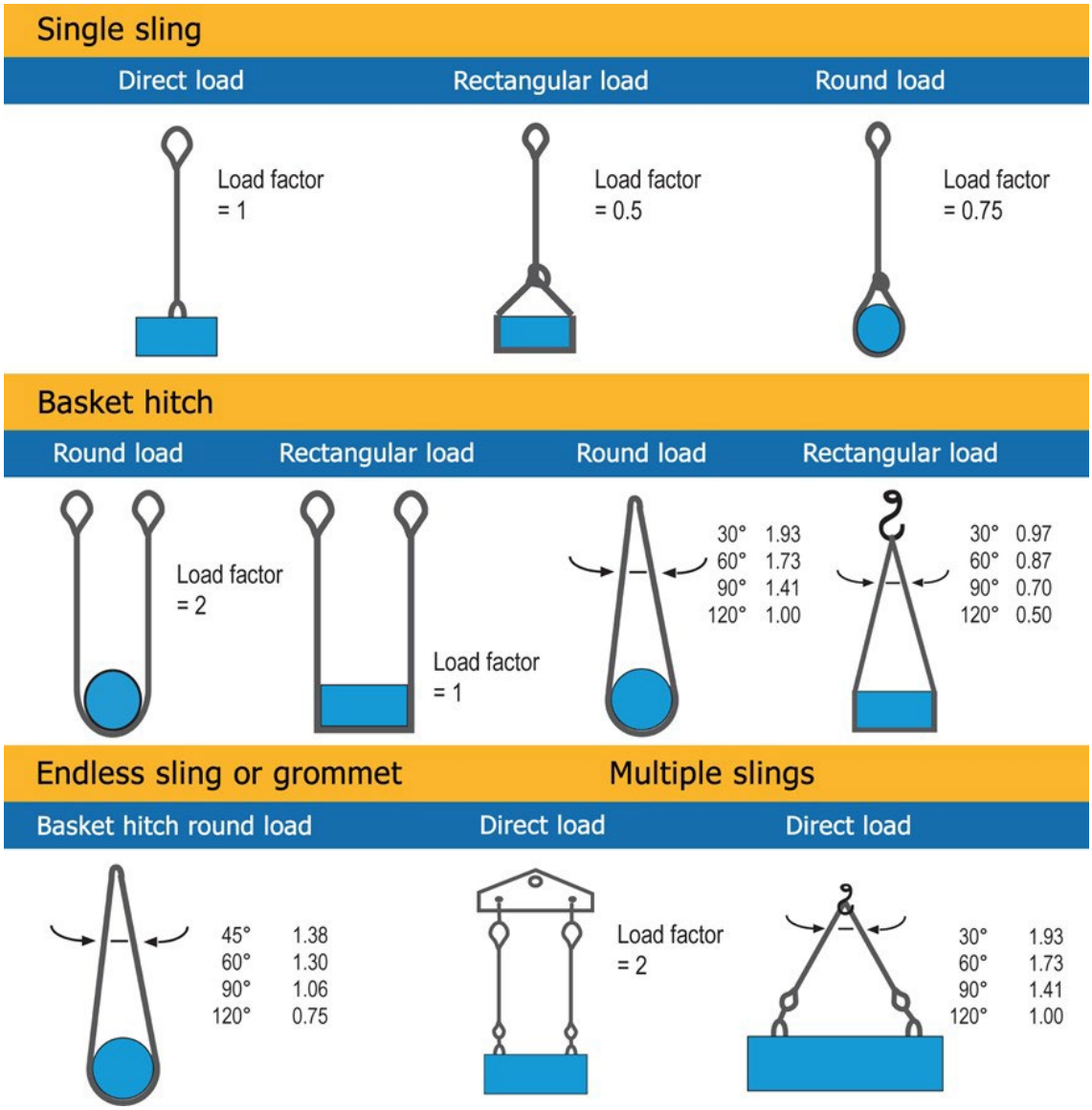
Before moving a load, you will need to select an appropriate slinging technique.

2.6.1 Slinging Techniques

The way you sling the load will depend on the size, shape and requirements of the load. Some slinging techniques reduce the rated capacity of the slings. Make sure you have allowed for the reduction when you are selecting the slings and lifting equipment for the job.



2.6.2 Load Factors and Slinging



The lifting capacity decreases as the angle between the legs of the sling attachment increases. Different methods of slinging will also alter the lifting capacity.

A simple rule of thumb for a good safe working angle is to make sure that the horizontal distance between the points of attachment of the load does not exceed the length of the slings.

This will ensure that the angle between the two legs of the sling does not exceed 60°.

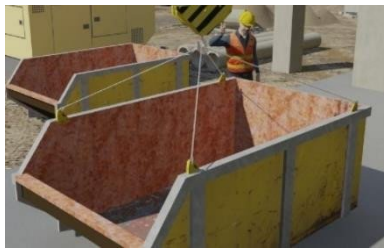
The recommended safe angle between two legs of a sling is 60˚.

The recommended maximum angle between the two legs of a grade 80 or 100 chain sling is 120°.

When you are using two slings to lift a load and are determining the length and capacity of the slings required, ensure that you consider:

- The weight of the load.
- The reeve factors.
- The angle factors.
- The size of the load.
- The slinging method.
- The clearance required to make the lift.

When slinging a rigid object with a multi-legged sling it must be assumed that only two of the sling legs are taking the load.



Additional legs do not increase the rated capacity of the sling assembly, therefore each leg has to be capable of taking half of the weight of the load.

The maximum angle of a four-legged sling is the greatest angle between any two of the four slings. This is generally between the diagonally opposite legs. The rated capacity is assessed through the largest included angle in the multi-legged sling assembly.

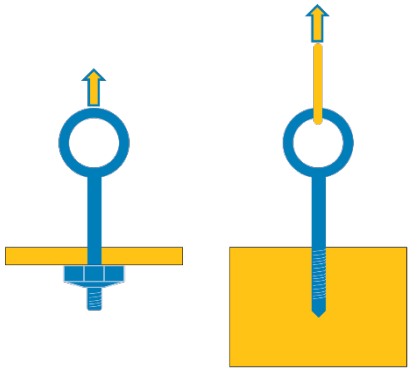
The rated capacity of slings decreases as the angle between the slings increases or if the slings are nipped or reeved. All factors must be considered when determining which sling is the correct one to lift a given load.

Included Angle	Load Factor
60 degrees	1.73
90 degrees	1.41
120 degrees	1

2.6.3 Using Shackles and Eye Bolts

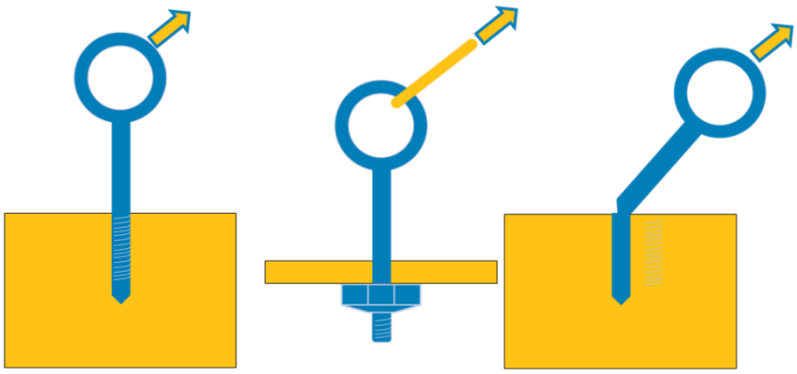
When using multiple slings, always use a bow shackle large enough to accommodate all of the eyes safely on the bow. The pin of the shackle should rest on the hook.

Uncollared eyebolts should only be used with straight lifts.



If the sling is set at an angle to the uncollared eyebolt, the sideways pull on the eyebolt could cause it to fail.

If shoulderless eye and ring bolts are pulled at an angle (as shown) they will either bend or break.

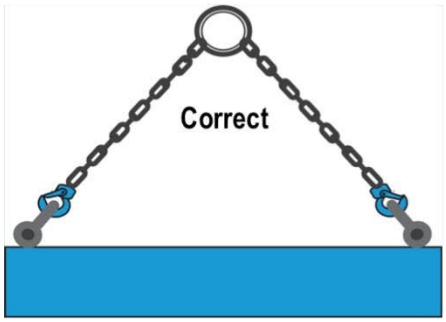


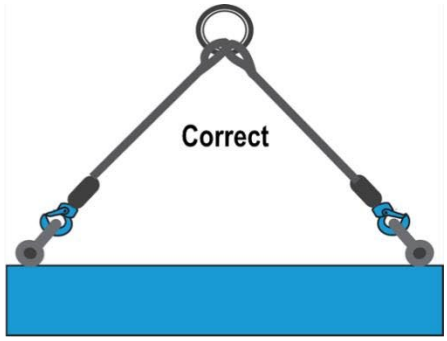
Collared eyebolts should always face the same direction so that angled slings are pulling sideways.

Where two eyebolts are used to lift a load, a pair of slings should be shackled into them. Do not reeve a single sling through two eyebolts and then put both eyes on the hook.

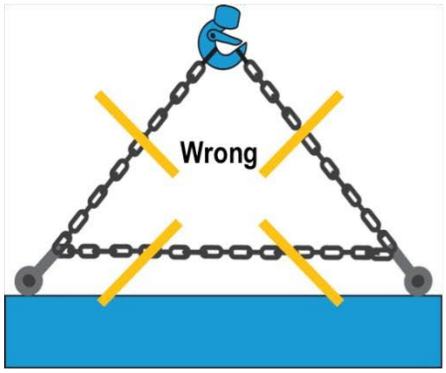
If using only one eyebolt in a vertical lift, make sure it is lashed to the load to prevent it from unwinding during the movement of the load.

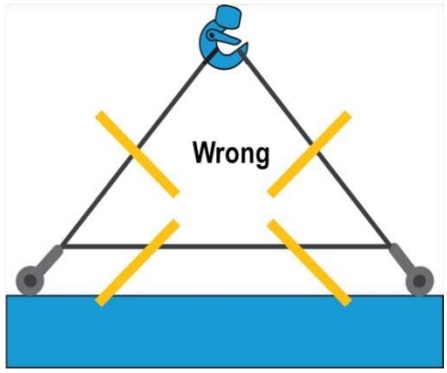
Make sure the eyebolts are screwed down tightly so that the collar is in contact with the load.





Here the strain on the eyebolt is doubled.





2.6.4 Safe Slinging Techniques

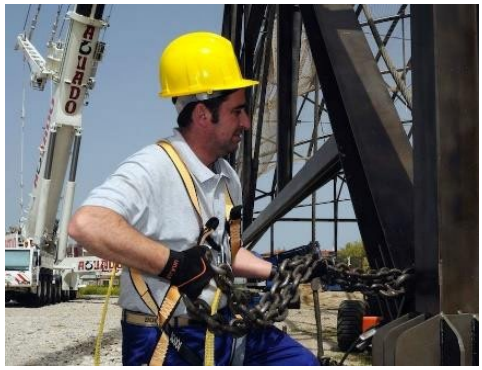
You can determine the safest slinging points on a load through calculation or by conducting a test lift.

Calculations such as measuring the distances from the centre of the load out to the slinging points and evenly distributing the weight will ensure that the lifting points are safe.

This is the best method, but may not always be possible.

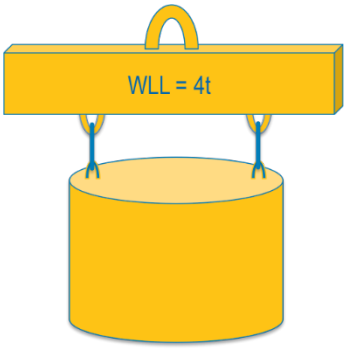
When selecting suitable slinging points make sure that you consider:

- The centre of load distribution and load balance.
- Security of slings.
- Reeve and angle factors.
- Weight of load.
- Avoiding damage to the load.



The following are examples of slinging techniques and the formulae that are used to ensure the slinging is completed in a safe manner.

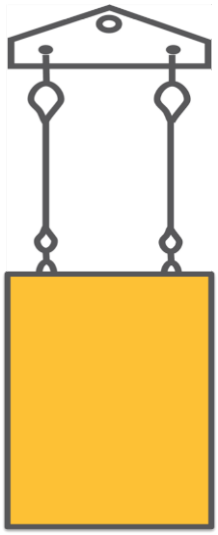
2.6.4.1 Slinging Technique 1



A drum filled with water is to be lifted with two vertical flexible steel wire rope (FSWR) slings fixed to a spreader:

- The weight of the load is 1500kg.
- The lifting beam weighs 400kg and is rated to 4 tonne.

What is the minimum diameter FSWR required to safely lift the drum?



Calculations

Rated Capacity = Weight of load divided by angle factor.

= 1500 ÷ 2

= 750kg

Diameter of FSWR sling (mm) = Square root of (Rated Capacity (kg) ÷ safety factor 8)

= √(750 ÷ 8)

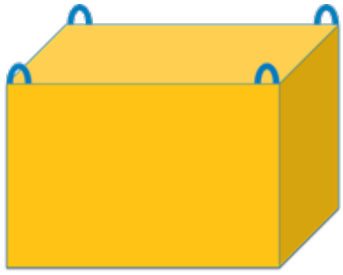
= √93.75

= 9.682

Therefore:

FSWR diameter = 10mm (rounded up from 9.682)

2.6.4.2 Slinging Technique 2



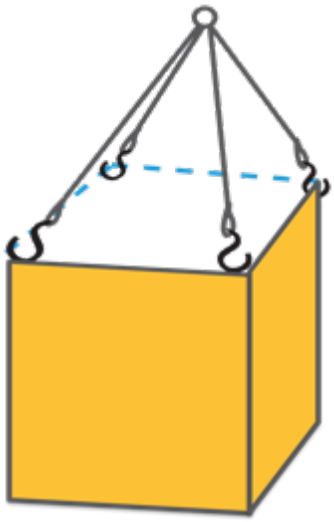
A box with built-in lifting lugs is to be lifted.

The included angle between the diagonally opposite sling legs is 90 degrees.

- The chain slings are Grade (80) T.
- The chain diameter is 12mm.

What is the maximum load that can be lifted (rounded down to the nearest 10th of a tonne)?

Calculations:



Firstly, calculate the rated capacity for the chain using the formula: Rated Capacity (kg) = D squared (mm) x (grade x 0.4)

Rated Capacity (kg) = D^2 (mm) x (grade x 0.4)

= 12 x 12 x (80 x 0.4)

= 12 x 12 x 32

= **4608kg**

For multi-legged slings, it must be assumed that only two slings are taking the load. Therefore, the permissible load is calculated for one pair of diagonally opposite slings.

Multiply the rated capacity by the angle factor (1.41 for a pair of slings with an included angle of 90 degrees) to calculate the maximum load of the box.

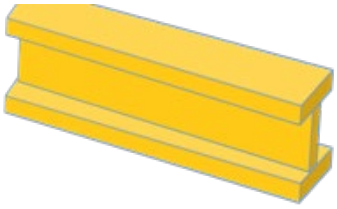
Maximum Load = Rated Capacity x angle factor

= 4608kg x 1.41

= **6497.28kg**

This is then converted to tonnes and rounded down to the nearest 0.1t. Therefore: **Maximum load = 6.4t** (rounded down from 6497.28kg)

2.6.4.3 Slinging Technique 3



A pair of FSWR reeved slings is to be used to lift a steel beam.

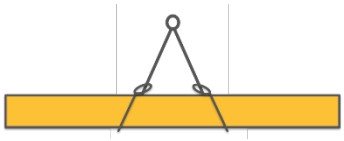
- The angle between the sling legs is 90 degrees.
- The steel beam weighs 173kg/m.
- The steel beam is 5m long.

Calculate the weight of the load and the minimum diameter of FSWR required to lift it.

Calculations

Weight of the Load = steel beam length (m) x steel beam weight (kg) Weight of the Load = 5 x 173

= **865kg**



Diameter of Sling = √(Load ÷ safety factor ÷ reeve factor ÷ angle factor)

= √(865 ÷ 8 ÷0.5 ÷ 1.41)

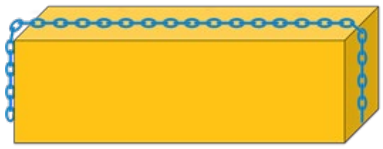
= √153.369

= **12.384**

Therefore:

Minimum Diameter of Sling = 13mm (rounded up from 12.384mm)

2.6.4.4 Slinging Technique 4



A square load is to be lifted using a set of Grade 80 (T) chains. The chains are slung in a two-legged sling and reeved around the load.

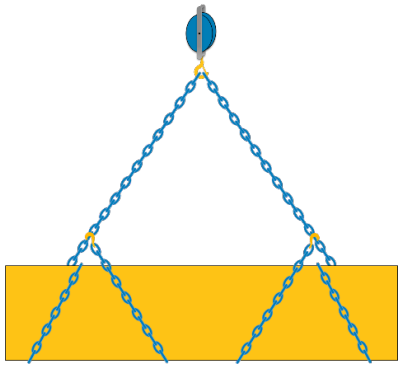
- The included angle for the slings is 60 degrees.
- The weight of the load is 2000kg.

Using the angle of the sling and the weight of the load calculate the chain diameter that will need to be used.

Calculations:

The formula to calculate the necessary grade 80 (T) chain diameter is:

Chain Diameter = √(weight of the load ÷ reeve factor ÷ load factor ÷ 32)



The reeve factor around rectangular loads = 0.5

The load factor for slings at 60 degrees = 1.73

Chain Diameter = √(2000 ÷ 0.5 ÷ 1.73 ÷ 32)

= √72

= **8.49**

Therefore:

The minimum Grade 80 (T) chain diameter that can be used in this configuration to lift this load is 9mm.

Section Three: Shift the Load

Once you have selected the equipment and slinging techniques that you will use, you need to make sure the work area is prepared in line with plans and site requirements.

3.1.1 Site Preparations and Equipment Assembly

Preparations that need to be made to the work area may include:

- Applying hazard prevention/control measures to the work area such as:
  - Barriers, signage and traffic control.
  - Adequate lighting.
  - Insulation or isolation of power lines.
- Removal of dangerous/hazardous materials from the work area.

- Letting the appropriate personnel know that you are ready to begin the dogging work.

- Ensuring that the work area and path of movement for the load are clear of any obstructions.

Once the site is prepared you should assemble any lifting equipment as required.

This could include:

- Attaching slings to lifting beams or frames using shackles.
- Adjusting the length of chain slings.

3.2 Prepare Load Destination

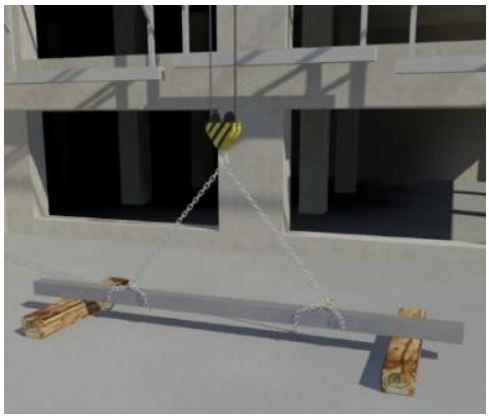
You should ensure that the destination for the load is also prepared and ready for the load to be landed.

The load destination could be:

- The ground.
- Loading platforms.
- Suspended floors.
- Vehicles.

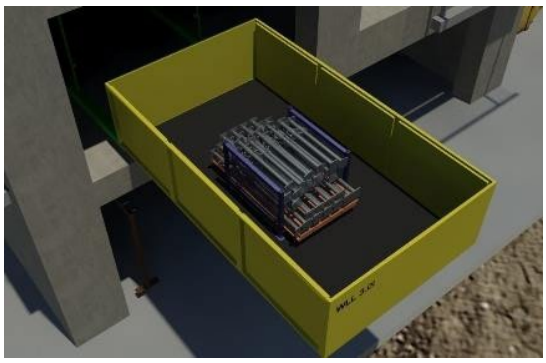
3.2.1 Load Destination Checks

Make sure that the load destination is tidy and ready to receive the load. Check that the load will be supported by the load destination. For example, if placing the load onto a concrete floor use site information gained from engineers or consult with authorised site personnel.



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

You will also need to check that there is safe access for walking and unpacking the load.



If the load is to be placed on a Cantilevered Crane Loading Platform (CCLP) it is important that you ensure the CCLP is capable of supporting the load.

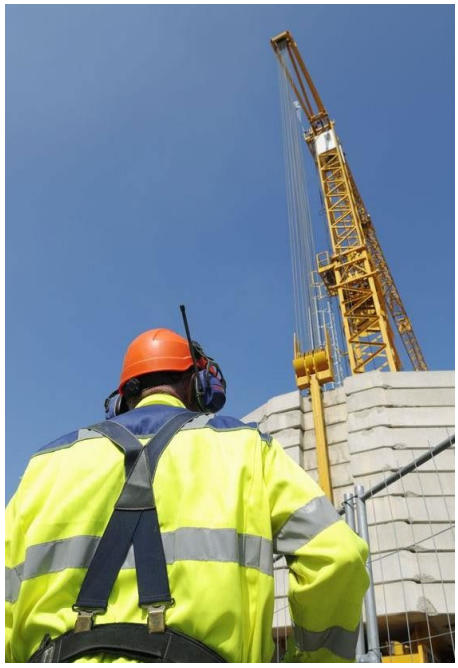
This can be done through checking the load limit or rated capacity (normally marked on the platform).

If the CCLP is not marked you should seek advice from the manufacturer.

3.2.2 Determine Path of Movement

As well as preparing the load destination, you should also ensure that the path of movement is appropriate to the task. The path of movement should be selected in the planning stage of the dogging task – before you move the load.

When determining the path of movement you should think about:



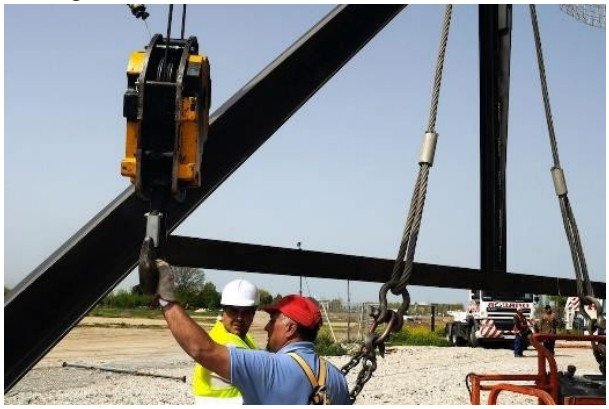
- The size of the load.
- The dimensions of the crane.
- The suitability of the pickup and landing sites.
- Preventing others from accessing the pathway.
- Spotters.
- Communication arrangements with the crane operator.
- Overhead power lines.
- Obstructions.

Check for any uneven or dangerous terrain and other obstructions or hazards. Where possible, ensure that the path is on a firm, level surface in order to maintain the stability of the plant and to minimise load swing.

Organise to move any materials out of the way, where possible, and have traffic controlled to prevent an accident.

3.3 Prepare Load

Before the load can be shifted, you need to make sure it is correctly connected to the crane hook and secured to prevent unwanted movement during the lift.



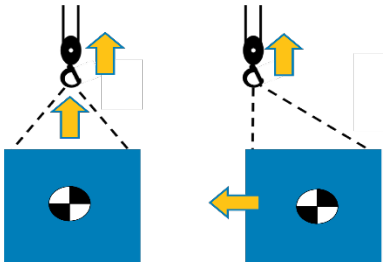
3.3.1 Attach and Secure Lifting Equipment to Crane Hook

The lifting equipment needs to be attached and secured to the crane hook (or lifting hook).

The hook should be fitted with a safety latch to prevent the slings from dislodging. If the lifting gear does not fit over the bill of the hook, use a shackle or lifting rings to attach the gear to the hook.

Make sure the shackle or lifting ring is large enough to comfortably hang from the hook with enough space for slings or other equipment.

3.3.2 Positioning the Crane Hook

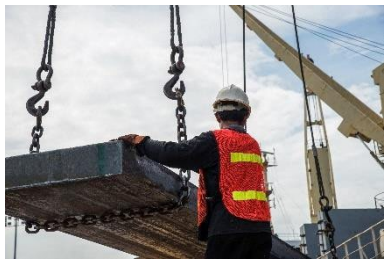


The crane hook should be positioned above the centre of gravity of the load. This will help to keep the load from swinging out of control or slipping from the sling arrangement when it is lifted. It will also prevent dragging or snigging of the load.

The centre of gravity may be marked on an item that is going to be lifted however, if it is not marked, you may have to conduct a test lift to determine the centre of gravity of the load.

3.3.3 Attaching Lifting Equipment to the Load

Attach and secure the lifting equipment and gear to the load, making sure that any sharp corners are packed to prevent any unnecessary damage to slings or the load.



Check that all shackles or eye bolts are secure and, if necessary, lashed or moused.

Mousing is done by passing a couple of turns of wire through the hole provided for this purpose in the unthreaded end of the pin and around the body of the shackle's hoop.

3.3.4 Attaching a Tagline to the Load

A tagline is used to assist in the safe landing and control of the load.

It is appropriate to use taglines when working near overhead power lines and at any time where the load may become easier to control in the landing process.

Taglines may also be necessary if the load is liquid with a moving centre of gravity, if it is windy, or if there are obstacles or obstructions that need to be avoided during the move (that could not be removed).

Natural fibre ropes are commonly used for taglines as they are strong and nonconductive.

The minimum diameter fibre rope you can use as a tagline is 16mm. DO NOT use a wet rope as a tagline – it could conduct electricity if coming into close range of power lines.

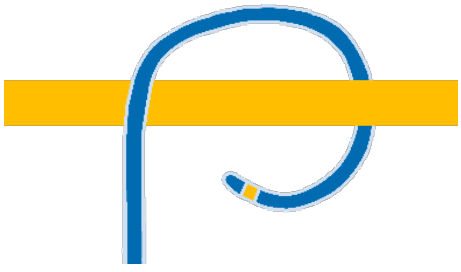
When using a tagline, do not wrap the rope around yourself as you may be dragged by a sudden movement of the load. Always wear gloves when using a tagline.

3.3.4.1 Temporary Rope Connections

You may need to use a variety of temporary rope connections when connecting a tagline to a load. The following connections may be used:

- Clove hitch.
- Rolling hitch.
- Single bowline.
- Sheet bend.

Clove Hitch around a Round Object

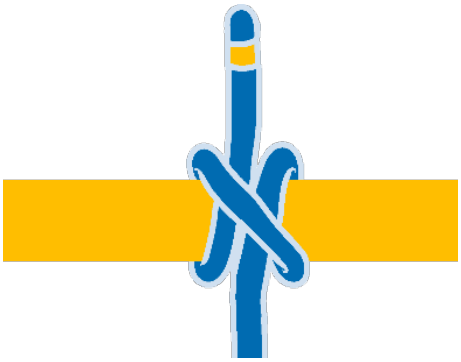


1. Pass the end of the rope around the object.

2. Loop the rope over itself.

3. Loop around object a second time.

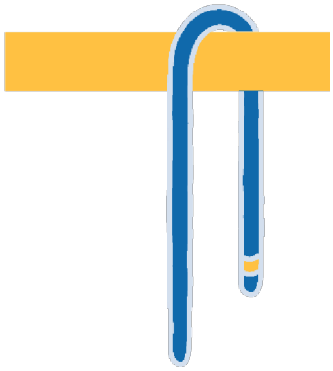
4. Thread the end under itself.



5. Pull tight to form the clove hitch.

This is used to commence rope lashing. It is not safe for other purposes unless the ends are secured with an additional half-hitch.

Rolling Hitch around a Round Object



1. Loop the rope over the object.

2. Pass the end around the object.

3. Continue around to make a half hitch going over the first turn.

4. Tuck the second loop between the rope length and the first turn.

5. Continue around the object to add a final half hitch. Tucking the end under the loop.

6. Pull the rolling hitch tight.

This is used to secure a stopper, or two ropes pulling in opposite directions. It is preferable to a clove hitch or blackwall hitch, as long as rolling turns are put on in the proper direction of pull.

Single Bowline

1. Form a small loop leaving enough rope the required loop size.

2. Bring the end of the rope up to the for loop.

3. Pass the rope through the loop like overhand knot.

4. Turn the rope end under the main tying an length creating another loop.

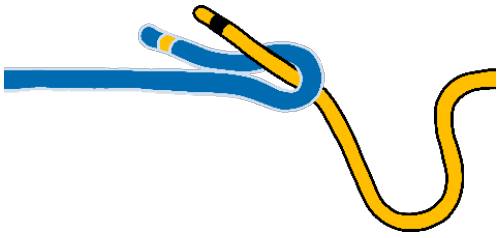
5. Pull end through the small centre loop

6. Tighten the knot leaving the loop at the required size.

This is used for making a temporary eye in the end of a rope.

Sheet Bend to another Rope

This is used for making a temporary eye in the end of a 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.

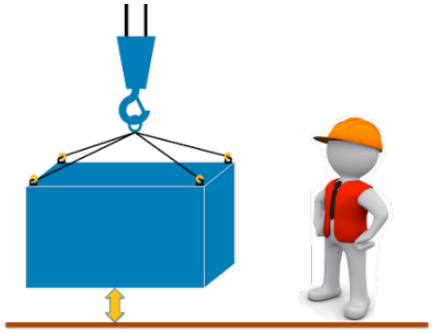
4. Tuck the second rope under itself in the centre of the knot

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

3.4 Conducting a Test Lift

Before moving the load it is important to conduct a test lift.

3.4.1 Test Lifts



Test lifts enable you to check the stability of the load, lifting equipment and gear, as well as the security of the slings. Test lifts also ensure that all the crane functions are operating correctly and that the crane is stable.

A test lift is done by lifting up the load slightly. You will be able to determine if the load is correctly slung by the amount of movement of the load as it is lifted.

When conducting the test lift, make sure you check that:

- The slinging method is correct and safe.
- There are no obstructions under the load.
- There are no loose parts under the load.

If the load dramatically shifts to one side you can identify where the centre of gravity is.

Signal for the crane driver to lower the load, adjust the slinging arrangement as required and conduct another test lift.

Continue this process until you are satisfied that the load can be moved safely.

Sometimes the only way of determining the load's centre of gravity is to conduct a test lift.

3.5 Shift Load

Once you are satisfied that the load is ready to be moved safely and in line with your lift plan, signal the crane operator to begin the lift.

3.5.1 Monitor and Direct Load

Constantly monitor the movement of the load and be aware of any other hazards in the path of the load. Also be ready to implement any control strategies.

If at any time the load becomes unstable, signal for the crane operator to stop and lower the load if safe to do so.

It is not safe to raise or lower the boom or load over workers as it can put them at risk of serious injury or death.

Use appropriate communication techniques for the situation. If the crane driver can see you clearly, use hand signals. If you are out of view, use whistle signals or a two-way radio.

Keep an eye on the weather conditions while the load is being moved.

Extreme wind can be dangerous to operate in and can cause:

- Load swing and spin.
- Crane instability.

To minimise the effect of the wind on loads, you should talk to the crane operator and consider:

- Applying the slew brake (where applicable).
- Applying guy ropes and braces (where appropriate).
- Stopping the work until conditions improve.

3.5.2 Emergency and Unplanned Situations

If an unsafe incident does occur you should:

- Stop.
- Assess the situation and resolve the issue if possible.
- Seek advice and assistance (if and when required).
- Report the unsafe incident or event according to state/territory requirements.

If an emergency situation arises it is important that you carry out the appropriate communications tasks.

These may include:

- Alerting personnel including safety officers, management, supervisor and any other people at the work site. You may also need to alert emergency services (dial 000).
- Communicating the nature of the emergency.
- Informing personnel of unsafe areas.
- Providing directions to emergency services.

In emergency situations you should always follow any organisational and site-specific procedures and adhere to the relevant legislation.

3.5.3 Landing the Load

Direct the crane operator to land the load at the prepared load destination.

The load destination should have been prepared to ensure that the load is stable and secure from movement once landed.

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

Before being released, round loads should be chocked to secure the load and prevent the load from rolling or shifting once the lifting gear is removed.

If the load is very heavy the crane operator will need to lower the boom/jib slightly once the load is in position to allow for any boom deflection (slight bending of the boom under the weight of the load).

3.5.4 Removing Lifting Equipment

Once the load has been landed and is stable and secure in its resting place, you can disconnect the lifting equipment.

After the lifting equipment has been removed, it should be properly stored or prepared for the next task.

In addition to this, the crane or hoist will need to be directed into position ready for the next task.

3.6 Inspect Lifting Equipment

Inspect all equipment after you have finished using it to make sure that it is in proper safe working order for the next person to use.

3.6.1 Record and Report Defects

Record and report any defects that you find to your supervisor or another authorised person.

Defects could include:

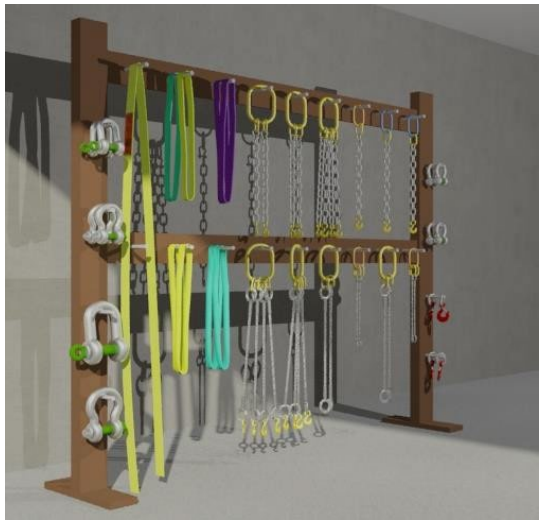
- Excessive wear.
- Damage.
- Stretching.
- Broken wires.
- Cut/damaged fibres.

Tag and isolate any defective equipment that you find to prevent anybody using it by mistake. Your supervisor will organise for defective equipment to be destroyed, repaired or returned to the manufacturer.

3.6.2 Storing Equipment

When storing lifting equipment you should consider if the location is:

- Clean and dry.
- Out of direct sunlight, ultraviolet light or fluorescent lighting.
- Well ventilated.
- Under cover.
- Away from chemicals, oils, sand/grit, and machinery.
- In a vermin free environment.
- In accordance with manufacturers' specifications.



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

3.7 Remove Hazard Control Measures

Once the job is completed, or a hazard no longer exists, you may need to remove some of the risk control measures you put in place (if they are no longer required).

3.7.1 Clean, Check and Store Equipment

The equipment used should be:

- Cleaned by removing all dirt, mud, moisture or other contaminants.
- Checked for any damage. If anything is wrong, report it; then, if possible, carry out any repairs.
- Stored correctly in the appropriate location so that they are kept free from damage and can be easily found the next time they are needed.

Talk to other workers in the area to let them know that you are removing the hazard control measures as it may impact on the way they perform their own work.

3.8 Tidy Work Area

When you have finished the job, the work area will need to be tidied and all excess materials need to be removed.

3.8.1 Clear the Work Area

Remove any excess materials from the work area as soon as practicable. A tidy work area is a safer work area!

Worksite requirements for clearing the work area may include disposing of or recycling certain materials. Details will be outlined in the project environmental management plan, quality requirements or site-specific procedures.

Other housekeeping procedures may include:

- Cleaning and storing tools and other equipment in line with standard work practices and other requirements.
- Removing any potential hazards such as leftover materials or debris, which could be a tripping hazard. Duty of care means not leaving a possible source of accident or danger for other people.
- Making sure you use appropriate PPE when dealing with waste or possible hazardous materials as you clean up.

Make sure you know and follow the procedures for your worksite. If in doubt, ask your supervisor or put things back where you found them.