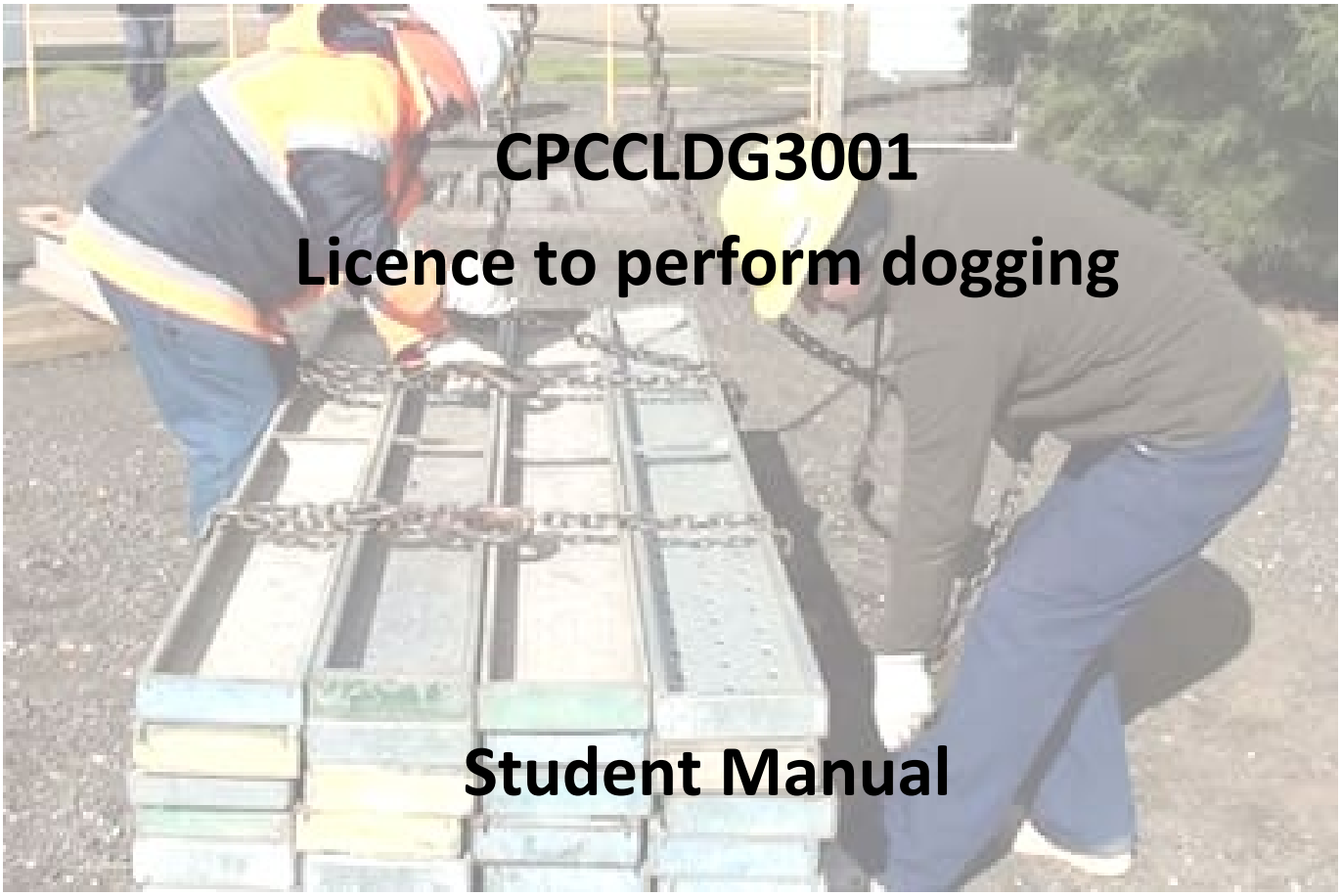


CPCCLDG3001

Licence to perform dogging

Student Manual

ModSkills+

TALENTED TRAINING RTO 45144

version 2: 18/06/2022

Contents

Introduction

Welcome to the unit of competency *CPCCLDG3001 Licence to perform dogging.*

This course will provide you with the skills and knowledge in the application of slinging techniques to move a load, including the selection and inspection of lifting gear, and the directing of a plant operator in the movement of a load when the load is out of sight of the operator.

What Is Dogging?

Dogging work is conducted in the construction industry and other industries where loads are lifted and moved using cranes or hoists.

Dogging consists of two main aspects:

- The slinging techniques used for moving a load (including the selection and inspection of lifting equipment), and
- The directing of a hoist or crane operator who is moving a load, when the load is out of the operator's view.

Required Texts / Reading

The only required text for this course is this **student manual** and any additional hand-outs / text resources your trainer provides during your classes.

This student manual provides the required information to engage in practical activities, class discussion and explains in detail the processes by which to use the applied knowledge as well. It is essential that you learn from both this manual and your trainer in order to successfully complete the related assessment.

Assessment

In this course, we use the national Assessment Instrument (NAI) as mandated for all licenced courses:

- knowledge assessment (theory short answer questions and calculations), and
- practical assessment (demonstration and observation).

Getting the most out of your study

- Talk to your trainer / facilitator and ask questions. They are experienced and able to assist you with your enquiries where possible
- Carefully choose your time and place to study outside of the class or in an environment that is comfortable and effective for learning
- Make a schedule to study and talk about your course with your fellow students (there is often value in collaborative discussion)
- Consider how the student manual information relates to what you are doing
- Seek feedback on your work and study to ensure you are on the right track and re-affirm your effective studying habits
- Make notes, use highlighters, use colours (for the visual learners), underline stuff, scribble memos, and decorate your desk with post-its – whichever approach works best for you
- Read your work examples aloud (to yourself – sometimes as a potential strategy it helps you to understand something by reading it aloud and also to identify areas for consideration)
- Consider the student activities in the student manual to reinforce your learning as you go
- Please advise if you are having issues. We would like to assist you to make this a positive learning experience.

Dogging Or Dogman?

There is some confusion sometimes when it comes to what a dogman is, in relation to dogging or a dogger.

The simple explanation is that a dogman, colloquially known as a dogger, is the person. The actual task – the slinging techniques or guiding of loads mentioned above – is called dogging work.

What happens when you Google "Civil Construction Dogger"

HRW Licence Requirements

Who Needs A Dogman Licence?

Everyone who is engaging in some sort of dogging work is required to have a dogman ticket (licence).

Slinging a load requires more than just hooking up the relevant chains or cables. To safely sling a load, it requires an understanding of the suitability of the lifting gear, as well as what method of slinging is required. Further consideration of the nature of the load, such as its mass and centre of gravity, is also a factor. The Dogman course teaches you the basics to get the load move safely.

There are limited times when someone who hasn't undergone a dogging course or have a High Risk Work Licence (DG) will be able to safely sling a load.

For someone who does not hold a Dogman licence or High Risk Work Licence to engage in basic dogging, then following conditions must be met:

- The weight of the load to be lifted must be predetermined by a competent person (e.g. marked on the load).
- The sling and slinging techniques for the load must be predetermined by a competent person.
- The condition of lifting gear must be predetermined by a competent person.
- The lifting points must be predetermined by a competent person and marked on the load.
- The load must be lifted within the view of the operator at all times.
- The lifting procedures must have been documented and signed-off by a competent person.

A person with a High Risk Work Dogging (DG) Licence must be used if these circumstances are not met. As you can see, the conditions are onerous and rightly so as human life is at stake, so you must get licenced people to do the job.

Licence Requirements

A licensed dogger is required when:

- Judgement in relation to the selection, suitability and condition of lifting gear is required; and
- Judgement is required on the method of slinging, taking into consideration the nature of the load, its mass and its centre of gravity; or
- The movement of a crane is being directed when the load is out of the plant operator's view.

Once you pass your assessment you will have 60 days to apply for your licence. Through your State or Territory's WorkSafe Regulator.

Your HRWL needs to be renewed every 5 years.

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

- Your licence can't be renewed.
- Your licence will be cancelled
- 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 only do high risk work without a licence as long as:

- You are enrolled in a high risk work licence (HRWL) course and supervised by someone who holds the same class of licence.

Legislation and Standards

This section introduces you to the legislation (or laws) that apply to the resource and infrastructure industry and which guide your activities as a resource industry worker. It covers some of the basic things you must do to ensure you always meet the necessary legislative requirements of your role.

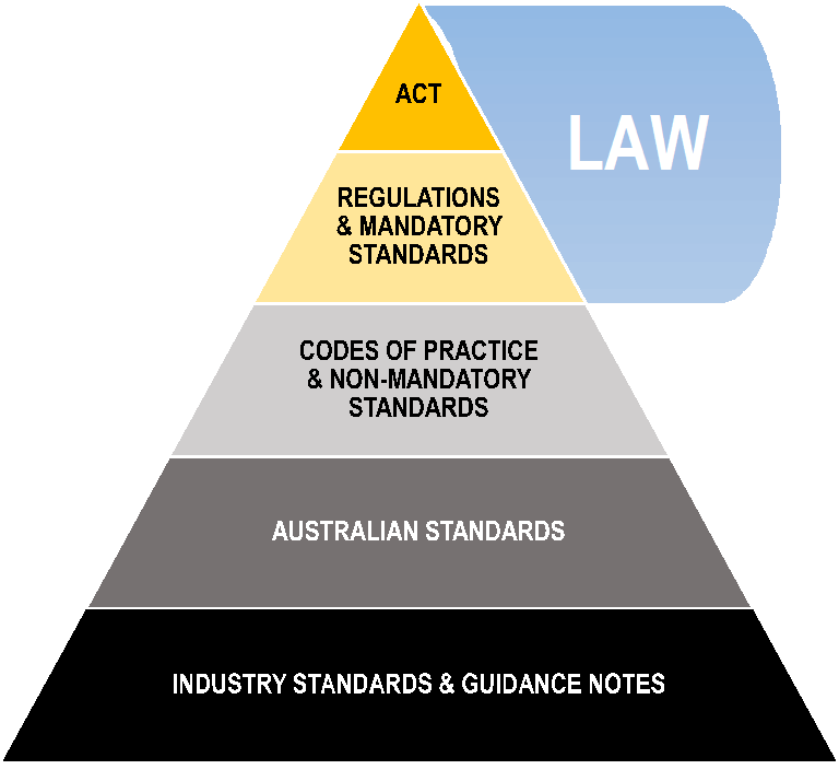
Society has laws to ensure the health, safety and wellbeing of citizens and to protect land, the environment and property from loss or damage. The vast majority of people follow these laws because doing so makes our society a more civilised place to live in – now and for future generations. In addition, there are the penalties that apply when laws are broken.

In most cases laws are not broken deliberately. Instead it is a usually because of a lack of knowledge or failing to take adequate care. Unfortunately, ignorance of the law or carelessness is not an acceptable defence in a court of law. Your best course of action is to be fully aware of the legislative requirements of your work and to use this knowledge when making decisions.

Legislation produces Acts of Parliament; e.g. *WHS Act 2011 (Cwlth)*. From the Act, the Government then produces the **Regulations**; e.g. *WHS Regulations 2011 (Cwlth).* The Regulation performs the function of supporting the Act by providing the specific details of how the Act will be implemented in a day-to-day situation.

An approved **Code of Practice** is a practical guide to achieving the requirements of law (i.e. legislation and regulation). e.g. the model Code of Practice developed by Safework Australia, aims at achieving the standards under the *WHS Act 2011 (Cwlth)* and the *WHS Regulations 2011 (Cwlth).*

Legislation, Regulation, Codes of Practice and Standards



The resource and infrastructure industry still has one of the highest rates of fatalities of any industry across Australia

Australian Standards

Standards are published documents that are designed to provide guidance to help ensure safety, performance and reliability through the specifications of goods, services and systems.

There are many standards relevant for the resources and infrastructure industry which guide workers in dogging activities. For example:

- **AS 3776:2015 Lifting components for Grade T(80) and V(100) chain slings**

  This Standard specifies requirements for forged lifting components for use in chain sling assemblies with corresponding sizes of Grade T chain complying with AS 2321. The components include hooks with eyes, clevises or other joining devices, mechanical connecting devices, and any other terminal fittings used in a lifting system based on Grade T chain. This Standard does not apply to welded components other than welded master links, welded multilink assemblies, welded joining links, or components subject to an existing Australian Standard.

- **AS 2550.1-2011 Cranes, hoists and winches - Safe use General requirements**

  This Standard specifies general requirements for the safe use of cranes, hoists and winches.

- **AS 1666.2-2009 (R2019) Wire-rope slings Care and use**

  This Standard sets out practices for the care and use of wire-rope slings under general conditions of use.

  Note: The (R2019) in brackets after the title of the Standard means that it was Reconfirmed in 2019 by the relevant technical committee, as still being relevant/current.

Duty Of Care

All personnel/workers have a legal responsibility under duty of care to do everything reasonably practicable to protect others from harm by complying with safe work practices. This includes activities that require licences, tickets or certificates of competency or any other relevant state and territory OHS/WHS requirements.

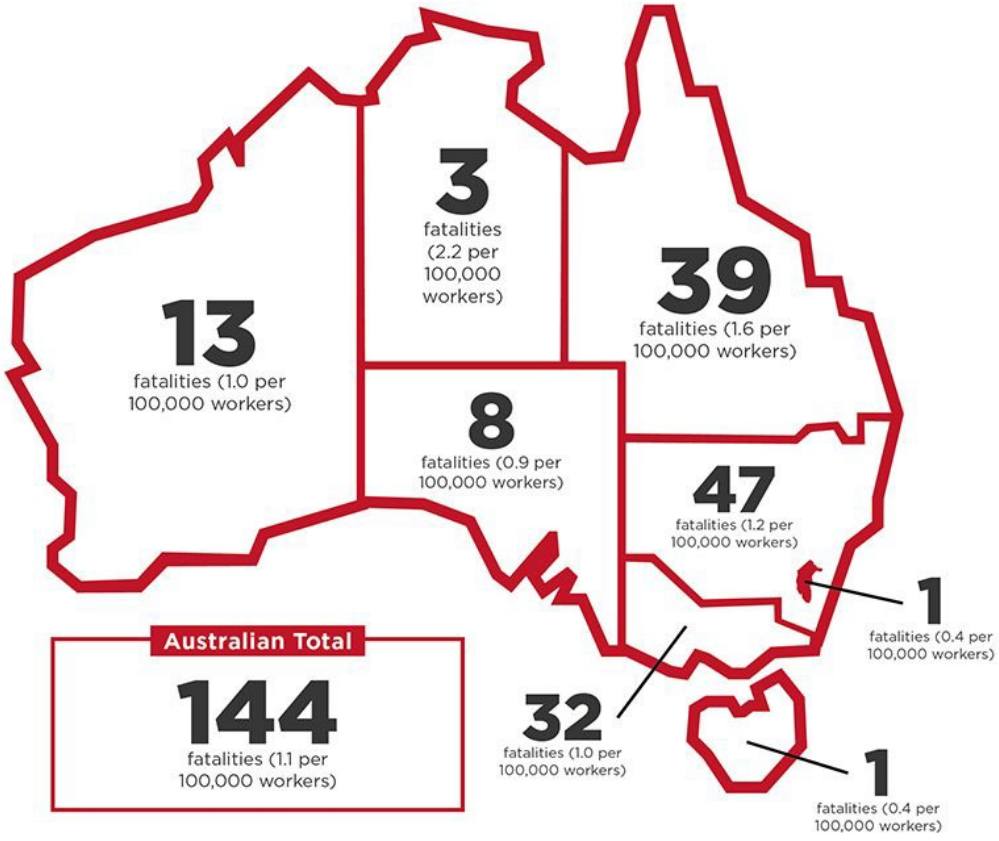
Duty of care applies to:

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

Safe Work Practices

Safe work practices are methods that must be implemented to make sure a job is carried out as safely as possible. The below map shows the fatalities per 100,000 workers in Australia in 2019; caused by work-related incidents.

Safe work practices include:



- Day-to-day observation of OHS/WHS policies and procedures
- Emergency procedures
- Risk assessment
- Use of basic fire-fighting equipment.

Safe work practices are governed by legislative requirements and workplace procedures.

Safe work practices relate to:

- Access to site amenities, such as drinking water and toilets.
- Drugs and alcohol at work.
- General requirements for safe use of plant and equipment.
- General requirements for use of personal protective equipment and clothing.
- Housekeeping to ensure a clean, tidy and safer work area.
- Preventing bullying and harassment.
- Smoking in designated areas.
- Storage and removal of debris.

Safe work practices should be referred to, and documented, when completing Safe Work Method Statements as a guideline for how to carry out a task safely.

Organisational Documentation

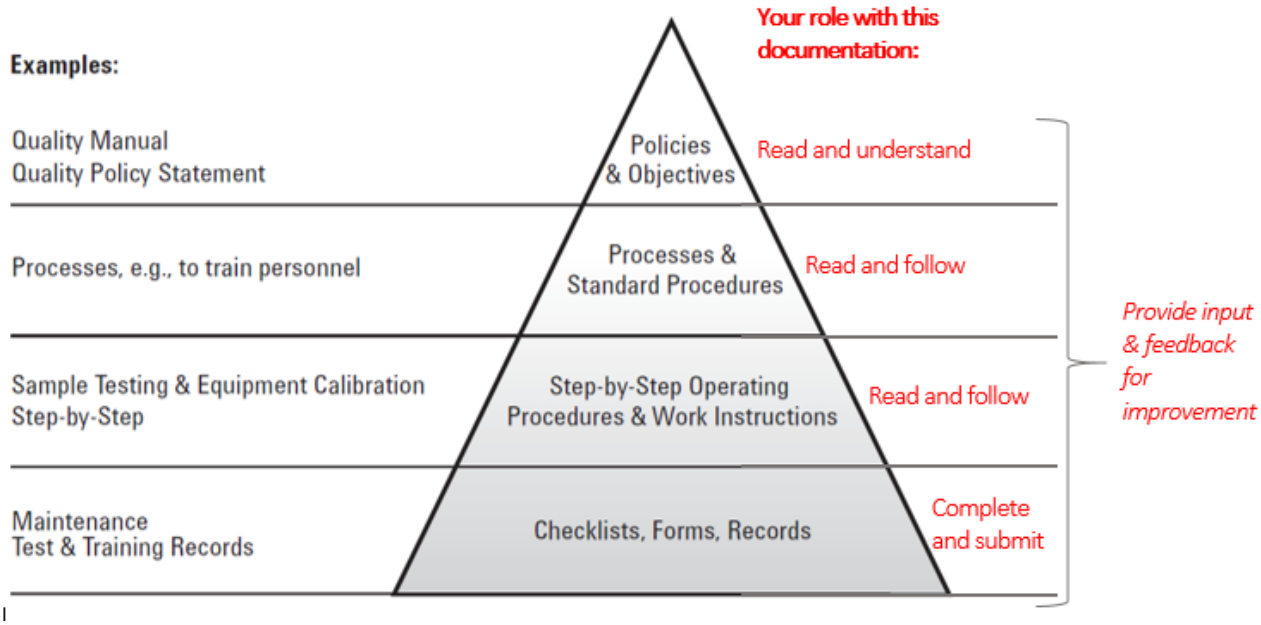
Before starting work you will need to check any existing compliance documentation relevant to your role.

If you are to get your job done efficiently and safely while also meeting a range of legislative requirements, you need to be able to source, read, interpret and complete a range of site documents within your company's organisation system.

You will need to work on ensuring both your verbal and written communication skills to ensure they are effectively supporting you doing your job.

Scope of documentation

The following diagram provides the range of documents within your workplace which cover the site's Safety Management System, Plant and Equipment, Maintenance, Communications, Industrial Relations, Finances, Environment Protection, and so on.



You may have access to these documents through your supervisor or perhaps through an internal electronic document system. You would have been educated with the most important documents when you underwent your employment induction.

During your site induction you will be told how to access the documentation relevant to your site and duties.

When conducting dogging operations the compliance documentation you will most be using will be guidelines for assessing and shifting loads, work instructions and safety information.

Make sure you understand what these documents are asking you to do and if need be, check with your supervisor before starting work.

Follow all instructions given by these documents at all times – they are designed to keep you safe.

Compliance documents contain information, procedures or processes that must be complied with, and also 'best practice' information to be used as a guide for workplace tasks.

Applying Requirements And Procedures

As the compliance requirements can vary from state to state, company to company, job to job, you are required to familiarise yourself with the documentation applicable to your work location and situation.

Working safely and effectively is your responsibility and ensuring those around you are aware of the requirements is another way of increasing your own safety level.

The procedures for your work should be applied from the planning level all the way through to the completion of the work.

These procedures will come from the legislation and regulations that apply to your industry and type of work.

It is your responsibility to make sure you know and apply the procedures effectively and maintain a duty of care towards those around you.

To apply any of the requirements from any level (acts, regulations etc.) you must understand them.

You need to be able to apply what is written in a way relevant to your work.

If you have any problems, difficulty or issues doing this, make sure you ask for assistance from appropriate personnel/workers.

Planning Work

It is important that you are aware of the requirements relating to your work. Before you begin your tasks ensure that you access the relevant documentation and plan your work.

Prepare A Dogging Plan

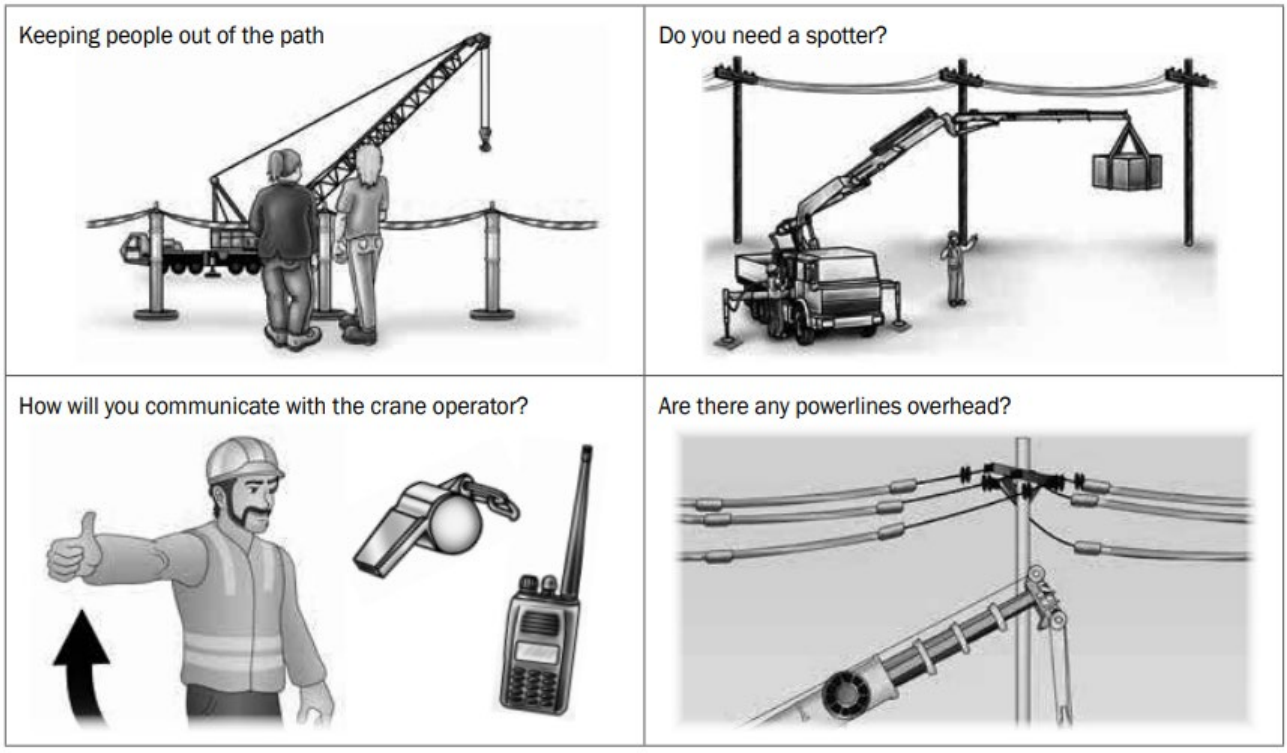
A dogging plan should include:

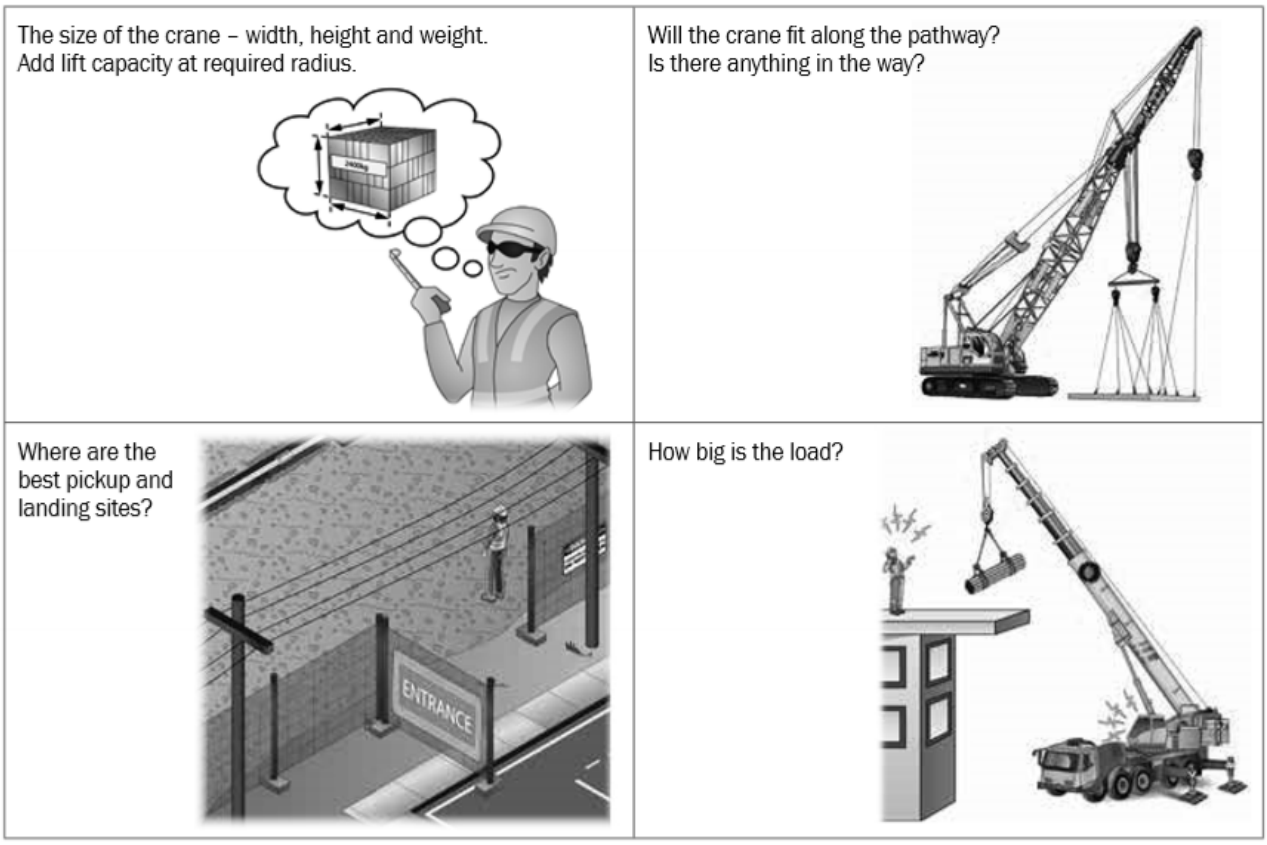
- Confirmed details of dogging requirements.
- Confirmed dimensions.
- Site access and egress.
- Suitability and availability of materials.
- Tools and equipment.
- Identification of potential hazards.
- Probable control measures.
- Identification of site coordination requirements.

You will need to speak with other personnel on site while putting together the plan so that you can organise coordination requirements and hazard control measures.

Planning the path of travel

You need to plan the path of the crane and load before you start a job. Some things you need to think about include:





Safe Work Method Statements

A Safe Work Method Statement (SWMS) details how specific hazards and risks, related to the task being completed, will be managed and is developed by the employer/PCBU for their employees/workers.

SWMSs fulfill a number of objectives:

- Legislative and regulatory requirements.
- They outline a safe method of work for a specific job.
- They provide an induction document that workers must read and understand before starting the job.
- They assist in meeting legal responsibilities for the risk management process, hazard identification, risk assessment and risk control.
- They assist in effectively coordinating the work, the materials required, the time required and the people involved to achieve a safe and efficient outcome.
- They are a quality assurance tool.

Completing a SWMS:

A SWMS must be prepared in consultation with those people who will be doing the job.

1. Break the job down into logical steps taking into consideration what is required to be achieved by the task.

2. Against each step, identify the workplace hazards in this activity i.e. the ways that a person [or plant] could be injured or harmed [or damaged] during each step.
3. Decide on measures required to control hazards i.e. what could be done to make the job safer and prevent the injuries or harm that may occur.
4. Identify roles and responsibilities for actions and outcomes to make ensure risk controls are carried out and supervision of the process occurs.
5. Ensure the SWMS is fully understood by all workers prior to commencing the task.

The Safe Work Method Statement must be available for inspection at any given time. It must also be reviewed each year and amended if necessary.

Safe Work Method Statements may also be referred to as Safe Work Procedures (SWP) or Job Safety Analysis (JSA).

A Safe Work Method Statement Template can be found in Appendix A.

Safe Work Method Statement

Company: (Name, Contact Person & Phone)					
Project/Site:		Principal Contractor:			
Job Task:	**Boom Lift – Working from**	SWMS No.:			
Date Created:		Revision Number:		Review Date:	

Workers Involved in Developing this SWMS			
Print Name:	Signature:	Print Name:	Signature:

Relevant Australian Standards / Codes of Practice / Legislation				
Material Safety Data Sheets Required				
Plant & Equipment Required				
Licenses / Competencies Required				
Hot Work Permit ☐ Yes	Confined Space Permit ☐ Yes	Crane Lift Plan / Permit ☐ Yes	Other Permit ☐ Yes	
Applicable Permit Number(s):				
PPE Required:				

High Risk Work:				
☐ Fall from Heights > 2m	☐ Structural Collapse	☐ Confined Spaces	☐ Work in Tunnel	☐ Explosives
☐ Asbestos	☐ Demolition of Structures	☐ Excavation >1.5m	☐ Mobile Plant	☐ Drowning
☐ Telecommunication Towers	☐ Pressurised Gas Pipes/Mains	☐ Electrical	☐ Traffic	☐ Tilt-up/Precast Concrete
	☐ Contaminated/Flammable Atmosphere	☐ Extremes of Artificial Temperature	☐ Chemical/Fuel/Refrigerant Lines	

Task/Location Specific Risks:				
☐ Access & Egress	☐ Ground Conditions	☐ Noise	☐ Water Pollution	☐ Weather
☐ Overhead Obstructions	☐ Compressed Air	☐ Cultural / Heritage Area	☐ Soil Pollution	☐ Obstacles / Buildings
☐ Underground Services	☐ Quick Cut Saw	☐ Snakes / Vermin	☐ Rotating Machinery	☐
☐ Pedestrians / Workers	☐ Angle Grinder	☐ Dust	☐ Fatigue	☐
☐ Unauthorised Persons	☐ Hot Work / Burns	☐ Significant Trees	☐ Exposure to UV	☐
	☐ Poor Lighting	☐ Flora & Fauna	☐ Ignitions Sources	☐ Other (refer to hazard prompt list)

Emergency plans

Regulation 43 of the Work Health and Safety (WHS) Regulations states a Person in Control of a Business or Undertaking (PCBU)[1] must ensure an emergency plan is prepared for the workplace.

This is a written set of instructions that describes the different types of emergencies which could occur at work and outlines what workers and others at the workplace should do in an emergency.

The role of incident scene management during or immediately after an incident is given to the PCBU or may be delegated to the WHS Officer. If external agencies are present (e.g. fire, police), this automatically falls under their authority.

Emergency plans should be site-specific, covered in induction training and made known to visitors.

Emergency Plans must include:

- emergency procedures, including:
  - an effective response to an emergency
  - evacuation procedures
  - notification of emergency services at the earliest opportunity
  - medical treatment and assistance; and
  - effective communication between the person authorised by the person conducting the business or undertaking to co-ordinate the emergency response and all persons at the workplace.
- testing of the emergency procedures, including how often they should be tested, and
- information, training and instruction to relevant workers in relation to implementing the emergency procedures

[1] Reminder note: A PCBU can be a company; unincorporated body or association; sole trader or self-employed person. Individuals who are in a partnership that is conducting a business will individually and collectively be a PCBU.

Risk Management

Risk management is the process of reducing or managing the risks when working with a hazard or in a hazardous situation and should take into consideration the context of the organisation and worksite.

Risk management is made up of the following stages:

Consultation and communicating with others and monitoring and review should be planned for and carried out at every stage of the risk management process.

Consultation and Communicating with Others

Communication and consulting with others is an important part of the risk management process and should take place at all stages.

Identifying risks and hazards and coming up with ways of controlling them includes talking to the people with knowledge of the situation, or who are directly affected by any action you may take.

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

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

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

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

Risk/Hazard Identification

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 the thing or situation that causes injury, harm or damage.

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

Before conducting a risk assessment at a worksite, check to see what systems and procedures are in place as they may affect the outcomes of the risk assessment.

It is important that suitably knowledgeable personnel/workers are involved in the risk identification process.

A good tip is to check:

- **Above head height** – remember the EWP will be working well above your head!
- **At eye level** – look around to see if there is anything in the way of where you want to move the basket.
- **On the ground (and below)** – Also make sure the path of travel is clear and can bear the weight of the EWP.

Make a note of any hazard you identify in the area. Remember, a hazard can also be a situation so keep an eye on how the people around you are working too.

Each task/procedure/function needs to be evaluated for risks, as well as the work area where the work is being carried out.

You should also check records of injuries and incidents, safety tags and talk to other workers.

Safety Data Sheets (SDS) can be useful tools in identifying potential hazards so make sure you check the SDS documents for your site.

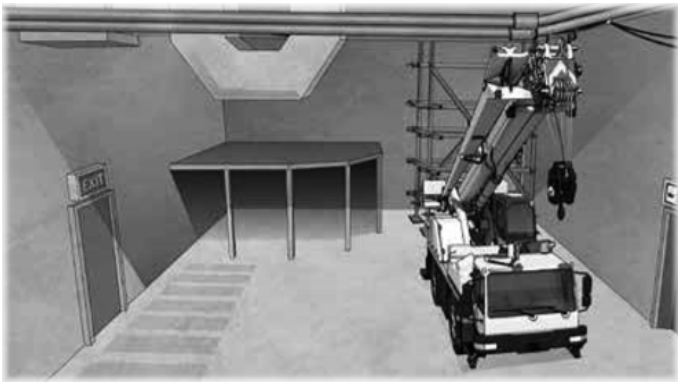
Talk to other workers, your manager, supervisor, team leader or health & safety representative to find out if the risk has already been addressed, and what techniques are available to you to resolve it.

If you find that there is no documentation or guideline in place to resolve an identified risk, you need to assess the risk and identify a feasible course of action to deal with it.

It is important that all records, policies and procedures are kept up to date so that the most relevant information is available and used.

Hazards commonly encountered in dogging:

Overhead services



You should check for service pipes for gas, water or electrical cables and direct the crane operator to avoid making contact with any of these with the crane boom or the load.

Powerlines

Working near overhead electric lines is dangerous and can cause death if you make contact with them. There are rules in each State/Territory that must be followed to ensure everyone's safety.

You must contact your local electricity supply company if you need to work near powerlines.

You should contact the local electrical authority/provider or state regulator for information and advice to find out the voltage of power lines in your area and state.

Queensland

The Queensland Electrical Safety Regulation breaks down the distances in detail. Exclusion zones are broken down not only by size of electric/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.

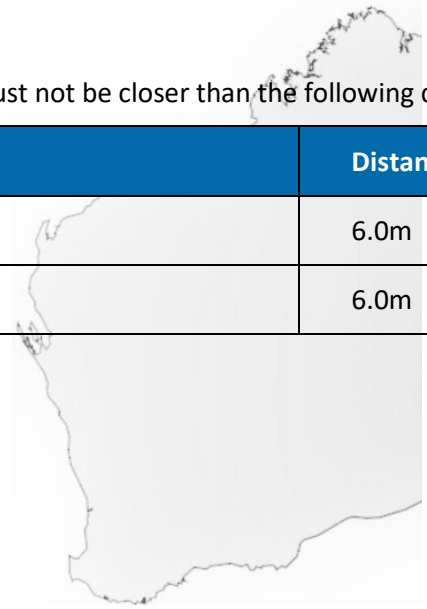
The following minimum distances are provided as guidance:

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

Western Australia

In Western Australia, equipment must not be closer than the following distances to uninsulated power lines:

Electric/Power Line Type	Distance
66kV to 132kV	6.0m
Over 132kV	6.0m



Tasmania

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

Electric/Power Line Type	Distance
Up to and including 133,000 Volts (poles) or LV	6.4m (or 3m with a safety observer)
Greater than 133,000 Volts (towers) or HV	10m (or 8m with a safety observer)

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 electric/power lines:

Electric/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:

Electric/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 electric/power lines:

Electric/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)

Once you have contacted your local power supply company to work closer than these minimum distances, they will determine the best method. This will usually consist of:

- Turn the power off
- Insulate the power lines
- Place a trained spotter in place to oversee the task
- Tigertails are placed on powerlines to make them easier to see when working near them.

If your were to contact these electric lines there are steps you should follow.

- Try to break contact if it is safe to do so (get crane to slew away/hoist or boom clear of lines)
- If contact cannot be broken, stay clear and keep an exclusion around the area (8m minimum)
- Seek assistance
- Once the power is isolated, administer first aid
- Do not use equipment of machinery until it has been inspected

Ground Surface and Condition

You should check the ground to see if:

- There is debris or rubbish in the way
- The surface is strong enough to support the weight of any equipment or materials
- If there are any open trenches or recently filled trenches
- Things in the path of travel
- Other equipment

Ground conditions must be assessed for suitability for the lifting operation, including consideration of the following items:

- Surface conditions – consideration of weight of crane, placement and stability of outriggers and bearing support or shoring requirements (as applicable).
- Surface slope – uneven, unstable or sloping of ground, including that affected by crane slewing or movement.
- cavities or excavations that could affect stability.
- location of any adjacent operations or excavations in the vicinity of the planned lifting operation and possible disruptions.
- Different ground types will have different ground bearing capacities. Where the ground consists of a combination of ground types, the poorer ground type should be used for determining maximum ground pressure that can be applied when the crane is set up on outriggers.

If applicable, the suitability of ground conditions, including sub-surface works, must be confirmed prior to lifting operations commencing. If required, additional support or advice should be requested including:

a) Soil test data reports;

b) Geotechnical reports or assessment; and

c) Other relevant site information such as facility plans or maps

The following table identifies the maximum permissible ground pressure according to the ground type.

Ground Type	Maximum permissible ground pressure Pmax *(Tonnes per m2)*
Hard rock	200
Shale rock and sandstone	80
Compacted gravel (with up to 20% sand)	40
Asphalt	20
Compacted sand	20
Stiff clay (dry)	20
Soft clay (dry)	10
Loose sand	10
Wet clay	Less than 10

Slinging hazards

It is important you learn to properly assess and sling a load. Failing to do this may result in any of the following:

The load could drop or fall out of the slings while it is being lifted and moved. 	The load or sling could be damaged when it is placed at its destination. 	The load could be damaged in transit by the lifting gear. 
The shackle or lifting gear could break if the load is too heavy. 	The lifting gear could be caught under the load and damaged when load is placed at its destination. Use dunnage, packing or timbers. 	The crane could be damaged or become unstable if the load is too heavy. 

Insufficient lighting

Adequate lighting must be provided and maintained to ensure operations can be carried out safely. Examples of lighting include external lighting towers, portable lights and crane lights.

Suitable lighting should be provided for the task being carried out particularly for:

- access routes including access to lifting equipment
- ladders, and
- working areas.

Lighting levels should provide sufficient light for nighttime operations as well as enabling good visibility taking into account glare, reflections or shadows. If portable lighting is used, electrical cables should be protected from accidental damage and positioned to prevent trip hazards.

Weather

A risk assessment should consider how changes in weather may impact safe working practices[2], for example:

- when operating in wet conditions
- in high winds or when lightning is present
- stability of container/load stacks in high winds

[2] Further information about managing the risks associated with working in extremes of heat and cold is in Safework Australia's *Code of Practice: Managing the work environment and facilities* available at https://www.safeworkaustralia.gov.au/doc/model-code-practice-managing-work-environment-and-facilities

- when conditions create poor visibility
- in periods of extreme low or high temperatures, and
- during periods of high solar ultra-violet (UV) radiation.

Control measures may include:

- using weather forecasts to plan activities
- fitting equipment and infrastructure with devices to manage the risk of lightning strike
- using wind speed measuring devices e.g. anemometers on plant like cranes and ceasing activities when safe levels are exceeded
- stacking containers so they are stable
- providing drinking water, appropriate breaks and shelter in extreme heat, and
- providing suitable PPE like wet weather gear and sun protection like a wide brim hat, long sleeved shirt, long pants, sunglasses and sunscreen.

Adverse weather conditions in which lifting operations may need to be reassessed include:

- high winds
- lightning
- poor visibility due to rain, snow and fog, and
- significant vessel movement.

Crane operators should base their decision to make a lift on the information provided by the crane manufacturer, advice provided by competent people like a rigger or engineer and their experience as a crane operator.

Decisions may include ceasing crane operations if there is a serious risk arising from exposure to an immediate or imminent hazard, for example the possibility of the crane being struck by lightning. Any crane struck by lightning must be thoroughly examined before being returned to service.

Pedestrian traffic

Be very careful of workers, other personnel and pedestrians in or around the worksite. People are one of the biggest hazards on a worksite. You must always make sure the area is clear of anybody not directly involved in the lift. Make sure that no one (including you) stands close to the chassis or outriggers of an operating slewing mobile crane.

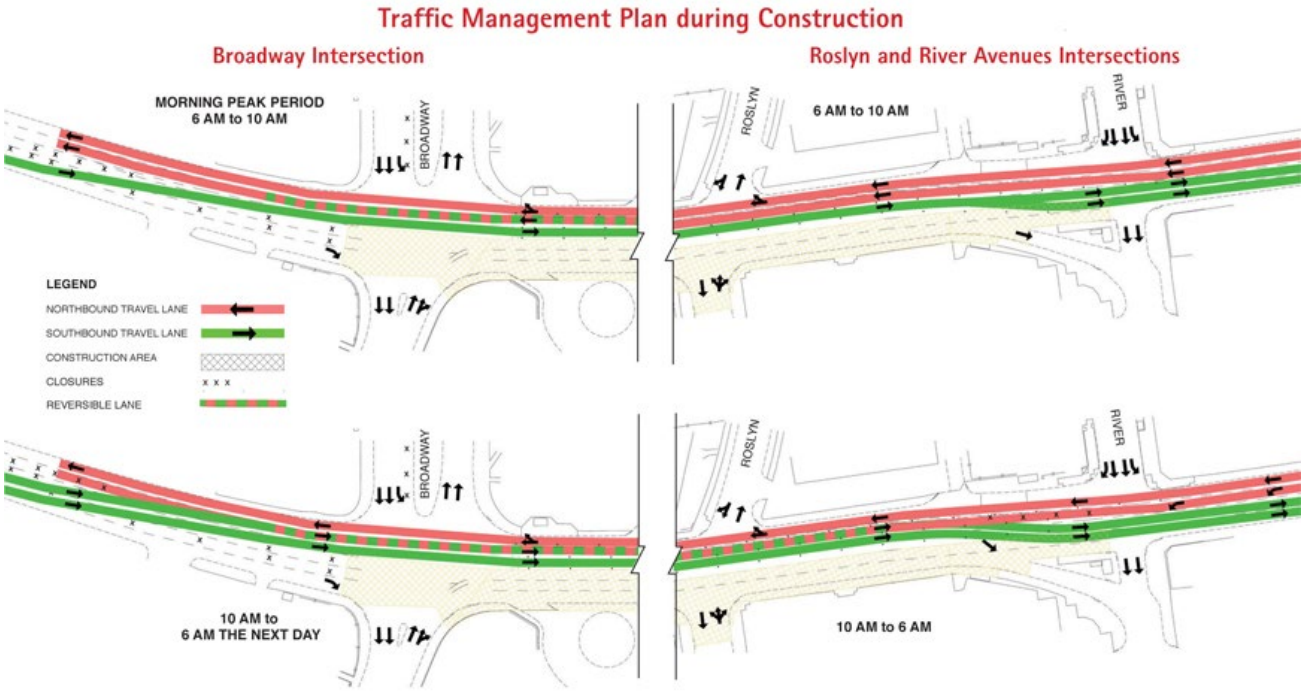
Regulation 215 of the WHS Regulations state: *Persons with management or control of powered mobile plant must ensure that the risk of powered mobile plant colliding with pedestrians or other plant is controlled, so far as is reasonably practicable. If there is a possibility of collision, the powered mobile plant must have a warning device that will warn persons who may be at risk from the movement of the powered mobile plant and measures must be taken to eliminate or minimise the risk.*

Where reasonably practicable the work environment should be designed so vehicles and powered mobile plant are separated from pedestrians.

The development of a traffic management plan assists in managing risks and communicating information about control measures.

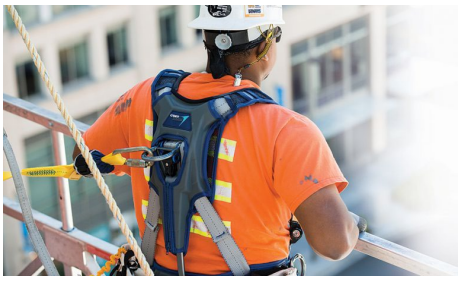
A traffic management plan should be developed in consultation with workers. It can provide details about:

- the desired flow of pedestrian and vehicle movements
- the expected frequency of interaction of mobile plant, vehicles and pedestrians
- traffic controls for each expected interaction including illustrations of the layout of barriers, walkways, signs and general arrangements to warn and guide traffic around, past, or through a work site or temporary hazard
- exclusion zones
- roles and responsibilities of people in the workplace for traffic management, and
- instructions or procedures associated with the control of traffic including in an emergency.



Traffic management plans should be updated to address changes in traffic movements[3].

Work at heights



Falls from heights can cause serious injury or death. Always make sure you use an approved safety system such as guardrails, scaffold or edge protection which has been fitted by a qualified person.

You should always wear a correctly fitted and approved harness. The lanyard should be anchored correctly.

[3] More information about how to manage traffic at a workplace is in Safework Australia's *General guide for workplace traffic management available at* https://www.safeworkaustralia.gov.au/sites/default/files/2021-04/General%20Guide%20to%20Workplace%20Traffic%20Management%20FINAL%202021%202.PDF

Risk Assessment

Risk assessment is made up of 3 factors:

Likelihood	Has the event happened before? Is it likely to happen again?
Consequence	How severe is the outcome?
Risk Level	The combined result of likelihood and consequence.

Using a table similar to the one shown here you can assess how high the risk is, and how soon you should act to remove or control the hazard to achieve an acceptable level of risk.

LIKELIHOOD	**CONSEQUENCE**				
	Insignificant	**Minor** First Aid Required	**Moderate** Medical Attention and Time Off Work	**Major** Long Term Illness or Serious Injury	**Severe** Kill or Cause Permanent Disability or Illness
Almost Certain	**M**	**H**	**H**	**VH**	**VH**
Likely	**M**	**M**	**H**	**H**	**VH**
Possible	**L**	**M**	**H**	**H**	**VH**
Unlikely	**L**	**L**	**M**	**M**	**H**
Rare	**L**	**L**	**M**	**M**	**M**

RISK LEVEL	**ACTION**
VERY HIGH	Act immediately: The proposed task or process activity must not proceed. Steps must be taken to lower the risk level to as low as reasonably practicable using the hierarchy of risk controls.
HIGH	Act today: 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 Safe Work Method has been prepared. 5. The supervisor must review and document the effectiveness of the implemented risk controls.
MEDIUM	Act this week: The proposed task or process can 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 Safe Work Method has been prepared.
LOW	Act this month: Managed by local documented routine procedures, which must include application of the hierarchy of controls.

Any task with a risk level that is Very High is absolutely unacceptable to carry out. Steps must be taken to reduce the risk level.

Hazard Control Implementation

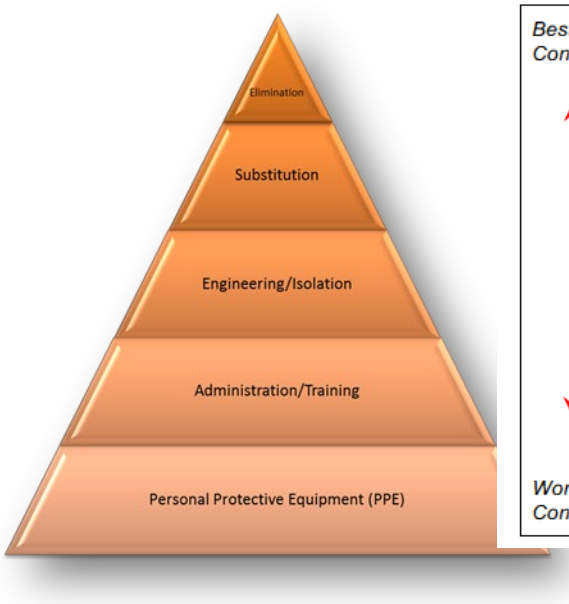
Coming up with a way of controlling hazards includes talking to the people with knowledge of the situation, or who are directly affected by any action you take.

You should always talk to any workers involved in the hazard control measures as well as the OHS officer or supervisor.

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

You must control hazards or better yet, remove them altogether!

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. The Hierarchy has 6 levels:



The following order is recommended:

Best Control	**Elimination**	*Is it possible to eliminate the hazard altogether?*
	Substitution	*Is it possible to replace the substance or, equipment with something less hazardous?*
	Isolation	*Is it possible to stop persons from interacting with the hazard e.g. machine guarding, remote handling?*
	Engineering	*Where people have to interact with a hazard is it possible to engineer a less hazardous solution e.g. stairs instead of a ladder, ventilation devices, refuel machinery from the ground?*
	Administrative	*Is it possible to lessen the exposure of people through changing the way the job is done, rotating people through the job, administrative controls such as training, high risk permits?*
Worst Control	**PPE**	*Last resort – is PPE appropriate to the type, level of hazard and has it been selected correctly?*

It is important to consider all of the options available when deciding on the best course of action.

Not all options are feasible or possible under some circumstances.

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

The risk treatment plan should clearly identify the order in which to implement the individual risk treatments.

Review of the Implemented Control Strategies

Once a Hazard Control Strategy is in place you should review the situation to see if the risk has been reduced to an acceptable level, and if there is more you can do to reduce the risk. Often a number of strategies need to be used together to reduce risk.

The acceptable level of risk is determined by an organizations policy, goals and objectives towards safety. Talk to your supervisor or health and safety rep if you are not sure about whether or not the risk has been reduced enough to carry out the work.

All identified hazards and implemented control strategies need to be documented in the risk assessment form and should be referred to when completing the Safe Work Method Statement prior to starting work.

Personal Protective Equipment

As a minimum, a person performing dogging work must wear a safety helmet (hard hat), hi-vis shirt/vest, and safety boots.

Personal protective equipment (PPE) is anything used or worn by a person to minimise a risk to the person's health or safety. PPE must be provided and maintained by the employer. The employer would also have to provide training for workers required to use it, and the employee would have a responsibility to use it properly.

PPE also includes items such as:

- eye protection for example, goggles, glasses and face shields
- hearing protection for example, ear plugs and ear muffs
- respiratory protection for example, filter respirators, air line respirators and SCBA
- foot protection for example, safety shoes and boots, spats and rubber gum boots
- head protection for example, hard hats, helmets and broad brimmed hats
- body protection for example, aprons, overalls, gloves and high visibility clothing
- Any substance used to protect health, for example, sunscreen.

Using PPE

PPE is one of the least effective ways of ***controlling risks*** to health and safety and should only be used:

- when there are no other practical control measures available
- as an interim measure until a more effective way of controlling the risk can be used
- To supplement higher level control measures.

What to consider when choosing PPE

When choosing the right PPE for the job, the selection processes must include consultation with workers and also include:

- *an evaluation of the risk and performance requirements for the PPE*
- *compatibility of PPE items where more than one type of PPE is required*
- *consultation with the supplier to ensure PPE is suitable for the work and workplace conditions*
- *Preference for PPE that complies with the relevant Australian Standard or equivalent standard.*

The use of PPE is part of safe work practices, and it is part of the employee's duty of care to use the PPE if required. This assumes that the employer has met his/her obligations to:

- consult with employees and health and safety representatives
- fully investigate better control methods
- provide appropriate, good-quality, properly fitted, and well-maintained PPE
- make provision for any secondary problems arising from the use of the PPE
- provide appropriate education, training and supervision.

If these conditions have been met, the employer has both a right, and a duty, to enforce the use of PPE, imposing penalties if necessary.

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

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

Clothing and personal safety

- Tie back long hair that could become entangled in drive mechanisms.
- Wear appropriate PPE (protective clothing, safety glasses/goggles, steel cap boots, etc.)
- Always wear a helmet if there are any overhead obstacles in the work.
- Always wear a protective mask when machining materials, which may present a health risk e.g. Magnesium alloys.
- Always use safety shoes with steel toecaps and oil-resistant soles.
- Never wear loose or baggy clothing.
- Always completely fasten buttons and hooks on the arms of clothing to avoid the danger of entanglement in drive mechanisms.
- Always use gloves when loading or unloading work pieces or tools and when removing chips from the work area to protect your hands from sharp edges and heat generated during machining.
- Do not operate the machine while under the influence of prescribed drugs with powerful effects, illicit drugs, or alcohol.
- Do not operate the machine if you suffer from dizziness or fainting spells

Review of the Risk Management Procedure

1. Identify and document all hazards in the work area (environmental).
2. Identify and document all hazards associated with the job to be completed (procedural).
3. Check to see if there is existing documentation that deals with the identified hazards and implement the necessary control strategies.
4. Assess the level of risk involved with all remaining hazards.
5. Consult with others to identify feasible methods of dealing with the hazards to reduce the risk level to an acceptable level while maintaining legislative and site requirements.
6. Implement hazard control strategies.
7. Review the implemented strategies and risk levels that are now associated with the hazards, implementing further control strategies as required.
8. Document all stages of the process and use the information to complete your Safe Work Method Statement / Job Safety Analysis / Safe Work Procedure.

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 intent to sling and control the load during the lift.

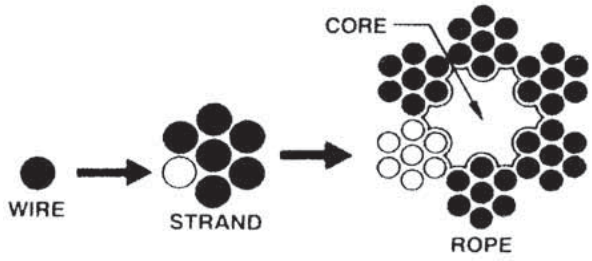
Lifting gear includes all equipment associated with the lifting and moving of the load from the hook down.

It includes:

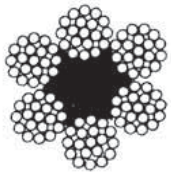
- Ropes.
- Chains.
- Slings.
- Shackles.
- Beams.
- Clamps.
- Other attachments that can be used to lift or secure a load.

Flexible Steel Wire Ropes (FSWR)

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.



6 x 19 Construction FSWR

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.

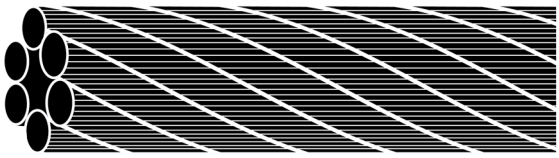
The core of a FSWR can be:

- Fibre Core (FC).
- Independent Wire Rope Core (IWRC).
- Plastic Core (PC).

Lays

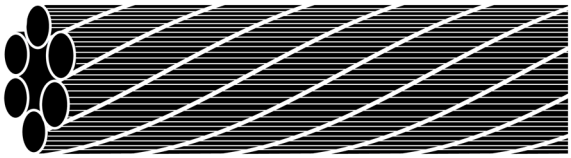
Lay is the direction the wires are formed into strands and the strands are formed into the finished rope.

The strands can be laid either left or right around the core. In left hand lay the strands are laid anti-clockwise and in right hand lay they are laid clockwise.



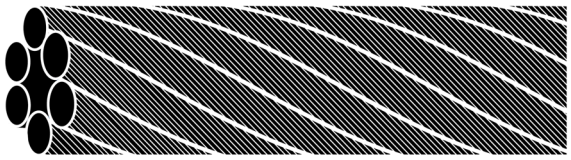
Right Hand Ordinary Lay

Lay does not affect the working load limit of the rope but it does determine characteristics such as the spin of the rope.



Left Hand Ordinary Lay

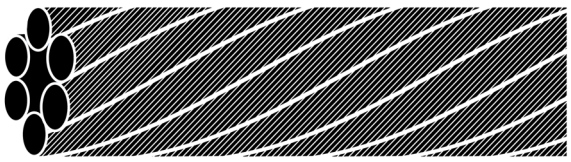
Ordinary lay is where the wires are laid in the opposite direction to the strands. Most general purpose ropes are right hand ordinary lay. Ordinary lay ropes are used extensively for slinging. The minimum construction FSWR for slings is 6 x 19 or 6/19.



Right Hand Lang's Lay

They are more resistant to crushing and kinking because of the very short length of exposed wires.

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



Left Hand Lang's Lay

Lang's lay is more flexible and harder wearing than ordinary lay ropes. It is used as excavator, dragline, and pile driving ropes where severe abrasion occurs. It is harder wearing because more of the individual wires are exposed to the sheaves.

Therefore there are 4 main types of FSWR:

- Right Hand Ordinary Lay (RHOL).
- Left Hand Ordinary Lay (LHOL).
- Right Hand Lang's Lay (RHLL).
- Left Hand Lang's Lay (LHLL).

Natural and Synthetic Fibre Ropes

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

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

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 WLL than natural fibre rope because they do not have overlapping fibres and because some filaments are 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 and are not suitable for hand haulage. Prevent this 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 powerlines.

Chains

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 are stamped or embossed on the chain at least every metre or every 20 links, whichever is less.

Chain Grades:

- Grade 30 = L or 30 or 3 (Mild steel chain).
- 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 chain used extensively for lifting).
- Grade 100 = V (Very high tensile chain).

FSWR Slings

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

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

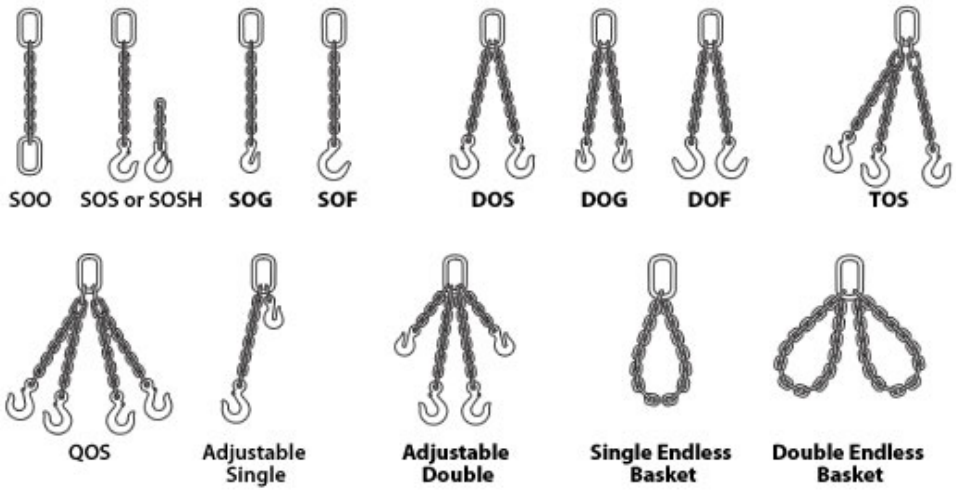
The minimum construction for use as a sling is 6/19.

Chain Slings

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 working load limit tag must be fixed on all chain assemblies The tag must detail the SWL under all conditions of loading.

If a tag is missing the sling should be taken out of service, unless the necessary information is marked on the master link. Once the tag is replaced the sling can immediately be returned to service. The tag should be replaced by a competent person.



Synthetic Webbing Slings

Flat webbing and round synthetic slings are used for lifting where it is necessary to protect the load from damage and for protection from electrical hazards. They are made from nylon, polyester, polypropylene or aramid polyamide. Each sling must be labelled with the WLL. **Do not** lift if the label is missing.

Synthetic slings are colour coded:

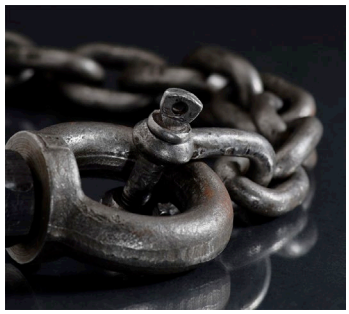
Round Slings - *AS 4497.2* **Flat Webbing Slings** - *AS 1353.2*
Working Load Limit (WLL) Tonnes

Sling Lifting Configurations	Straight Lift $L = 1$	Choked Lift $L = 0.8$	Basket hitch and 2, 3 & 4 leg slings			
			Parallel $L = 2$	$\beta = 60°$ $L = 1.73$	$\beta = 90°$ $L = 1.41$	$\beta = 120°$ $L = 1$
Sling Colour as per Australian Standards						
Violet	1.0	0.8	2.0	1.7	1.4	1.0
Green	2.0	1.6	4.0	3.4	2.8	2.0
Yellow	3.0	2.4	6.0	5.1	4.2	3.0
Grey	4.0	3.2	8.0	6.9	5.6	4.0
Red	5.0	4.0	10.0	8.6	7.0	5.0
Brown	6.0	4.8	12.0	10.3	8.4	6.0
Blue	8.0	6.4	16.0	13.8	11.2	8.0
Orange	10.0	8.0	20.0	17.3	14.1	10.0
Orange	12.0	9.6	24.0	20.7	16.9	12.0

NOTE: Working Load Limit = L x WLL; L= Loading Factor; β = Included angle between the legs

Shackles

Shackles are 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 splitpin forelock (i.e. split flat cotter pin) or nut and splitpin.



Always use the correct size 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 SWL/WLL stamped on them.

Dee Shackle

Bow Shackle

Eye bolts

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.

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

Loads can spin when lifted with a single eyebolt causing the eyebolt to unscrew from the load. Mouse the eyebolt to the load to stop unscrewing.

Uncollared Eye Bolt

Collared Eye Bolt

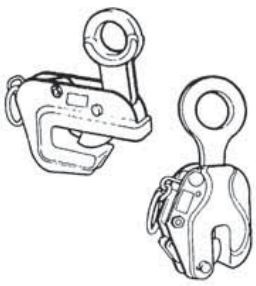
Hooks

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 800 strength.

Beam/Plate clamps

Plate clamps that are designed to increase the purchase on the plate as it is lifted.



Spreader & 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 WLL. The WLL must include the weight of the load plus all lifting gear (slings, shackles etc.).

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.

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.

Inspect Lifting Gear

Check all lifting gear before you use it. DO NOT use any lifting gear that is damaged or in poor condition.

Lifting Gear:	Defects to check for:
FSWR	× 10% of wires are broken over a length of 8 x diameter of the rope. × Kinking. × Knotted. × Affected by heat. × Stretched. × Sun-rot. × Corroded. × Affected by acid & alkaline. × Birdcaging × Crushed.
Fibre Ropes	× Brittleness. × Overloading (stretched). × Discolouration due to excessive heat. × High stranding. × Sun-rot. × Cut or broken yarns/strands. × Mildew. × Knotted. × Effects of acid or corrosive agents.
Chains	× Twisted. × Affected by heat. × Kinked, knotted. × Cracked links. × Stretched, locked or does not move freely. × Spot welded. × SWL/WLL tags missing. × Gouged, cut or worn more than 10% of the links original diameter. × Grade markings missing or unreadable. × Pitting.
Hooks	× Throat opening stretched more than 5%. × Cracked. × Stretched. × Distorted. × Bent. × Bight worn by 10% or more.
Shackles and Lifting Rings	× Bent. × Cut, gouged or worn by 10% or more. × Deformed. × SWL missing or illegible. × Damaged. × Incorrect fitting pin. × Cracked.
Synthetic Slings	× External wear; abrasions. × Internal wear; is often indicated by the thickness of the sling or the presence

Lifting Gear:	Defects to check for:
	of grit and dirt. × Damage caused by high temperatures, sunlight or chemicals. × Damage to the stitching. × Damage to eyes, terminal attachments or end fittings. × Label / Tag has been removed, destroyed or is not legible. × Damage to sleeve or protective coating. × Sling has not come into contact with acids, organic solvents such as paint, coal tar or paint stripper etc. × Visible cuts or tears or contusions.

Any equipment that is not safe to use should be labeled and rejected. You may need to destroy the equipment to prevent others from using it, or return it to the manufacturer for testing, repairs or replacement.

Communication Methods

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. These can include:

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

Workplace communications may take the form of:

- Verbal and non-verbal language.
- Written instructions.
- Signage.
- Hand signals.
- Whistle or buzzer signals.
- Listening.
- Questioning to confirm understanding, and appropriate worksite protocol.

Talk to the appropriate personnel (e.g. supervisors, colleagues or managers who are authorised to take responsibility for the workplace or operations) to discuss the best options for communication.

To direct the crane driver you may use:

- Hand signals.
- Whistle or buzzer signals.
- Two-way radio.

Communicating with the Crane Operator

Talk to the crane operator and select the methods that you are going to use to communicate during the lift (e.g. hand signals).

If you are using any communication equipment (such as fixed channel two-way radios, whistles or bells/buzzers) make sure that it works before starting the job.

Communication Equipment

Mobile phones

Mobile phones have made a huge difference to the way we communicate in the workplace. On a site that is covered by GSM, mobile phones play a principal role in enabling quick and efficient communication.

While mobile phones have been a major boon to communication, they can hinder work if not used appropriately. Here are some tips for safe use of your phone and for ensuring you control your phone, rather than letting it control you!

- Do not use mobiles in flammable environments.
- When on work time, restrict mobile phone conversations to essential work-related calls; check your company's policy on mobile phone use while on duty.
- Do not use your mobile while you are driving or operating an item of equipment or trying to do any other work task that requires your undivided attention.
- Turn off mobiles during meetings and important conversations.

Satellite phones

Remote sites rely on satellite communication networks to connect their operations to phone and internet services and ensure work can carry on as usual. While connectivity at

the desk in the site office is generally available, issues can escalate when working in the field.

Satellite phones require a clear, wide and direct line of sight between the handset and the sky. Factors such as atmospheric conditions, geographical features and thick tree cover may affect reception. However, when working in the field mobile satellite connectivity is required not only for safety purposes, but to also increase the efficiency of daily tasks.

Care instructions that apply to mobile phones also apply to satellite phones.

Two-way radios

Two-way radio is the preferred communication device when continuous and instant contact is required during specific tasks. Two-way radios are suitable only for short-range communication which, depending on the set-up, can range from 1–15 kilometres.

Most two-way radios use either UHF (Ultra High Frequency) or VHF (Very High Frequency) bands.

Radio functions

The functions available on a two-way radio will vary by make and model but the basic functions are:

- Push-to-Talk (PTT) button. This is used to enable your transmission. While the PTT button is held down, you can only make transmissions. Release it to receive transmissions from the other radio.
- Volume.
- Squelch control (used to suppress background noise).

Radio operation techniques

Here is a typical two-way radio procedure. Be sure to check the procedures that apply on your site, as they may differ.

1. Select the relevant channel for your site.
2. Check the channel is clear.
3. Press the Push-to-Talk (PTT) button when you are ready to make a transmission. Know what you are going to say before starting the transmission. This will reduce the need for ums and ers.
    a. Speak into the microphone:
    b. Hold the microphone vertical, close to your mouth.
    c. Pause for a moment before speaking to avoid parts of the message being cut off. Pause also before releasing the PTT button to prevent cut-offs at the end of your message. Use the proword ‘Over‘ when you complete a part of a transmission.
    d. Speak across the face of the microphone.
    e. Speak with natural rhythm; avoid pausing and the use of ’ ‘er‘ ‘ or ‘ah’.
    f. Speak steadily and not fast.
    g. Avoid shouting into the microphone.
4. End the transmission with ‘Out‘, letting the person you are talking to know that the transmission is done.

Radio protocol

Two-way radios are used for quite specific purposes so you need to be aware of some of the basic guidelines for appropriate use:

- Use them only for essential business or emergency communication, not chit- chat.
- Keep messages short and to the point.
- Do not break into others’ transmissions.

Maintaining and securing communication equipment

Most modern communications equipment is relatively maintenance-free but there are a number of things you can do that will help the device function at its best and increase its service life.

The following tips are applicable to all communications equipment and indeed any electronic item:

- **Heat**. Excessive heat damages or degrades the electronics and batteries of electronic equipment. Keep your device out of direct sunlight or hot enclosed environments like glove boxes and closed vehicles.
- **Dust**. Use a case to protect your device. In extreme situations consider using a plastic bag.
- **Moisture**. We all know that dunking devices in water is bad for them; however, often less obvious moisture sources can cause damage. Beware of moisture that can come from overspray, condensation or perspiration.
- **Storage and security**. Due to their value and small size, electronic devices are often stolen. Make sure they are secured; where it is practical and safe to do so, carry them on your body.
- **Using it**. Have your phone on you and turned on when it is practical and safe to do so. The value of a mobile phone is that it makes you easily contactable.
- **Getting protection**. Consider using a shock-absorbent, water-resistant case for your phone when working in challenging environments.
- **Cleaning**. Most devices only require basic cleaning according to the manufacturer's instructions. Use a fine brush to remove dust.
- **Care of battery**
    - Most modern devices use lithium- ion batteries. Contrary to popular belief, these batteries do not need to be fully discharged. The only reason you may need to do this is to help calibrate the battery mete; this rarely needs to be done.
    - Remove batteries if the device will not be used for an extended period. Store them in a plastic bag in a refrigerator (not the freezer).
    - Excessive heat damages the carrying capacity of lithium-ion batteries. Try to keep them cool.
- **Preserving battery charge by:**
    - turning the device off
    - turning off features that are not available or required – wireless internet, Bluetooth and GPS.
    - turning down screen brightness.

Emergency Communications

In an emergency use the communication equipment that is specified in your site's emergency procedures and/or the equipment you can use to contact emergency responders. Try your best to remain calm, as panicking will make it more difficult to follow a procedure and communicate effectively with those who can help in an emergency.

Regardless of the communication technology used, you should communicate the following basic details in your message:

- your name
- location of the accident/emergency
- type of injuries
- number of people injured
- what assistance is required
- what hazards exist.

Emergency radio communication

Select your emergency broadcast channel.

1. Hold down the send button and announce 'Emergency, Emergency, Emergency' (3 times). Repeat at regular intervals until you are able to raise help.
2. If you are not involved in the emergency response, stay off radios while an emergency situation is dealt with.
3. Stay by the communication device during the emergency or have someone else remain with it.

Emergency telephone numbers

Make sure you know your site's emergency contact numbers, which should be displayed at key locations and be included in site procedures. It is a good idea to store any important numbers in your mobile phone.

Dealing with communication faults

There will be situations when an item of communications equipment will not be available, due to either a fault or poor reception. For this reason, most sites will use multiple communication technologies and have

procedures in place which specify which item of equipment should be used in a given situation. You need to be aware of the procedures that apply on your site and have access to more than one form of communication.

Always report faults to your supervisor or use the methods outlined in your site's management system.

Types of Cranes

Cranes that you may work with could include:

Tower cranes

(including self erecting)

Portal boom cranes

Slewing mobile cranes

Derrick cranes

Non-slewing cranes

Overhead bridge & gantry cranes

Vehicle loading cranes

Load Assessment

Part of putting together a job plan includes assessing the load itself. You need to assess the following:

- The weight of the load (to decide what crane and slings to use).
- 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).
- Any other characteristics of the load that may be important (is it a special shape? Does it have specific lifting or slinging points?).

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.

For special shaped loads you may need to check the manufacturer's specifications to determine the best method of slinging it.

Working Load Limit

The working load limit (WLL) of a sling is the maximum load that load limit may be lifted by that sling making a straight lift. The load factor for a straight lift = 1.

Working load limit of flexible steel wire rope (FSWR)

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

Formula: WLL (kgs) = D^2 (mm) x 8

For example: Rope diameter (D) = 12mm

WLL (kgs) = D^2 (mm) x 8

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

= 12 x 12 x 8 = 1152kgs

WLL (t) = 1.15 tonnes

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.

Formula: D (mm) = √*L(kg)* ÷8

For example: Load = 1152kg

D (mm) = √1152 ÷ 8

= √144

= 12 (mm)

Therefore an FSWR sling of at least 12mm is required to lift a 1152kg load for a straight lift.

Working load limit of chain

The WLL 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 WLL. Return it to the manufacturer for WLL assessment and retagging.

To calculate the WLL of 80 grade lifting chain in kilograms square the diameter (D) in millimetres (mm) and multiply by 32.

Formula: WLL (kgs) = D^2 x 32

For example: Chain diameter, 10mm. Grade T (80)

WLL = D^2 (mm) x 32

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

= 10 x 10 x 32

= 3200kg s

WLL (t) = 3.2 tonnes.

The above 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 32 and find the square root of the result.

Formula: D (mm) = √L (kgs) ÷ 32

Load = 3200kg

D (mm) = √3200 ÷ 32

= √100

= 10 (mm)

Therefore a Grade 80 chain, 10mm in diameter is required to lift a load 3200kg for a straight lift.

To calculate the WLL of grade 30 or 40 lifting chain in kilograms, square the diameter (D) in millimetres (mm) and multiply the grade (G) by 0.3.

Formula: WLL (kgs) = D^2(mm) x G x 0.3

For example: Chain diameter, 1Omm. Chain grade 30

WLL = D^2 (mm) x G x 0.3

= D (mm) x D (mm) x G x 0.3

= 10 x 10 x 30 x 0.3

WLL = 900kgs

WLL (t) = 0.9 tonnes

Working load limit of natural fibre rope

To calculate the WLL of natural fibre rope in kilograms, square the rope diameter (D) in millimetres (mm).

Formula: WLL (kgs) = D^2(mm)

For example:

Diameter = 25mm

WLL (kgs) = D^2(mm)

WLL (kgs) = D (mm) x D (mm)

= 25 x 25

= 625kgs

WLL (t) = 0.625 tonnes

The above equation can be reversed to calculate the diameter (D) in millimetres of fibre rope needed to lift a given load. To do this find the square root of the load in kilograms.

Formula: D (mm) = √Load (kgs)

Load = 200kgs

D (mm) = √200

= 14.14 (mm)

Therefore a 15mm diameter fibre rope sling is required to lift a 200kg load for a straight lift.

Preparing Site and Equipment

Apply Hazard Control Measures

Part of preparing the site includes setting up any hazard controls. This might include setting up barricades to keep pedestrians outside of the work area, setting up extra lighting or having power lines insulated or disconnected.

Make sure that any control measures are consistent with workplace and safety standards. If you are unsure, check with your WHS officer or supervisor.

Communicate With Team Members To Ensure Coordination

Before you start preparing the lifting equipment you should speak with any personnel involved in, or affected by the dogging work.

You need to make sure everyone is aware of the work sequence and any mobile plant or equipment that will be used in the area.

It is important to make sure everyone is aware of what you will be doing and when so that you can properly coordinate the activity. If personnel are unaware of what you are doing they may put themselves in danger during the task. This is especially important to consider when transferring loads around a work site.

Communication techniques may vary from site to site or task to task. Make sure you are aware of the correct procedure for communicating with personnel at your work site.

Load specific Equipment

Depending on the task you may need to use or shift a range of load specific equipment such as:

- Brick cages.
- Personnel cages.
- Kibbles.
- Rubbish bins.
- Rescue cages.

These items must be used in accordance with relevant standards to ensure the safety of all personnel involved. All equipment requiring repair should be isolated to prevent its use until it is fixed.

Safety Tags & Lockout Systems

These are isolation systems that help to prevent incidents by making sure faulty equipment is not used.

A lockout prevents operation of equipment by an unauthorised person. Only the person who placed a tag or lockout device can remove it.

For example, if a lock is applied to prevent use of equipment, the key should be kept in the possession of the person placing the lock. Spare keys should not be accessible except in emergencies.

To select the appropriate isolation method, you should talk to relevant people and refer to relevant documentation such as:

- Supervisor
- Safety Officer
- Other competent or qualified persons
- Service technicians

- Manufactures specifications and instructions
- JSA
- SWMS
- Risk assessments

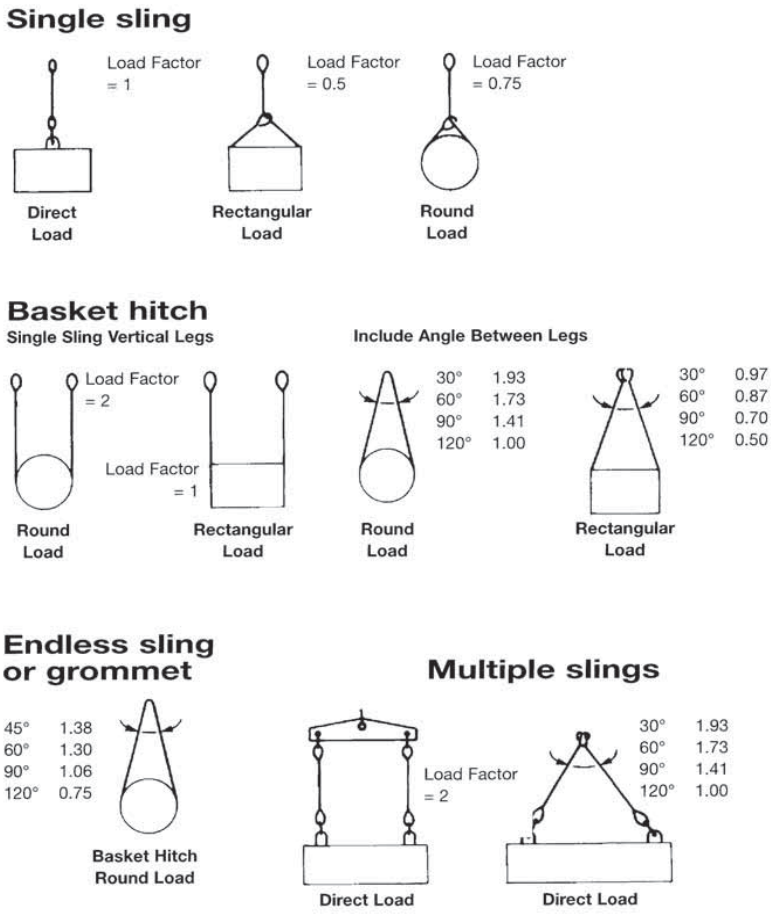
Slinging Methods

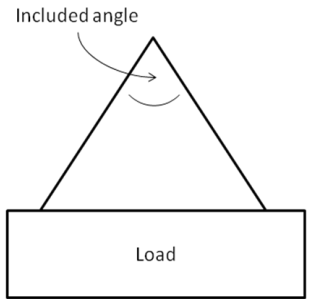
The way you sling the load will depend on the size, shape and requirements of the load. Some slinging techniques reduce the WLL of the slings. Make sure you have allowed for the reduction when you are selecting the slings and lifting equipment for the job.

Load factors and slinging

The lifting capacity of a sling for a straight lift is the WLL. Once the WLL has been altered due to a particular slinging method such as an increase in the angle between two legs or a reeve it is then referred to as the safe working load (SWL).

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°. At 60° the slings will lift only 1.73 the WLL of one sling.

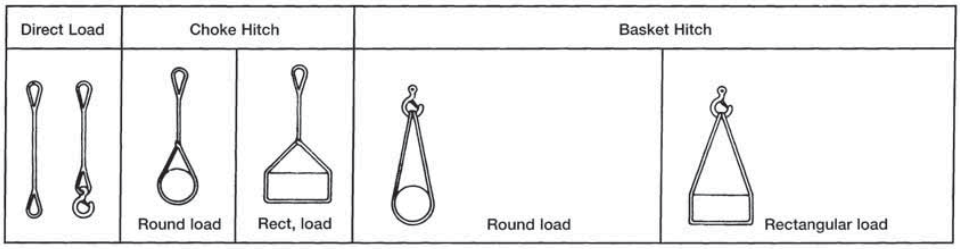
The recommended maximum angle between the two legs of a sling is 90°. The recommended maximum angle between the vertical and any leg of a sling is 45°. At 90° the slings will lift 1.41 times the WLL of one sling.

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

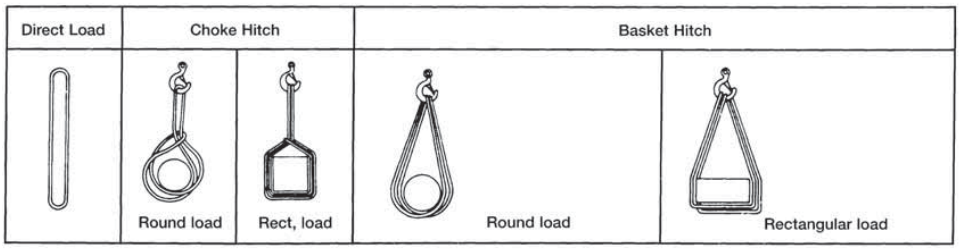
When slinging a rigid object with a multi-legged sling it must be assumed that only two of the sling legs are taking the load. Additional legs do not increase the SWL of the sling assembly. Therefore each leg has to be capable of taking half of the weight of the load.

The SWL 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. Remember that the rule of thumb method of working out the SWL of slings is not completely accurate. For an accurate SWL refer to the manufacturer's load charts.

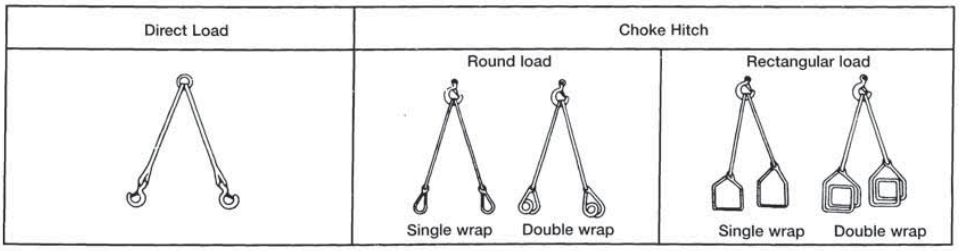
Single-part, single-leg slings



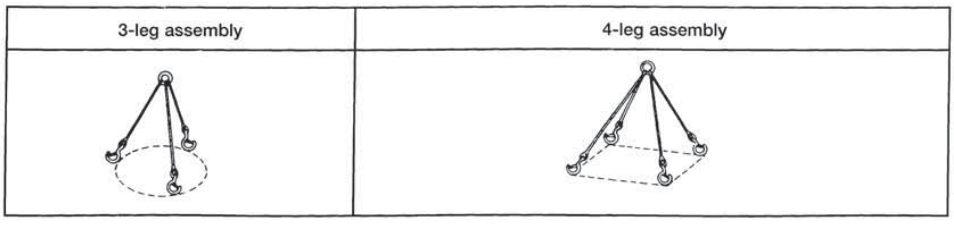
Double-part, single-leg slings



Two-leg slings



Three-leg and four-leg slings

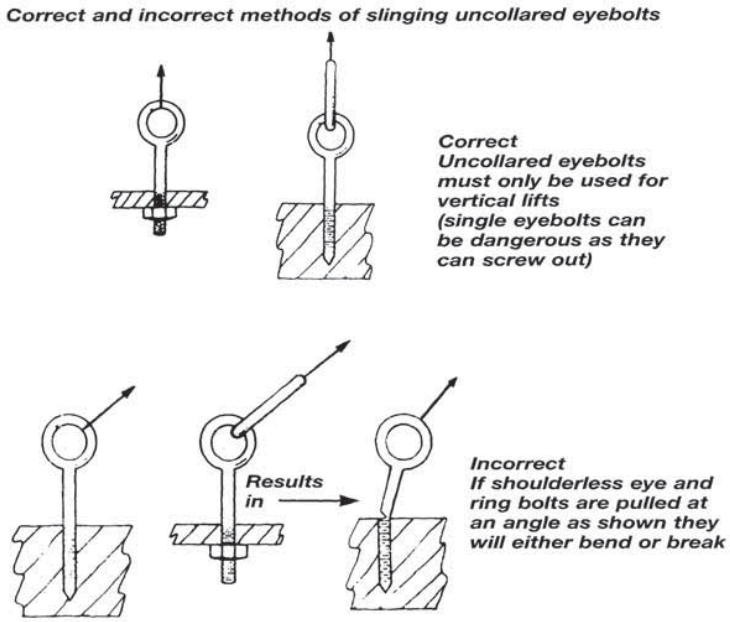


Using Shackles and Eye Bolts

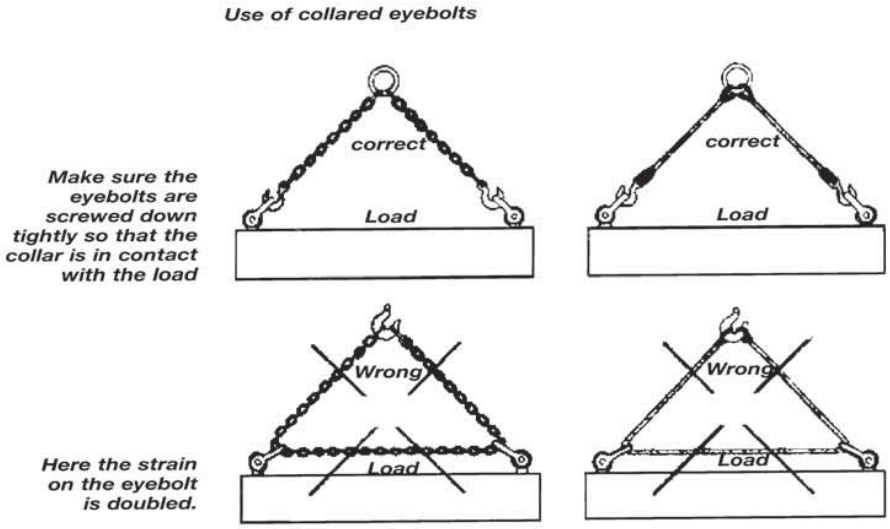
When using multiple slings, always use a bow shackle large enough to accommodate all of the eyes safely on the bow. The pin of the shackle should rest on the hook.

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.

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



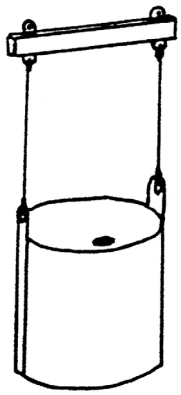
Where two eyebolts are used to lift a load, a pair of slings should be shackled into them. Do not reeve a single sling through two eyebolts and then put both eyes on the hook.



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.

Slinging Technique Examples

Example 1



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

The drum has a diameter of 0.9m and is 1.7m tall.

The weight of the empty drum is 260kgs.

Water weighs 1 tonne per cubic meter.

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

Calculations

Volume (in m^3) = Diameter x Diameter (in m) x 0.79 x Height (in m).

Weight (in kg) = Volume x 1000kg (water weight per m^3) plus 260kg (tare of drum).

The load on each sling is then determined by dividing the weight by the load factor.

Volume = 0.9 x 0.9 x 0.79 x 1.7

Volume = 1.088m^3

Weight = 1.088 x 1000 + 260

Weight = 1348

The sling diameter can now be calculated using the formula:

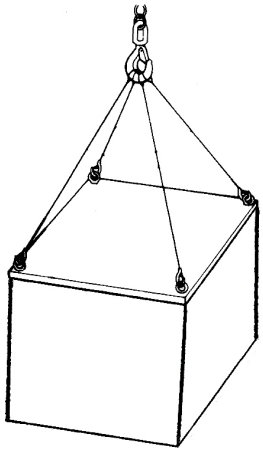
Diameter (in mm) = √load ÷ 8 x 2

= √1348 ÷ 8 x 2

= 36.715 ÷ 8 x 2

FSWR diameter = 10mm (rounded up from 9.178)

Example 2



A box with built-in lifting lugs is to be lifted. The included angle between the diagonally opposite sling legs is 60 degrees.

The chain slings are Grade T.

The chain diameter is 8mm.

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

Calculations

Firstly calculate the SWL for the chain using the formula:

SWL (in kgs) = D^2 (in mm) x 32 or D squared (in mm) x grade x 0.4 (for grade T)

SWL = 8 x 8 x 32

SWL = 2048kg

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

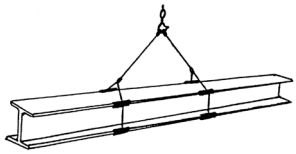
Multiply the SWL by the angle factor (1.73 for a pair of slings with an included angle of 60 degrees) to calculate the maximum load of the box.

2048kg x 1.73 = 3543.04kg

This is then converted to tonnes and rounded down to the nearest 0.1t.

Maximum load = 3.5 t (rounded down from 3543.04kg)

Example 3



A pair of FSWR reeved slings are to be used to lift a steel beam. The angle between the sling legs is 90 degrees.

The diameter of the slings is 16mm.

The steel beam weighs 173kg/m.

What is the maximum length of beam that can be lifted by these slings?

Calculations

Firstly calculate the SWL of the FSWR by using the formula:

SWL (in kg's) = D^2 (in mm) x 8.

SWL = 16 x 16 x 8

SWL = 2048

The sling SWL is then multiplied by the load factor (1.41 for a pair of slings with an included angle of 90°), and then multiplied by the reeve factor (0.5 for slings reeved around rectangular sections). This is expressed by the formula:

Maximum load = SWL x load factor x reeve factor.

Maximum load = 2048 x 1.41 x 0.5

Maximum load = 1443.84

The result is then divided by the weight per meter of the beam (in kg's).

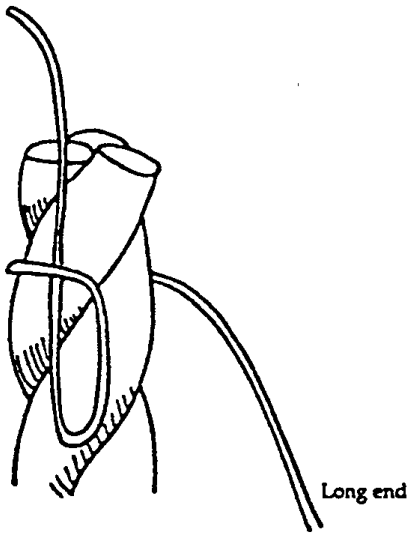
1443.84 ÷ 173 = 8.346

Maximum length beam = 8m (rounded down from 8.346 m)

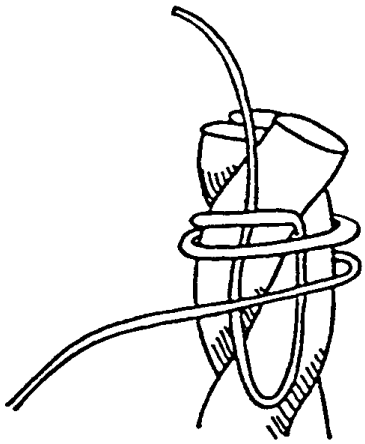
Prepare and Assemble Lifting Equipment

Once you have decided on the type of lifting gear, and the slinging method you are going to use you should assemble any lifting equipment as required. For example attaching slings to lifting beams using shackles. Ropes may also need to be prepared. Rope work that may be required could include:

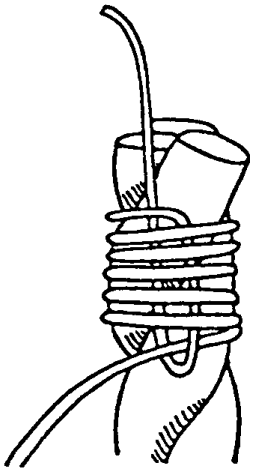
Common whipping



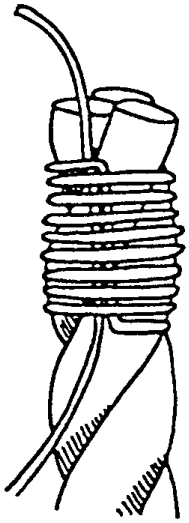
1. Form a loop facing away from the end of the rope, leaving one short end and one long end of whipping twine.



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

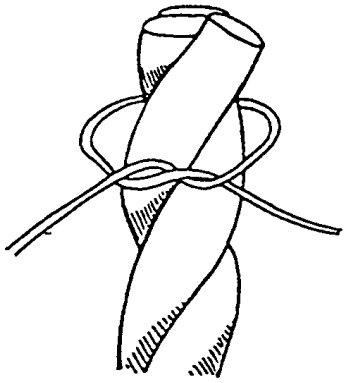


3. Keep passing the twine around the rope until the correct length is achieved. Pass the long end of the twine through the loop.

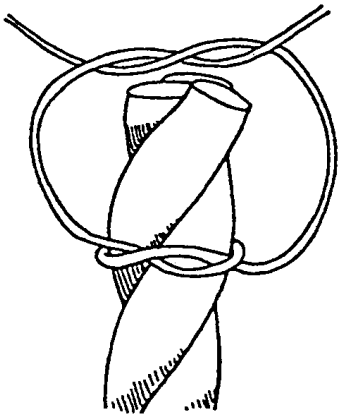


4. Pull the short end of twine until the long end is buried about halfway under the whipping. Now pull each end of the twine with equal strength until the whipping is tight. Trim off the loose ends.

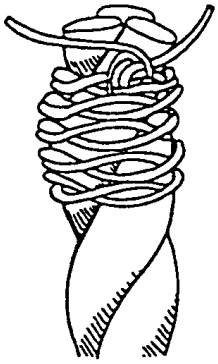
West Countryman's whipping



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

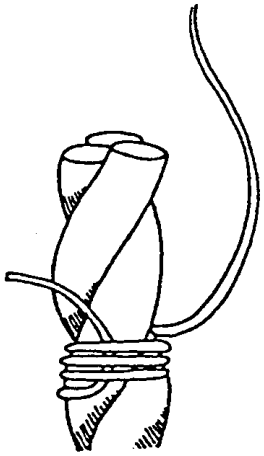


2. Take another half turn around the rope with each length of twine and form a second overhand knot on the other side of the rope.

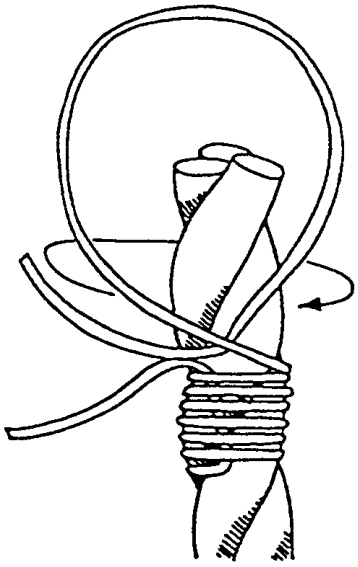


3. Continue tying overhand knots in such a way that the knots alternate all the way up the rope. Finish off with a reef knot – in other words – two overhand knots, one on top of the other.

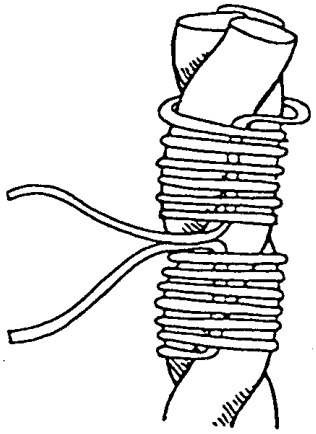
American whipping



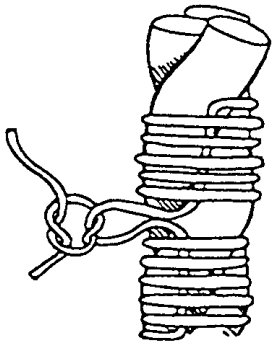
1. Lay the end of the twine down and take a number of turns over the end and around the rope.



2. Now lay the other end down and hold the two ends together. Make several turns around the rope with one side of the loop covering the other side of the loop and the rope.

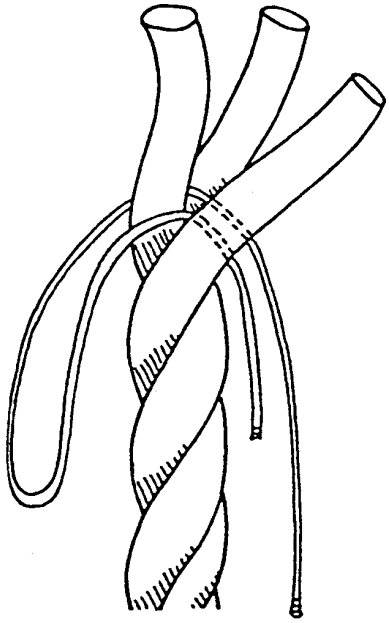


3. Tighten the whipping by pulling the two ends.

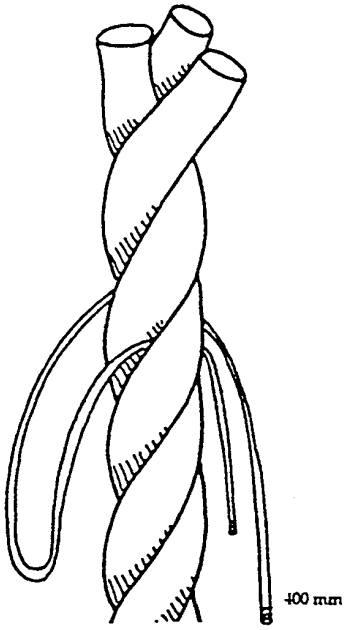


4. Tie a reef knot with the two ends to secure and finish the whipping.

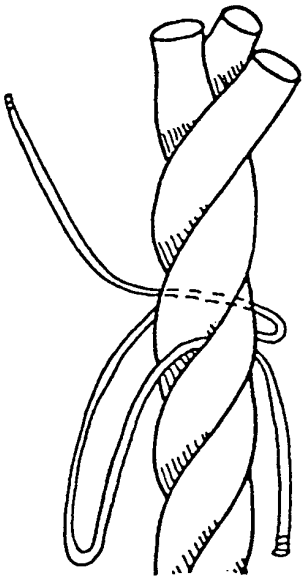
Sailmakers' whipping

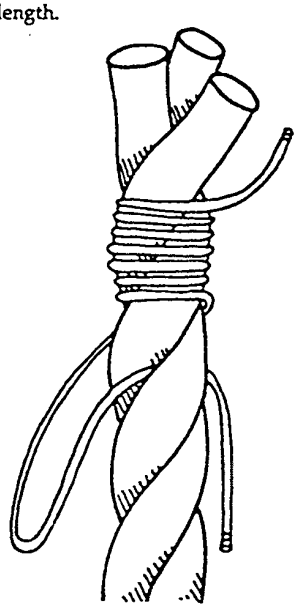


1. Unlay the rope for about 50 mm and form a loop around a strand with the whipping twine. The two (2) ends of the twine should emerge together opposite the strand with the loop.



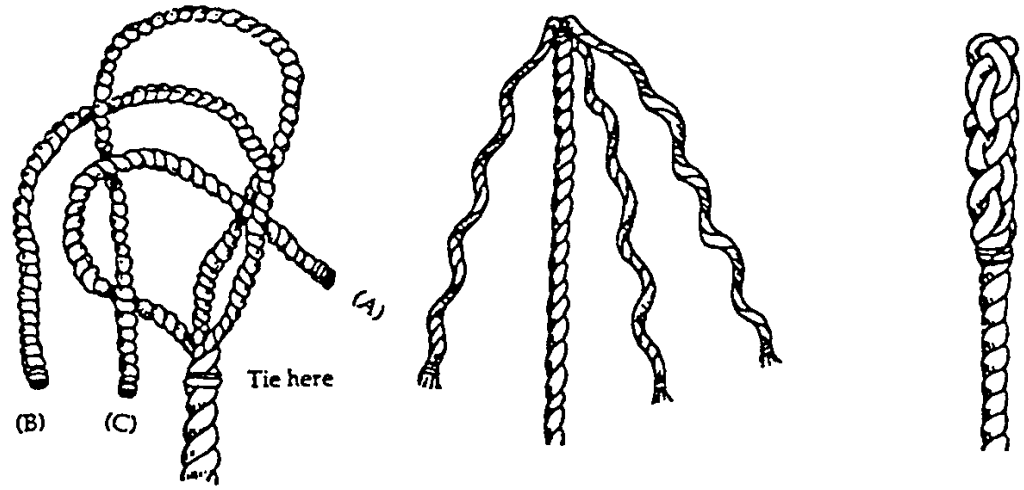
2. Lay the rope back up and adjust the twine so that the loop and one end of twine are approximately 100 mm in length. The other end should be about 400 mm in length.



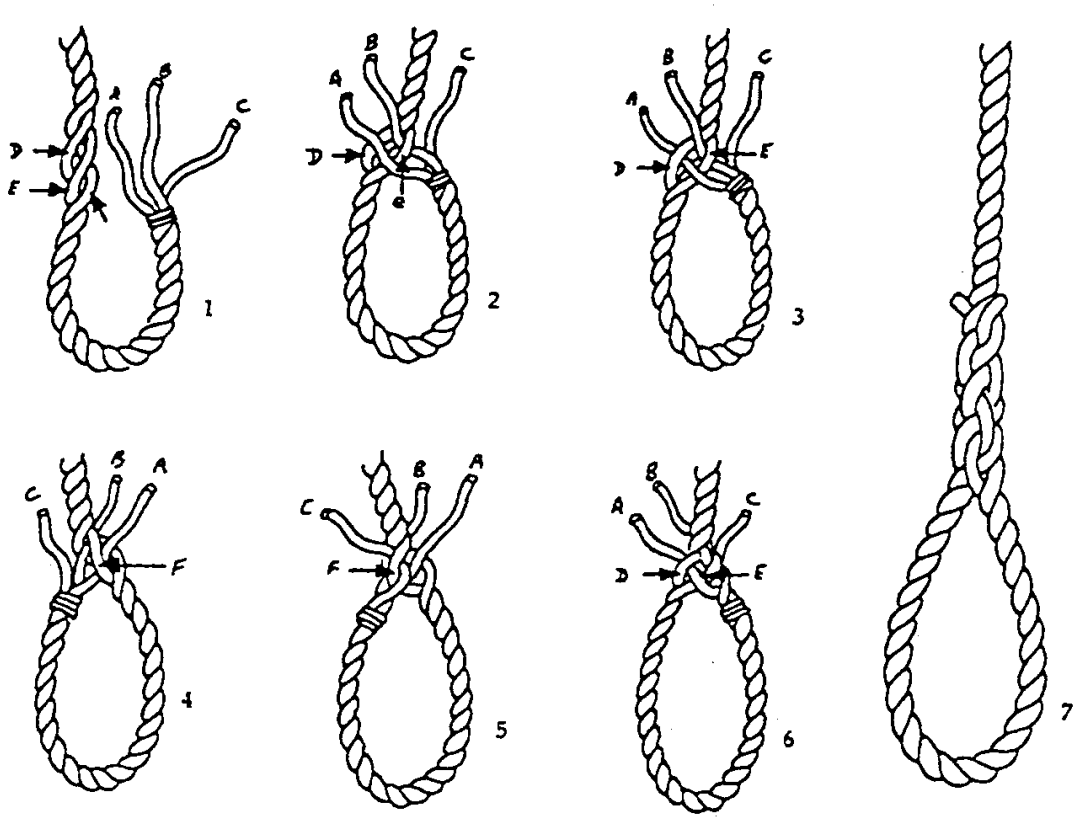


3 & 4. Holding the loop and short end of twine with the rope in one hand use the other hand to wind the long end of twine around the rope away from the loop and short end of twine.

Back splice (end splice)



Eye splice



Ensure Crane is Prepared For Lifting

When preparing to move the load it is important to ensure that the crane is correctly set up. To do this you may need to check the outriggers and packing and the crane load chart.

Outriggers

Outriggers are hinged or sliding beams that are usually secured with locking pins or check valves. They must be secured when they are retracted. Outriggers should be packed to keep the crane level and stable when in use.

DO NOT set up outriggers close to an excavation. The pressure of the crane could cause a collapse of the excavation wall.

General Rules For Packing Under Outriggers.

- Outriggers should be fully extended wherever possible.
- Make sure that the ground under the packing is firm and can bear the load.
- The packing must cover as much area as possible to distribute the load.
- The base layer of packing should be laid closely together and be at least 75 mm thick.
- The top layer of packing must be at right angles to the direction of the outrigger beam and at least 200 mm wide.
- The packing should be hardwood free from defects. Where oregon is used, beware of cracks.
- The packing must be 'pigstyed' (each layer at right angles to the next).
- Check the condition of the jacks and packing regularly during crane operation.
- Packing will often loosen up during initial use as the ground settles.

Calculating The Required Size Of Outrigger Packing

The formula for calculating the required size of outrigger packing is:

$$\sqrt{\frac{W \times R}{B \times N \times V}} = \text{Area (in square meters)}$$

W = Load plus half the mass of the boom (in tonnes);

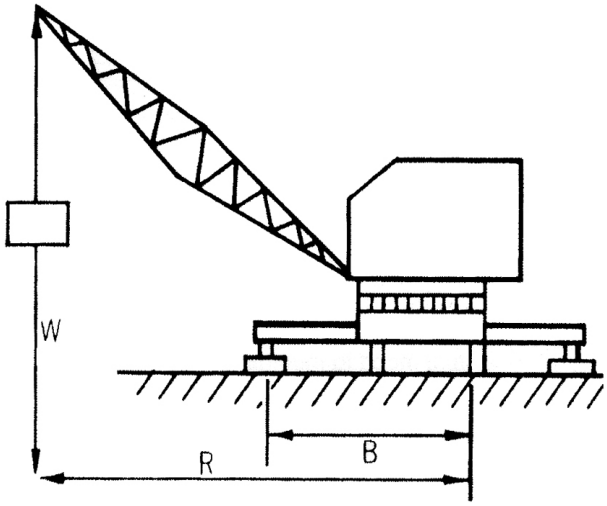
R = Distance from load to back wheel support (in meters);

B = Distance from end of outrigger to back wheels (in meters);

N = Number of outriggers on the loaded side; and

V = Soil bearing pressure (in tonnes per square metre).

If a mobile lattice-boom crane is to be set up, as shown below what smallest packing pad needed for each outrigger?



Outrigger packing pads are available in the following four sizes:

0.3m x 0.3m, 0.6m x 0.6m, 0.9m x 0.9m, 1.2m x 1.2m.

There are two outriggers on each side.

- The load to be lifted plus half the boom weight (W) is 5.5t.
- The distance from the load to the back wheel support (R) is 6m.
- The distance from the end of the outrigger to the back wheel (B) is 3m.
- The bearing pressure of the soil (V) is 20 t/m^2.

Calculations

$$\sqrt{\frac{W \times R}{B \times N \times V}} = \text{Area (in square meters)}$$

$$\sqrt{\frac{5.5 \times 6}{3 \times 2 \times 20}} = \text{Area (in square meters)}$$

$$\sqrt{\frac{33}{120}}$$

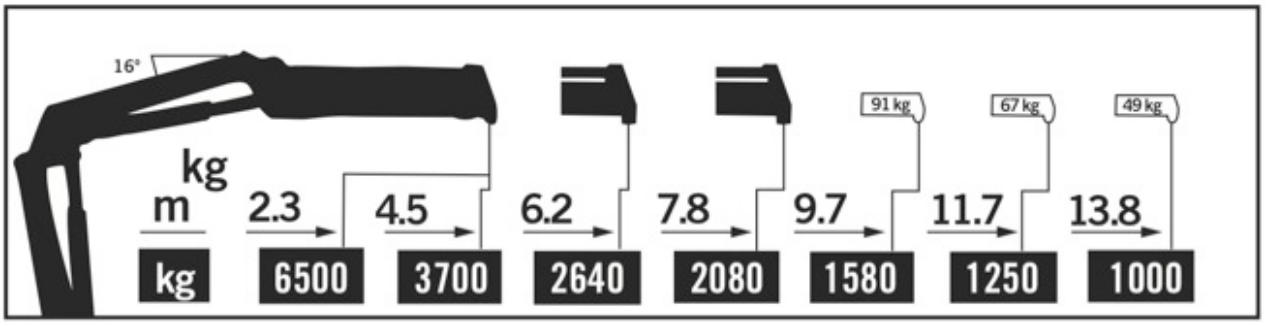
$$\sqrt{0.275} = .5244 \text{ m}^2$$

Therefore, the packing pad needs to be 0.6m x 0.6m (rounded up from 0.52m).

Crane Load Charts

The load chart on the crane must display the maximum load that can be lifted:

- With any length of boom or jib.
- With the crane stationary on outriggers.
- With the crane free (unpacked) at the ends.
- At any radius of the load from the centre of the crane.
- With the crane free (unpacked) at the sides.



The dark line across the chart below divides the configurations into damage categories if the crane is overloaded. Any overloading that occurs above the dark line results in structural damage. Overloading below the dark line results in crane instability.

How to determine the maximum load that can be lifted

Refer to the crane load chart to identify the maximum load that can be lifted by a crane in any given configuration.

For example:

A crane is set up on fully extended outriggers and is rigged with a 20 t hook block weighing 250 kg.

- The radius is 6.0m.
- The boom length is 10.1m.
- The load is to be lifted is over the rear.

CRANE LOAD CHART
Showing Rated Lifting Capacity (in tonnes) on Fully Extended Outriggers

Radius	10.1m Boom		18.1m Boom		26.0m Boom	
(m)	Over Rear	Over Side	Over Rear	Over Side	Over Rear	Over Side
3.0	25.00	25.00	14.00	14.00		
3.5	21.70	21.70	13.40	13.40		
4.0	18.50	18.50	12.75	12.75		
4.5	15.50	15.50	12.15	12.15		
5.0	12.80	12.80	11.60	11.60	7.40	7.40
5.5	10.50	10.50	10.00	10.00	7.10	7.10
6.0	8.80	8.80	8.70	8.70	6.65	6.65
6.5	7.70	7.55	7.70	7.70	6.40	6.40
7.0	6.85	6.60	6.85	6.60	6.10	6.10
7.5	6.20	5.70	6.20	5.70	5.75	5.75
8.0	5.60	4.95	5.60	4.95	5.40	5.40
8.5	5.05	4.36	5.05	4.35	5.00	4.80
9.0			4.60	3.85	4.60	4.35
10.0			3.90	3.10	3.90	3.50
11.0			3.30	2.65	3.30	2.95
12.0			2.80	2.25	2.80	2.50
13.0			2.40	1.95	2.40	2.15
14.0			2.10	1.55	2.10	1.80
16.0					1.55	1.30
18.0					1.20	0.95
20.0					0.90	0.60
22.0					0.70	0.40
24.0					0.55	0.25

Don’t forget to deduct the weight of the hook block.

The maximum load that can be lifted in this configuration is 8.55t (8.8t – 250kg).

Prepare Load Destination

The load destination could be:

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

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

Perform Dogging Work

Attaching Lifting Equipment to the Crane Hook

Attach the lifting gear to the crane hook. If the lifting gear does not fit over the bill of the hook use a shackle to attach the gear to the hook. Make sure the shackle is big enough to comfortably hang from the hook with enough space for slings or other equipment.

Hook Position

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.

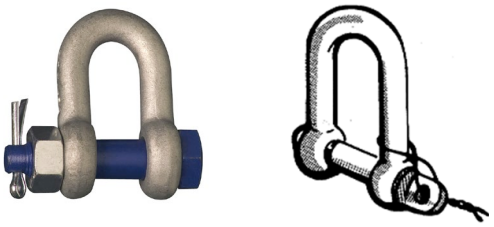
Attach Lifting Equipment to the Load

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

Check the manufacturers specifications for special loads to locate specially designed lifting points.

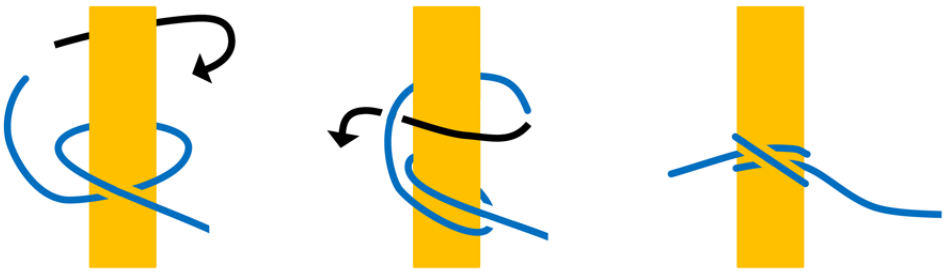
Check that all shackles or eye bolts are secure, and if necessary lashed or moused.

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.

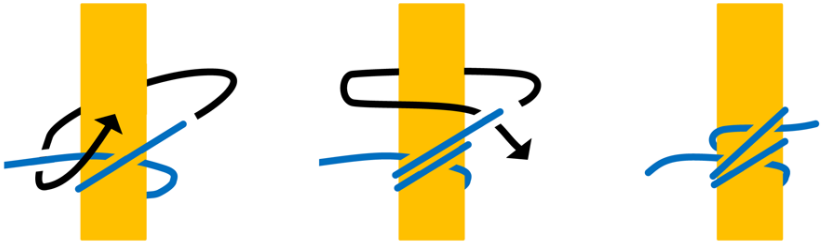


Some methods for attaching rope to the load include:

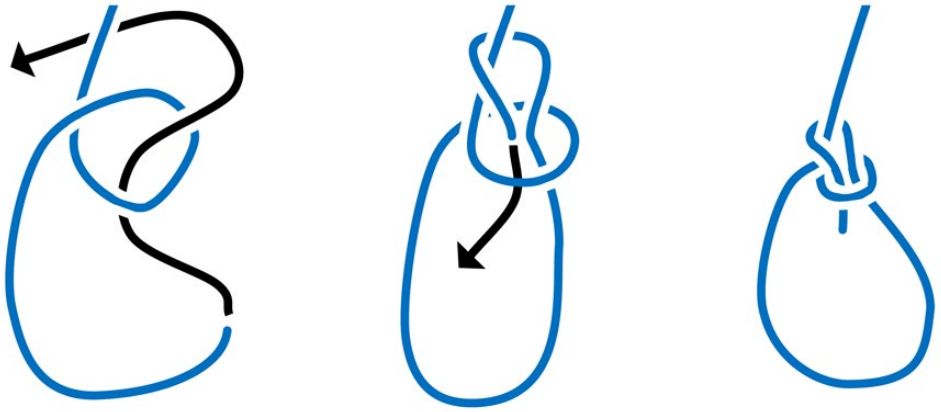
Clove hitch around a round object



Rolling hitch around a round object

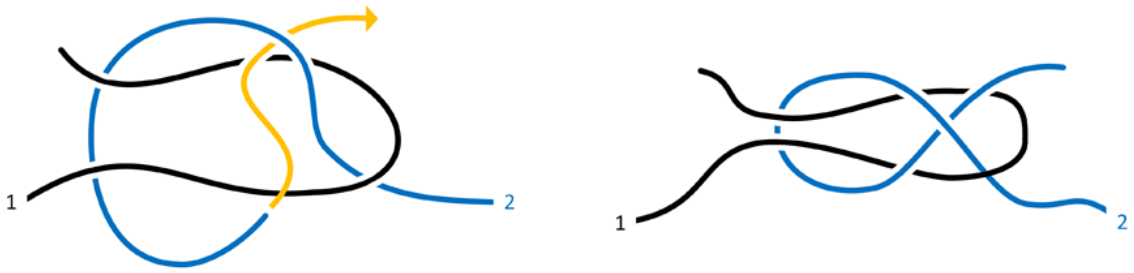


Single bowline



Timber hitch and half hitch around a plank

Sheet bend to another rope



Attach a Tagline to the Load

A tagline is used to control the stability of the load while it is being moved. Taglines may be necessary if the load is liquid with a moving centre of gravity, if it is windy, or if there are obstacles/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 non-conductive. 16mm is the minimum diameter fibre rope you can use as a tagline. Do not use a wet rope as a tagline – it could conduct electricity if coming into close range of powerlines.

Whenever using a tagline make sure that you do not wrap the rope around yourself as you may be dragged by a sudden movement of the load. Always wear gloves whenever using a tagline.

Conduct a Test Lift

Before moving the load it is important to conduct a test lift. A test lift is done by lifting the load just slightly off the ground. You will be able to determine if the load is correctly slung by the amount of movement of the load as it is lifted. If the load dramatically shifts to once side you can identify where the centre of gravity is. Lower the load, re-arrange the lifting gear or re-sling the load as required and conduct another test lift. Continue this process until you are satisfied that the load will be able to be moved safely.

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

Shift the Load

Once you are satisfied that the load is ready to be moved safely, signal the crane operator to begin the lift. Constantly monitor the movement of the load and be aware of any other hazards in the path of the load.

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

Co-ordinate Load Movement with Crane Operator

Use the following hand and whistle signals to direct the crane operator during the lift:

Whistle, bell or buzzer signals

Motion	Whistle, bell or buzzer Signal	Motion	Whistle, bell or buzzer Signal
Hoisting raise	2 Short ••	Hoisting lower	1 Long —
Luffing boom up	3 Short •••	Luffing boom down	4 Short ••••
Slewing right	1 Long, 2 Short — ••	Slewing left	1 Long, 1 Short — •
Jib-trolly out: telescoping boom extend	1 Long, 3 Short — •••	Jib-trolly in: telescoping boom retract	1 Long, 4 Short — ••••
Travel and Traverse	Not applicable	STOP	1 Short •

Directing Cranes Safely

Conduct a Test Lift

Before moving the load it is important to conduct a test lift. A test lift is done by lifting the load just slightly off the ground. You will be able to determine if the load is correctly slung by the amount of movement of the load as it is lifted. If the load dramatically shifts to once side you can identify where the centre of gravity is. Lower the load, re-arrange the lifting gear or re-sling the load as required and conduct another test lift. Continue this process until you are satisfied that the load will be able to be moved safely.

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

Shift the Load

Once you are satisfied that the load is ready to be moved safely, signal the crane operator to begin the lift. Constantly monitor the movement of the load and be aware of any other hazards in the path of the load.

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

Make sure that you check the area before directing a crane to travel. Check for:

- ☑ Potholes and soft or rough ground.
- ☑ Overhead obstructions.
- ☑ Power lines.
- ☑ Personnel working in the area.
- ☑ Blind corners.
- ☑ Traffic flow.
- ☑ Underground services.

Slewing

Before directing a crane to slew make sure that the load chart allows the weight of the load 'over the side' of the crane. Cranes may not be able to lift as much weight over the side as they can over the front or back.

Luffing

Be aware that when a boom luffs down the load centre moves further away from the crane reducing the lifting capacity of the crane. Make sure that before directing a crane driver to luff-down you have checked that the crane will be able to support the weight of the load safely at the increased radius.

Boom deflection: This is where the boom of the crane bends slightly under the weight of the load. Be aware that when the load is released the boom will spring back up. This is particularly dangerous when operating under powerlines as the boom could spring up and contact with the overhead lines.

General rules for mobiling up and down slopes

Take the slope and angle of the boom into account when moving up or down a slope.

When mobiling on a slope with the boom facing uphill ensure that the boom angle does not become too close to vertical. This is to prevent the boom toppling over backwards.

Do not travel across a slope with a load.

Crawler cranes are very dangerous on sloping ground. Direct the driver to boom down before walking a crawler crane up a slope. Once the crane reaches the top the driver must boom up to compensate.

Where necessary use another crane to steady heavy crawler cranes when they are travelling downhill.

Land the Load

- ✓ Direct the crane operator to land the load at the prepared load destination.
- ✓ The load destination should be prepared to ensure that the load it 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.
- ✓ Round loads should be chocked to prevent the load from rolling or shifting once the lifting gear is removed.

Loading Platforms

Loading platforms are used in multi-storey structures to crane heavy building material or scaffolding material into the structure. They are steel structures with designated load capacities of up to 5t and extend from the side of a building out to 5m (approx.).

Working In Different Environments

The dogging work may require you to work in a range of environments and positions on a work site. This could include working at heights within uncompleted structures or in working in confined spaces.

Both work at heights and work in confined spaces require specialised training, and should be conducted in accordance with Australian Standards.

These types of work can involve the use of specific safety equipment such as a fall arrest harness and breathing apparatus.

Always follow site and organisational policies and procedures whenever conducting work at heights or in confined spaces. There are many dangers involved in these types of work. You may need to get a work permit before being allowed to conduct these types of work.

Do not ever work in these conditions unless you have been trained and fully understand the hazards and safety requirements.

Packing Up

Remove Lifting Equipment

Once the load has been landed and is stable and secure in its resting place you can detach the lifting equipment. Once removed the lifting equipment should be properly stored or prepared for the next task.

Dismantle Lifting Equipment

Once the work has been completed you will need to dismantle the equipment you have used. This could include dismantling any slinging arrangements that include shackles, lifting beams or spreader beams.

Equipment Inspection

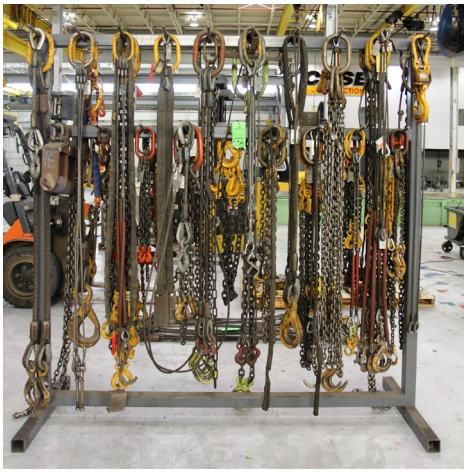
Inspect all equipment after you have finished using it to make sure that it is in proper safe working order for the next person.

Record and report any defects that you find to you supervisor or 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 organize for defective equipment to be destroyed, repaired or returned to the manufacturer.

Store Equipment



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

While cleaning and maintaining equipment you may be required to use hand and power tools. Always use these tools in accordance with the manufacturer's specifications. Do not use the hand and power tools for any task other than what they were designed to do.

Complete any maintenance records in accordance with site procedures. If you are not sure about the reporting requirements of the site, check with your supervisor.

Remove Hazard Control Measures

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

Talk to other workers in the area to let them know what you are doing as it may impact on the way they perform their own work.

Tidy the Work Area

Remove any excess materials from the work area before you leave. A tidy work area is a safer work area! Left over materials or debris could be a tripping hazard.

Appendix A: Safe Work Method Statement

SWMS Created By **(Student Name):**	Date of Creation:
SWMS Name:	
SWMS Summary:	

Note: Student can be free-thinking (but respectful) with providing the following information if in a simulated setting for the assessment

Company/Contractor Details:	Project Details:
Name:	Client:
ABN:	Contact Name:
Address:	Site Address:
Contact Number:	Contact Number:
Email:	Start Date:

How to complete this SWMS:
CONSULT: Consult with all persons who will be involved in the completion of the work. **LIST:** List each of the steps in the task work being done. **IDENTIFY:** Describe the health and safety hazards and risks arising from each step in the work. **RISK ASSESSMENT:** Review the level of risk associated with each hazard listed. **CONTROL:** Describe how the risks will be controlled, and describe what hazard control measures will be put in place. **RESPONSIBILITY:** Allocate a person to be responsible for the hazard control measure. **REVIEW:** Review the effectiveness of the control measures and apply further hazard control measures as required.

Training/Qualifications Required To Carry Out Work: Are All Workers Adequately Trained And Qualified? Yes / No	PPE Required To Carry Out Work:
Legislation, Australian Standards & Codes Of Practice Relevant To Work (Where Applicable):	Equipment Required To Carry Out Work:
Environmental Statement:	Safety Checks Required Prior To Commencement Of Work:
Coordination With Other Trades:	Permits Required For Commencement Of Work: Have These Permits Been Acquired? Yes / No

Risk Analysis Matrix

Use this table to determine the level of risk associated with an identified hazard.

LIKELIHOOD	CONSEQUENCE				
	Insignificant	Minor First Aid Required	Moderate Medical Attention and Time Off Work	Major Long Term Illness or Serious Injury	Severe Kill or Cause Permanent Disability or Illness
Almost Certain	M	H	H	VH	VH
Likely	M	M	H	H	VH
Possible	L	M	H	H	VH
Unlikely	L	L	M	M	H
Rare	L	L	M	M	M

RISK LEVEL	ACTION
VERY HIGH	Act immediately: The proposed task or process activity must not proceed. Steps must be taken to lower the risk level to as low as reasonably practicable using the hierarchy of risk controls.
HIGH	Act today: The proposed activity can only proceed, provided that: The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. The risk controls must include those identified in legislation, Australian Standards, Codes of Practice etc. The risk assessment has been reviewed and approved by the Supervisor. A Safe Working Procedure or Safe Work Method has been prepared. The supervisor must review and document the effectiveness of the implemented risk controls.
MEDIUM	Act this week: The proposed task or process can proceed, provided that: The risk level has been reduced to as low as reasonably practicable using the hierarchy of risk controls. The risk assessment has been reviewed and approved by the Supervisor. A Safe Working Procedure or Safe Work Method has been prepared.
LOW	Act this month: Managed by local documented routine procedures, which must include application of the hierarchy of controls.

Safe Work Method Statement

Work Step	**Associated/Identified Hazards**	**Risk Level (L, M, H, VH)**	**Hazard Controls**	**Revised Risk Level (L, M, H, VH)**	**Person Responsible**
Work your way through each step in the work process, giving a brief description of what is required at each stage.	What hazards can be identified for this step?	What is the risk level?	What hazards controls will be put into place to deal with the identified hazards for this step?	Has the risk been reduced?	Who is responsible for carrying out the work and maintaining the hazard controls?

Work Step	Associated/Identified Hazards	Risk Level (L, M, H, VH)	Hazard Controls	Revised Risk Level (L, M, H, VH)	Person Responsible

Personnel Signoff

All personnel required to carry out this task need to be listed below.

By signing this SWMS, each person declares that they have carefully read the SWMS and that they understand their responsibilities and requirements to complete the work.

Name (please print)	Position / Qualification	Signature	Date

Senior Management Signoff

Does this SWMS meet the necessary safety requirements? Yes / No

Does this SWMS require review? Yes / No Review Date:

Additional Comments:			
Name:	Position:	Signature:	Date:

Appendix B: Dogging Formulae

Dogging Formulae Information

Angle Factors	
0°	= 2
30°	= 1.93
45°	= 1.85
60°	= 1.73
90°	= 1.41
120°	= 1

Reeve Factors	
Wrapped around a **Square Load =**	
50% rated capacity reduction	**Factor = 0.5**
Wrapped around a **Round Load =**	
25% rated capacity reduction	**Factor = 0.75**

Material Densities	
Oil/Fuel	800kg per m^3
Water	1,000kg per m^3
Hardwood	1,100kg per m^3
Concrete	2,400kg per m^3
Aluminium	2,700kg per m^3
Steel	7,8500kg per m^3

Circular
Volume = D x D x L x 0.79
Weight/mass = D x D x L x 0.79 x density

Working out Load Weights (square or rectangular loads)

Area = L x W

Volume = L x W x H

Weight = L x W x H x density

Working out Load weights (circular or cylindrical loads)

Area = D x D x 0.79

Volume = D x D x L x 0.79

Weight = D x D x L x 0.79 x density

Sling Formulae

	Determine Rated Capacity/WLL	Determine Diameter (D) Size
Flexible Steel Wire Rope (FSWR)	Rated Capacity/WLL(kg) = D(mm) x D(mm) x 8	D(mm) = Rated Capacity ÷ 8 = √Answer
Chain – Grade 80 (T)	Rated Capacity/WLL(kg) = D(mm) x D(mm) x 32	D(mm) = Rated Capacity(kg) ÷ 32 = √Answer

Dogging Formulae

Formula to use when **WEIGHT** of the load is **Known** or has been **Calculated**:
Rated Capacity of Slings (Min) = Weight of load ÷ Angle Factor ÷ Reeve Factor

OR

Formula to use when **Rated Capacity** of slings is **Known** or has been **Calculated**:
Weight of Load = Rated Capacity of Slings x Angle Factor x Reeve Factor

For Rectangular Loads

Step 1 – Work out the Weight of the Load	
	VOLUME m^3= L x W x H
	WEIGHT of Load(kg)= Volume(m^3) x Density(kg)

Step 2 – Work out the Rated Capacity of Slings	**Rated Capacity of Slings** = Weight of Load(kg) ÷ Angle Factor ÷ Reeve Factor

Step 3 – Work out Diameter	**FSWR:** D(mm) = Rated Capacity(kg) ÷ 8 = √Answer
	'T' CHAIN: D(mm) = Rated Capacity(kg) ÷ 32 = √Answer
	CHAIN (Other): D (mm) = Rated Capacity (kg) ÷ Grade ÷ 0.3 = √Answer

Example

Using the above information we can work out the minimum diameter of FSWR sling needed.

Using FSWR slings, wrapped and reeved and set at an angle of 60˚ to lift a solid concrete block measuring 3.5m long, 0.8m wide and 0.6m high. What is the minimum diameter of FSWR needed?

Working out:

Area = L x W
= 3.5 x 0.8
= 2.8m^2
Volume = Area x Height
= 2.8 x 0.6
= 1.68m^3
Weight = Volume x Density
= 1.68 x 2400
= 4032kg

Rated Capacity/WLL of Slings = Weight of Load ÷ Angle Factor ÷ Reeve Factor
= 4032 ÷ 1.73 ÷ 0.5
= 4661.2717kg

FSWR Diameter = Rated Capacity ÷ 8
= 4,661.2717 ÷ 8
= √582.65897
= 24.138349mm
= **25mm** (rounded)

For Circular Loads

Step 1 – Work out the weight of the load	**AREA**(m^2) = Length(m) x Width(m)
	VOLUME(m^3)= Area(m^2) x Height/Thickness(m)
	WEIGHT of Load(kg)= Volume(m^3) x Density(kg)

Step 2 – Work out the Rated Capacity/WLL of Slings	**Rated Capacity/WLL of Slings** = Weight of Load(kg) ÷ Angle Factor ÷ Reeve Factor

Step 3 – Work out Diameter	**FSWR:** D(mm) = Rated Capacity(kg) ÷ 8 = √Answer
	'T' CHAIN: D(mm) = Rated Capacity(kg) ÷ 32 = √Answer
	CHAIN (Other): D (mm) = Rated Capacity (kg) ÷ Grade ÷ 0.3 = √Answer

Example

Using the above information we can work out the minimum diameter of 'T' Chain slings needed.

Using 'T' Chain slings, wrapped and reeved and set at an angle of 60˚ to lift a concrete pipe measuring 1.2m outside diameter, 1.125m inside diameter and 3.5m long. What is the minimum diameter of 'T' Chain needed?

Working out:

Outside Volume:
Area = L x W
= 0.6m x 0.6m x π
= 1.13m^2
Volume = Area x Height
= 1.13 x 3.5
= 3.96m^3

Inside Volume:
Area = L x W
= 0.56 x 0.56 x π
= 0.99m^2
Volume = Area x Height
= 0.99 x 3.5
= 3.48m^3

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

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

Rated Capacity of Slings = Weight of Load ÷ Angle Factor ÷ Reeve Factor
= 1152 ÷ 1.73 ÷ .75
= 887.86kg

'T' Chain Diameter = Rated Capacity ÷ 32
= 887.86kg ÷ 32
= √27.75
= 5.27mm
= **6mm** (rounded)