SLEWING MOBILE CRANE (100T)
SAFETY AND LICENCE GUIDE

Training support material for:

TLILIC0021
Licence to operate a slewing mobile crane
(up to 100 tonnes)

Produced by:

EASY GUIDES
Australia Pty Ltd

Contents

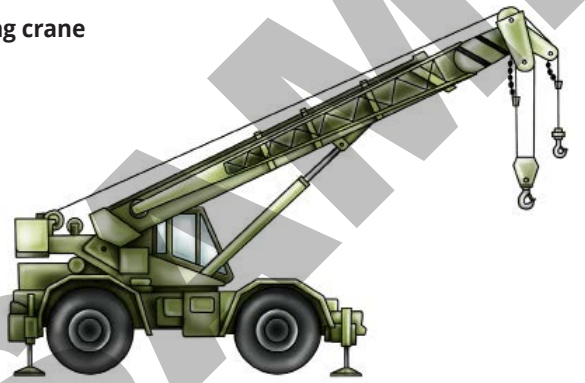
Introduction to Slewing Mobile Crane (up to 100 tonnes)

What is a slewing mobile crane

A slewing mobile crane is a powered crane which features a boom or jib that can slew from front to back.
The crane is mounted on a vehicle.

Slewing mobile crane

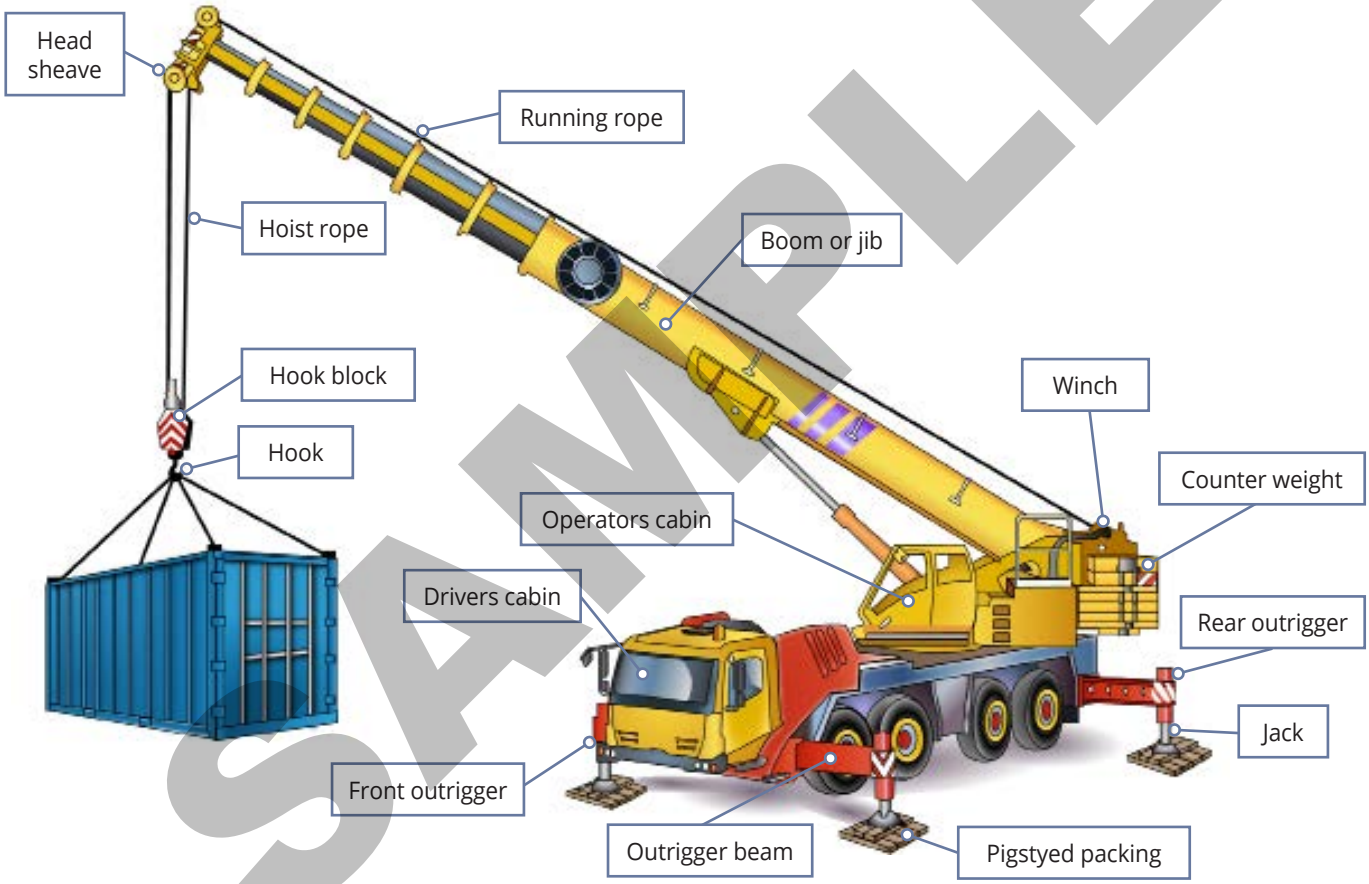
Rough terrain slewing crane



Crawler crane

This learner resource does not cover front-end loader, backhoe, excavator or similar equipment when configured (arranged or set up) for crane operations.

Parts of a slewing mobile crane



Element 1 – Plan work / task

What is a lift plan?

A lift plan is a document that outlines the size of a load, weight, dimensions, center of gravity, resources needed for lift, sling equipment list and a hazard risk assessment. The following is a sample template of a lift plan.

Lift Plan

1. Project Details:		Version No:	
Candidate Name:		**Site Pick up address:**	
Operator Contact Details / Supervisor		**Site Drop off Address:**	
Crane make / model		**Crane ID**	
Lift 1 Description			
Lift 2 Description			
Lift 3 Description			
Lift 4 Description			

Item Details	**Lift 1**	**Lift 2**	**Lift 3**	**Lift 4**
Weight of Load	Kg	Kg	Kg	Kg
Weight of rigging	Kg	Kg	Kg	Kg
Weight of hooks	Kg	Kg	Kg	Kg
Additional Weight	Kg	Kg	Kg	Kg
Total*	Kg	Kg	Kg	Kg
Boom Length	M	M	M	M
Boom sequence				
Line pull	Tonne / kg	Tonne / kg	Tonne / kg	Tonne / kg
Parts of line	M	M	M	M
Hook block WLL	Tonne / kg	Tonne / kg	Tonne / kg	Tonne / kg
Pick up radius	M	M	M	M
Set down radius	M	M	M	M
Max radius	M	M	M	M
RC at Max radius	Kg	Kg	Kg	Kg
Communication Method	H 2WR W	H 2WR W	H 2WR W	H 2WR W
* Operator to Calculate / Sling Calculation				
2. Equipment for load lift / sling				
Dogger/Assessor initial				

3.* Sling Calculation Notes:

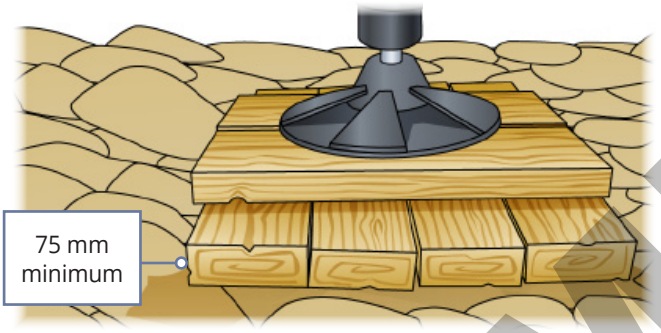
4.^ Risk Controls: See additional note template.

5.^ Sketch
For one of your lifts you will need to sketch the environment and any obstacles present.

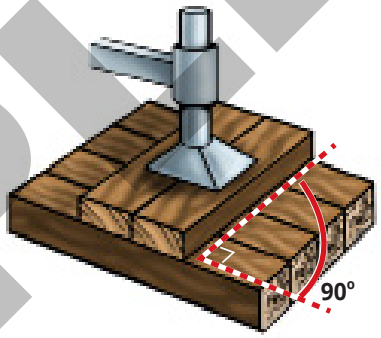
Sketch **one** load and show the following:
1. Crane standing position
2. Stabiliser location
3. Load location
4. Show distances and load movement-direction
5. Any obstacles

Outriggers and packing (continued)

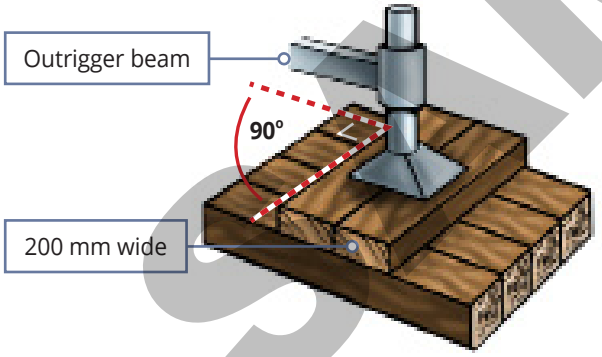
The base layer of packing should be closely laid and at least 75 mm thick



The packing should be pigstyed. This means each layer is at right angles (90° degrees) to the next.



The top layer of packing must be at right angles to the direction of the outrigger beam and at least 200 mm wide.

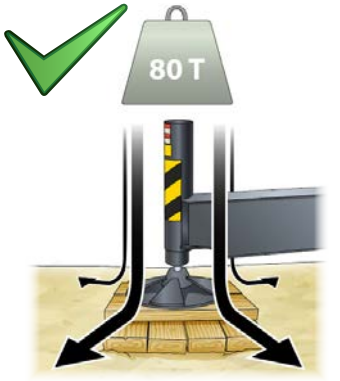


Packing, outriggers and jacks should be checked regularly during an operation.

Why you need packing

You **must** use packing under the outriggers. Each outrigger takes some of the weight of the crane and the load. Packing spreads that weight over a larger area. You must work out the minimum area of packing needed under each outrigger. This will keep the crane stable.

Packing spreads the weight



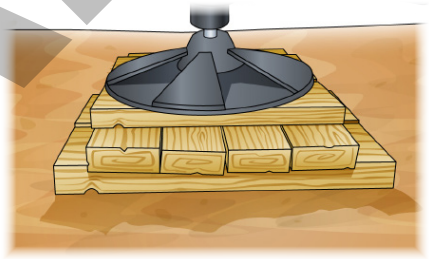
No packing

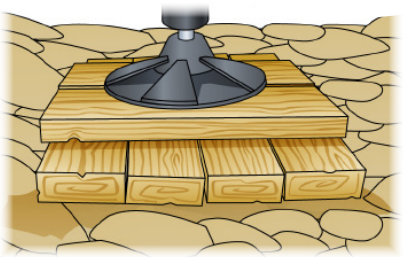
If you **do not** use packing the outriggers could sink and the crane could tip over.

How soil types affect packing

The type of ground you are working on changes how much packing you need.

For example, if you need to set up on soft clay you will need more packing than if you are setting up on shale or rock. The three best ground types are hard rock, shale or sandstone, and compacted gravel with up to 20% sand.





Packing formula

To calculate the area of packing needed in square metres you must know:

- The cranes mass (Cm)
- The loads mass (L)
- The bearing pressure of the soil (PMAX).

$$\text{Area} = \frac{(Cm + L) \times 0.65}{PMAX}$$

OR

Area = (Cm + L) × 0.65 ÷ PMAX

In this formula:

Cm = Crane mass

L = Load

PMAX = Soil bearing pressure

Remembering this formula

It is much easier to understand this formula if you know what each part of the formula does.

Find the load on each outrigger

You should start by working out the top section. This part works out how much weight each outrigger will support. This is calculated on 65% of the total load.

$$\text{Area} = \frac{(Cm + L) \times 0.65}{PMAX \text{ (Soil bearing pressure)}}$$

(Crane mass + Load weight) × 0.65 = Amount of weight on 1 outrigger

For example, if the crane weights 8 tonnes
and the load weighs 2 tonnes:
8 t + 2 t = 10 t
10 × 0.65 = 6.5 t
Each outrigger will support 6.5 tonnes

Element 2 – Prepare for work / task

Risk assessment – Used to identify hazards

Shown here is an example of a risk assessment and control form.

You can use it at your workplace to help with risk management.

You can find out more about risk management in codes of practice available from –

Safe Work Australia
www.safeworkaustralia.gov.au

or from your state or territory regulator.

Example of a Risk Assessment and Control Form

Workplace area or grouping: ..... Reference no: .....

Form completed by: ..... Date form completed: .....

Signature: .....

Hazard Identification

Hazard: .....

Associated risk: .....

Specific circumstances relating to the risk: .....

Persons at risk: .....

Risk Assessment

Existing control measures (if any):

Likelihood: ❑ Almost certain ❑ Likely ❑ Possible ❑ Unlikely ❑ Rare

Consequences: ❑ Catastrophic ❑ Major ❑ Moderate ❑ Minor ❑ Insignificant

Risk Control

Possible control options: .....

Elimination: .....

Substitution, Isolation or Engineering: .....

Administrative or Personal Protective Equipment: .....

Preferred control options (and why): .....

.....

Implementation Plan

Control option	*Associated activities*	*Resources required*	*Person(s) responsible*	*Proposed implementation date*	*Sign off and date*	*Scheduled review date*

Review

Are control measures in place? ❑ Yes ❑ No Why not? .....

Are controls preventing or minimising the risk? ❑ Yes ❑ No Why not? .....

Are there any new problems with the risk? ❑ Yes ❑ No What are they? .....

Hazard - Too dark

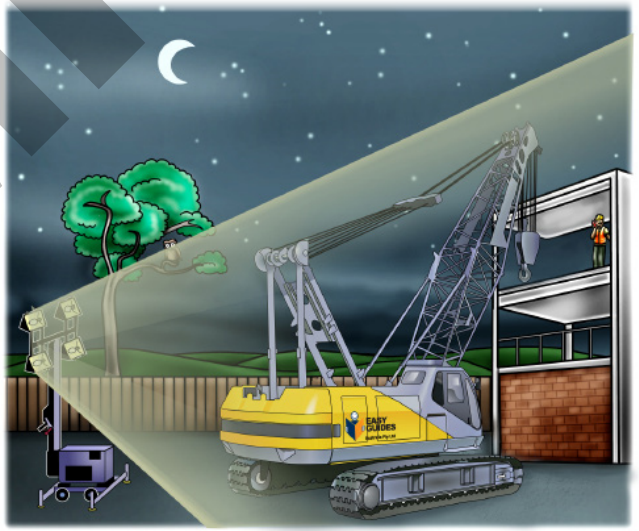
You must be able to see clearly. Ask your boss to have the area properly lit up. They may need to set up temporary lighting while you work.

Hazard

If the work area is dark or dimly lit you might not be able to see clearly.

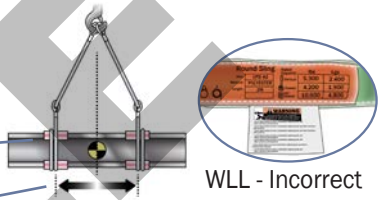
Control

Use extra lighting such as portable lamps, or try to find a brighter area if you can.



Methods of not endangering ones self while slinging a load

To prevent harm on one's self and others, you would need to identify hazards and use appropriate risk controls while slinging a load.



Hazards that can be found with slinging a load can be;

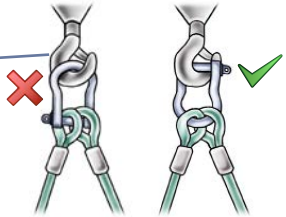
Sling hazard 1. Sharp edges on load,

Sling hazard 2. Wear and tear on sling equipment,

Sling hazard 3. Load In-balance,

Sling hazard 4. Incorrect use of equipment that makes up sling configuration

Sling Hazard 5. WLL. – Incorrect reading of working load limits and calculations of load to become unstable or drop load.



A risk assessment for slinging a load.

Company Details: Easy Guides Australia (EGA Earchworks – 19 Chandler Road, Boronia Vic 3155) Date: 12/12/ Contact:

Work Description: Lift a load, concrete drainage 12 meters long, 4.5 tones in mass, using a web sling with a spreader beam and basket hitch.

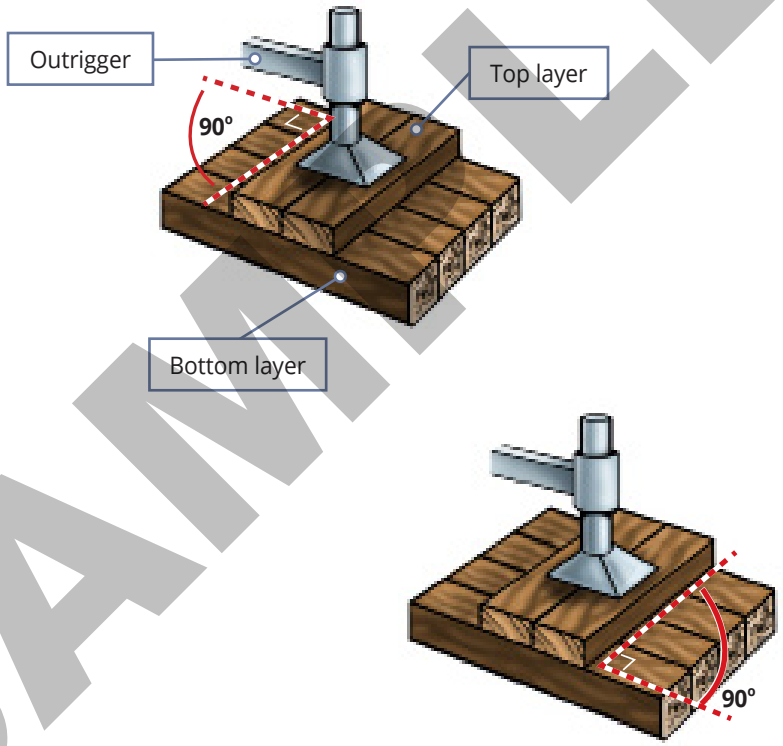
Hazard Item	Likelihood / Risk Level	Consequences / Likelihood	Control options or protection measures	1. Elimination	2. Substation	3. Administrative	4. preferred control options	5 use ppe
1	1 = low	Could - Cause load to fall	Use protective material around sling to prevent break and damage to sling	Yes	Yes	Yes – have an equipment checklist	See notes	N/A
2	1 = low	Possible – Could cause sling to fail or break	Use protective equipment when sling and store in a safe environment.	Yes	Yes	Check equipment for faults and not use and use new equipment	See notes	N/A
3	2 =moderate	Could - Cause load to fall	Use a Leveler when testing lift to en sure load lift to destination will stay the same level and load is balanced, ensuring center of gravity.	Yes	Yes	Use a leveler or a tennis ball and see if it does not fall or move.	See notes	N/A
4	2=moderate	Could - Cause load to fall	Have a supervisor review you sling configuration hook,	Yes	Yes	Yes – Supervisor check. Use different conf	See notes	N/A
5	3=High	Likely - sling line or sling to break and load to fall	Remove any hazards such as people and direct people around load area. Use a spotter to monitor lift of load, on the ground with communication such as walkie talkie to lift operator. Double check WLL calculations with Supervisor.	Yes	No	Yes	See notes	N/A
Approved By:		TJ Crossbow		Signed:		TJ Crossbow		

... Attach Risk Assessment Summary sheet to document

QUESTION 91

What should the angle between the first (bottom) and second (top) layer of pigstying be?

The angle should be 90 degrees between layers of pigstying.



QUESTION 97

You are looking at the load chart. The chart has a thick black line near the middle.

What do the numbers **above** and **below** the line mean?

The numbers **above the line** tell you the structural strength of the crane.
The numbers **below the line** tell you how stable the crane is.

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

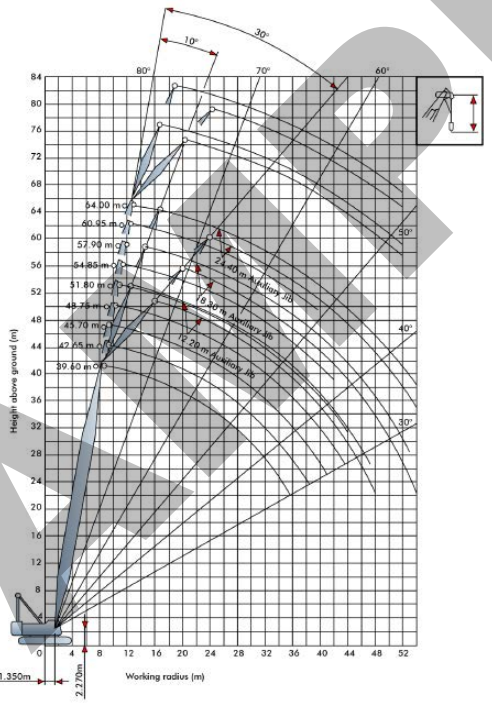
Structural strength **above** line

Instability **below** line

QUESTION 102

How can you find out the load rating when the fly jib is set up?

Check the load chart or the angle of the jib.



QUESTION 103

You have entered all the information into the computer.

How do you make sure the computer is working properly?

See if what the computer shows is the same as the load chart.

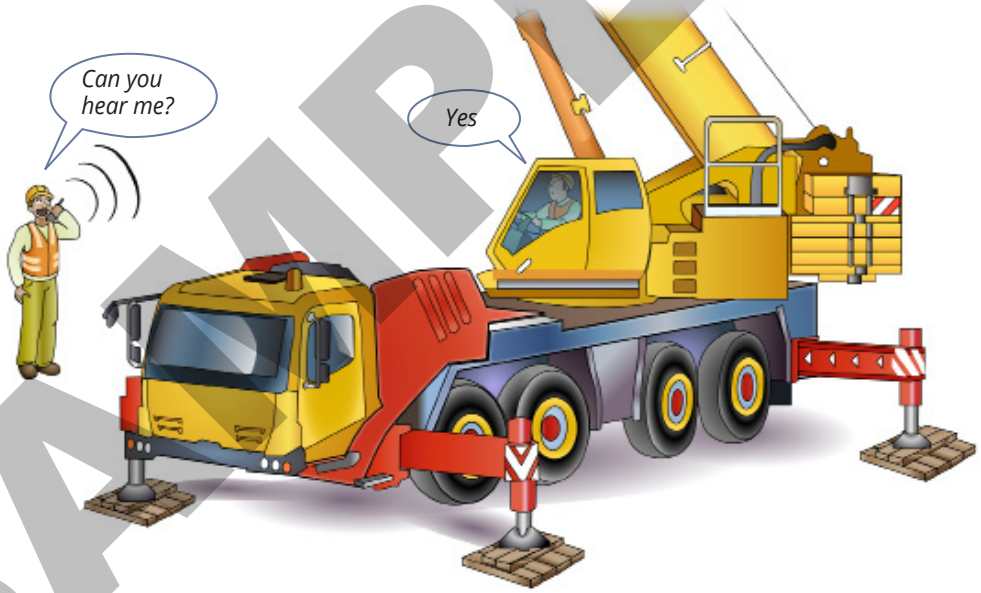
Note: Check the manufacturer's instructions for testing

QUESTION 104

You have done your post operational checks. You are about to lift a load.

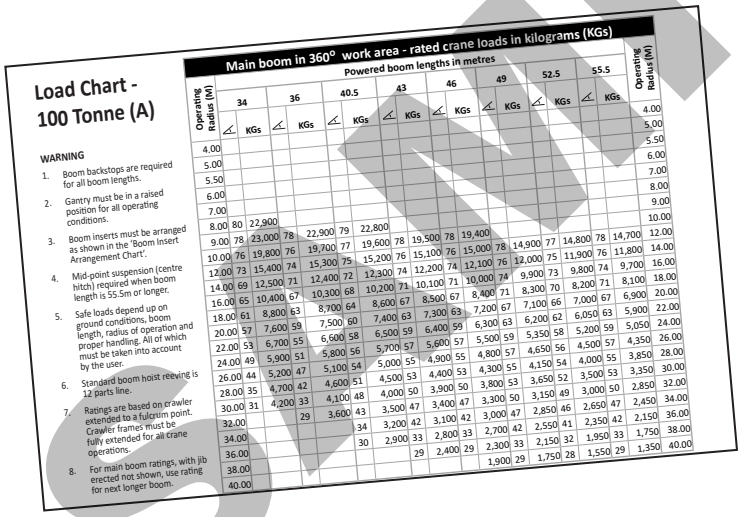
Why should you test your communication equipment?

To make sure you and the dogger can hear each other.



READING LOAD CHARTS

FOR CRANES UP TO 100 TONNES



Load Chart - 100 Tonne (A)

WARNING

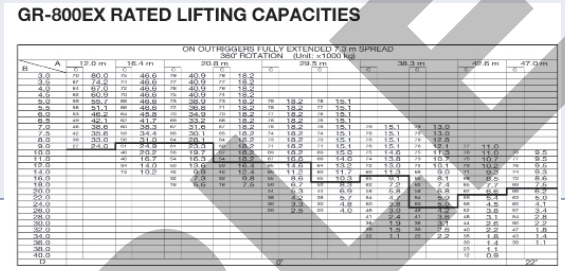
1. Boom backstops are required for all boom lengths.
2. Gantry must be in a raised position for all operating conditions.
3. Boom inserts must be arranged as shown in the 'Boom Insert Arrangement Chart'.
4. Mid-point suspension (centre hitch) required when boom length is 55.5m or longer.
5. Safe loads depend up on ground conditions, boom length, radius of operation and proper handling. All of which must be taken into account by the user.
6. Standard boom hoist reeving is 12 parts line.
7. Ratings are based on crawler extended to a fulcrum point. Crawler frames must be fully extended for all crane operations.
8. For main boom ratings, with jib erected not shown, use rating for next longer boom.

Main boom in 360° work area - rated crane loads in kilograms (KGs)

Operating Radius (M)	Powered boom lengths in metres																				Operating Radius (M)
	34		36		40.5		43		46		49		52.5		55.5						
	∠	KGs	∠	KGs	∠	KGs	∠	KGs	∠	KGs	∠	KGs	∠	KGs	∠	KGs					
4.00																					4.00
5.00																					5.00
5.50																					5.50
6.00																					6.00
7.00																					7.00
8.00	80	22,900																			8.00
9.00	78	23,000	78	22,900	79	22,800															9.00
10.00	76	19,800	76	19,700	77	19,600	78	19,500	78	19,400											10.00
12.00	73	15,400	74	15,300	75	15,200	76	15,100	76	15,000	78	14,900	77	14,800	78	14,700					12.00
14.00	69	12,500	71	12,400	72	12,300	74	12,200	74	12,100	76	12,000	75	11,900	76	11,800					14.00
16.00	65	10,400	67	10,300	68	10,200	71	10,100	71	10,000	74	9,900	73	9,800	74	9,700					16.00
18.00	61	8,800	63	8,700	64	8,600	67	8,500	67	8,400	71	8,300	70	8,200	71	8,100					18.00
20.00	57	7,600	59	7,500	60	7,400	63	7,300	63	7,200	67	7,100	66	7,000	67	6,900					20.00
22.00	53	6,700	55	6,600	58	6,500	59	6,400	59	6,300	63	6,200	62	6,050	63	5,900					22.00
24.00	49	5,900	51	5,800	56	5,700	57	5,600	57	5,500	59	5,350	58	5,200	59	5,050					24.00
26.00	44	5,200	47	5,100	54	5,000	55	4,900	55	4,800	57	4,650	56	4,500	57	4,350					26.00
28.00	35	4,700	42	4,600	51	4,500	53	4,400	53	4,300	55	4,150	54	4,000	55	3,850					28.00
30.00	31	4,200	33	4,100	48	4,000	50	3,900	50	3,800	53	3,650	52	3,500	53	3,350					30.00
32.00			29	3,600	43	3,500	47	3,400	47	3,300	50	3,150	49	3,000	50	2,850					32.00
34.00					34	3,200	42	3,100	42	3,000	47	2,850	46	2,650	47	2,450					34.00
36.00					30	2,900	33	2,800	33	2,700	42	2,550	41	2,350	42	2,150					36.00
38.00							29	2,400	29	2,300	33	2,150	32	1,950	33	1,750					38.00
40.00										1,900	29	1,750	28	1,550	29	1,350					40.00

NOTE: Please read the other 'Reading Load Charts' section before reading this section.

Introduction to load charts


GR-800EX RATED LIFTING CAPACITIES

ON OUTRIGGERS FULLY EXTENDED 7.3 m SPREAD
360° ROTATION (Unit: ×1000 kg)

A / B	12.0 m	16.4 m	20.8 m	25.2 m	29.5 m	33.9 m	38.3 m	42.6 m	47.0 m
3.0	80.0	46.0	40.0	18.2					
3.5	74.2	46.0	40.0	18.2					
4.0	67.0	46.0	40.0	18.2					
4.5	60.0	46.0	40.0	18.2					
5.0	55.7	46.0	38.0	18.2	18.2	15.1			
5.5	51.1	46.0	36.8	18.2	18.2	15.1			
6.0	46.2	45.8	34.9	18.2	18.2	15.1			
6.5	42.1	41.7	33.2	18.2	18.2	15.1			
7.0	38.6	38.3	31.6	18.2	18.2	15.1	15.1	13.0	
7.5	35.6	34.4	30.1	18.2	18.2	15.1	15.1	13.0	
8.0	33.0	31.0	28.7	18.2	18.2	15.1	15.1	12.8	
8.5	22.6	22.6	22.1	18.2	18.2	15.1	15.1	11.0	9.5
9.0		20.7	19.7	18.2	18.2	15.1	15.1	10.0	9.5
11.5		16.7	15.3	14.7	14.6	14.0	13.6	10.7	9.5
12.0		14.0	13.6	13.2	13.1	12.6	12.0	10.2	9.5
14.0		10.3	9.8	10.4	11.5	11.2	11.3	9.3	8.3
16.0			7.3	8.2	9.6	10.2	10.1	8.1	7.6
18.0			5.6	7.5	8.2	8.8	9.1	7.3	7.0
20.0					6.7	7.5	7.9	6.7	6.4
22.0					5.7	6.5	6.9	6.2	5.9
24.0					4.9	5.7	6.2	5.7	5.4
26.0					4.3	5.0	5.6	5.1	4.9
28.0					3.8	4.4	5.0	4.6	4.4
30.0					3.3	3.9	4.5	4.2	4.0
32.0					2.9	3.5	4.1	3.8	3.7
34.0						3.1	3.7	3.5	3.4
36.0						2.8	3.4	3.2	3.1
38.0						2.5	3.1	2.9	2.8
40.0							2.8	2.7	2.6

Load chart

All cranes have their **own** load chart. They should be in place and readable. The load chart gives information about the load capacity of the crane in a given configuration (set up). The cranes capacity changes depending on how the crane is set up.

Configuration

The configuration of the crane includes things like:

- The outrigger set up (if applicable)
- The length and angle of the main boom
- Operating radius
- Maximum line load and winch capacity
- Fly jib and hook attachments.

Important information

Other important information may include:

- Limitations of boom angles
- Operational conditions. For example wind speed.

Crane set-up

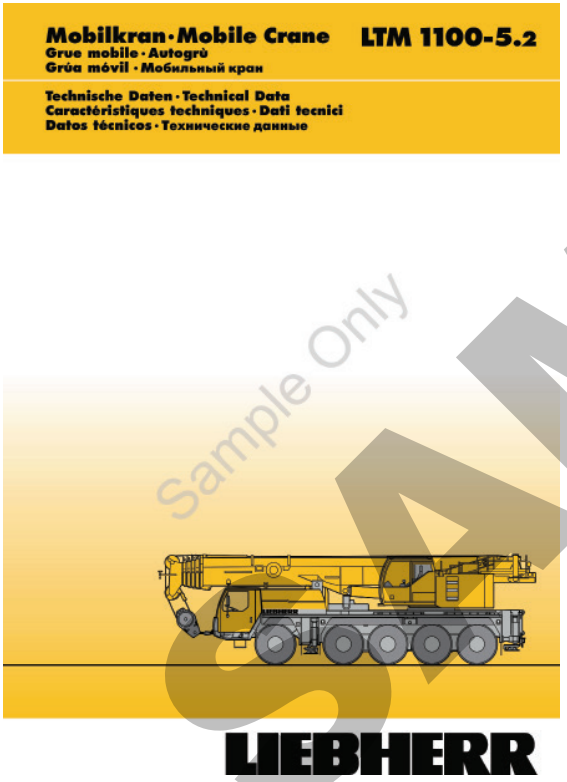
A load chart refers to a crane that is set up:

- According to manufacturers specifications
- On firm, level ground
- In ideal weather conditions
- With outriggers/stabilisers fully extended (where applicable)
- Tyres correctly inflated and in good condition.

Read all of the information on the load chart.

EXAMPLES OF READING CRANE CHARTS

Note: The following crane chart exercises us the C1 LOAD CHART_LIEBHERR LTM1100-5.2 **load chart. This is located in the 'Trainer's Resource' of the Easy Guides training material. Your trainer will provide you with this crane chart.**



General Questions

a) What counterweight is fitted to the crane to allow it to have on-road axle weights of 12t?

Answer = 7t counterweight

b) What is the rated capacity of the 7-sheave hook block?

Answer = 55t

c) What is the tare weight of the 30.2t rated capacity hook block?

Answer = 260kg

d) The working radii on the LTM 1055 3.2 is measured from where on crane?

Answer = From centre of slew

Element 3 – Perform work / task

Do the lift

This part of the book is about how to do a lift.

It covers:

- Positioning the hoist block and boom/jib
- Test lifts
- Moving and watching the load
- Safe crane operation
- Responding to unsafe situations
- Checking the planned route.

Conduct a test lift

With some loads it can be difficult to establish where the load's centre of gravity is. Sometimes the only way to be sure that the load will be stable while moving is to perform a **test lift** to see if it stays stable.

Test lift

Do a test/trial lift before you use the crane to move a load. This helps you check:

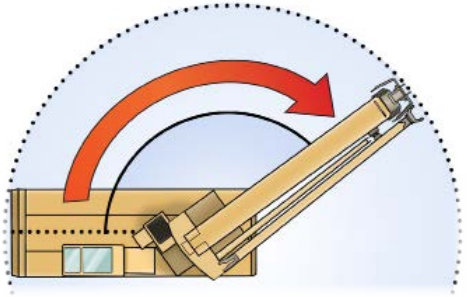
The crane can do the lift. You do not need to lift the load far off the ground to check that it is stable.

You need to confirm the weight of the load.

- Outriggers/packing are secure
- All crane equipment works properly

- Lifting slings/chains have been positioned correctly for even weight distribution
- Make sure the load is secure.
- Make sure the crane is stable.
- Check that crane functions are working.

There is enough clearance for the boom movement



QUESTION 181

...CONTINUED FROM PREVIOUS PAGE

You are operating a crane and:

The dogger touches the hook and jumps like they are getting a shock.

or

Your crane contacts overhead powerlines.

What must you do?

When you get to the ground, move away from the crane by **hopping** or by **shuffling with both feet together**.

Do not run or walk because the ground might be electrified.

Get to at least **8 metres** away from the crane or plant you are operating..

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QUESTION 181

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You are operating a crane and:

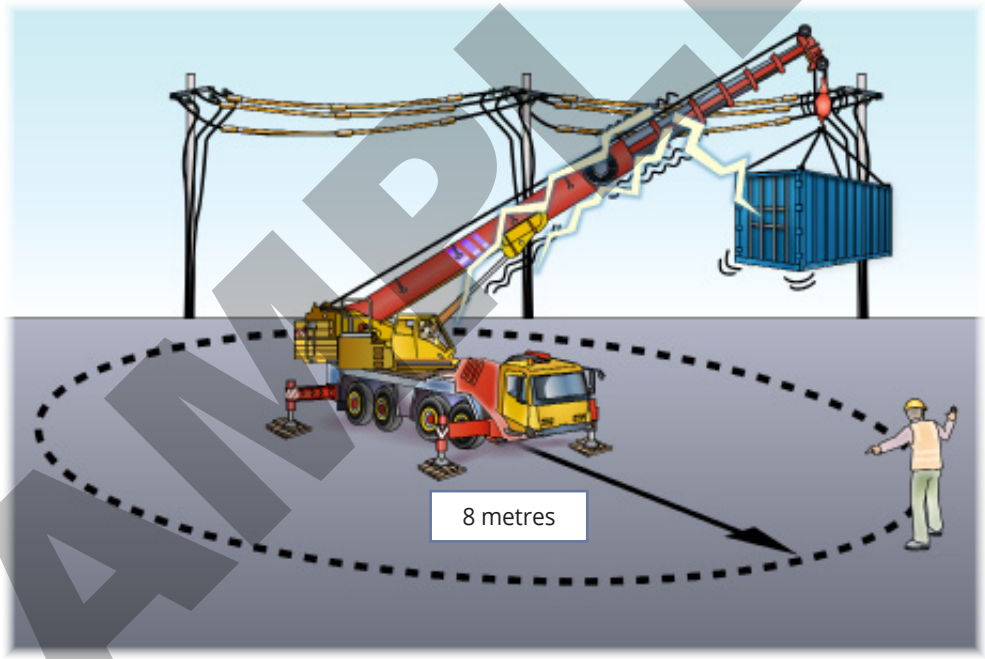
The dogger touches the hook and jumps like they are getting a shock.

or

Your crane contacts overhead powerlines.

What must you do?

When you get clear of the crane, warn everyone else to stay at least 8 metres away from it.



Do not touch any person getting an electric shock or touch electric lines.

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QUESTION 181

...CONTINUED FROM PREVIOUS PAGE

You are operating a crane and:

The dogger touches the hook and jumps like they are getting a shock.

or

Your crane contacts overhead powerlines.

What must you do?

Do all the incident reporting that you should.

Do any first aid you need to.

Do not use the crane until it has been checked out.

QUESTION 182

Something happens that can make the crane or load unsafe.

What must the operator do?

You need to:

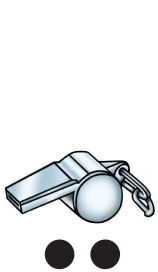
Stop using the crane, look at what is unsafe 	Try and fix the problem 
Ask for help or assistance 	Report as per site procedures. 

QUESTION 183

Some of the Australian standard signals used in dogging are shown here.

What does each of these signals mean?

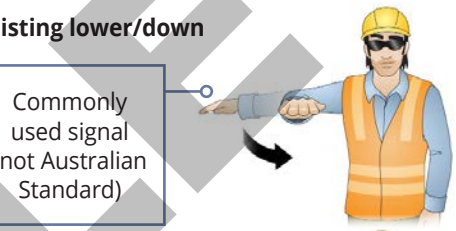
Hoisting raise



2 short

Hoisting lower/down

Commonly used signal (not Australian Standard)

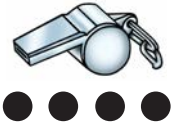


1 long

Luffing boom up

3 short

Luffing boom down



4 short

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QUESTION 183

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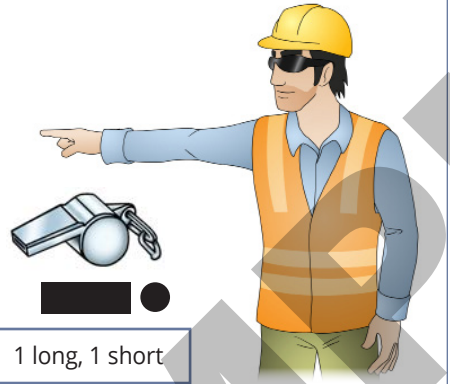
Some of the Australian standard signals used in dogging are shown here.

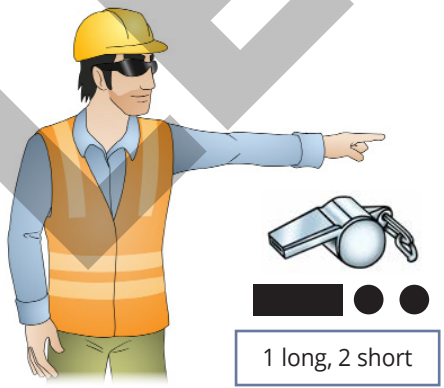
What does each of these signals mean?

Slew left /Travel left



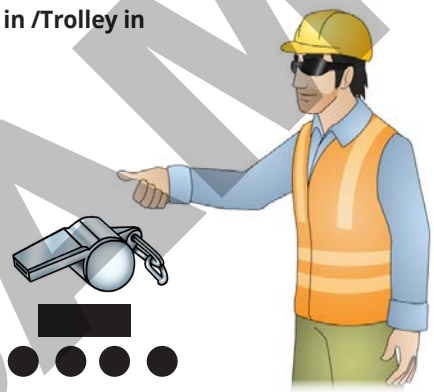
1 long, 1 short

Slew right /Travel right



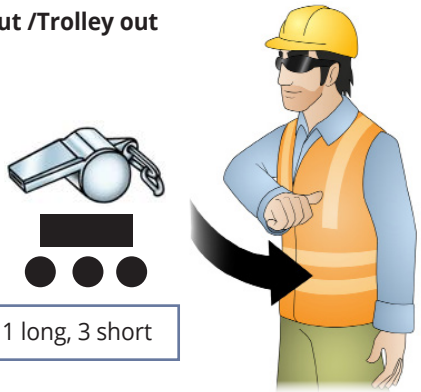
1 long, 2 short

Jib in /Trolley in



1 long, 4 short

Jib out /Trolley out



1 long, 3 short

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QUESTION 183

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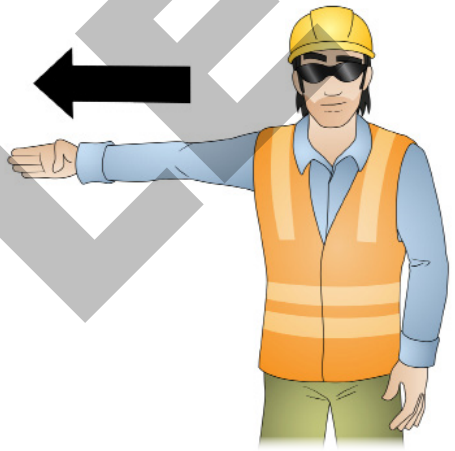
Some of the Australian standard signals used in dogging are shown here.

What does each of these signals mean?

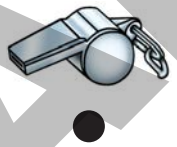
Travel and traverse

Indicate the direction you want the crane to go



Not applicable

Stop



1 short

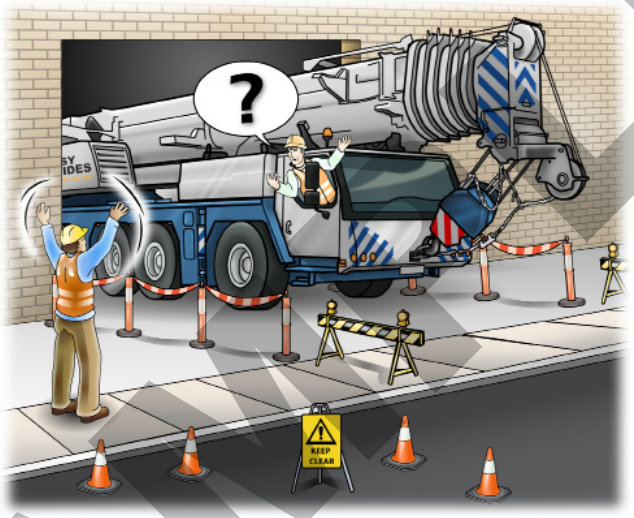
QUESTION 184

A workmate gave you a signal and you didn't understand it.

What should you do?

Also, who or what person would you follow directions from when lifting a load, either from hand, whistle or radio?

Stop operating the crane and ask your workmate to repeat or explain the signal.



You would follow directions of dogger or rigger or even another work mate. But when operating the crane you would follow the directions of the dogger or rigger.

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QUESTION 184

...CONTINUED FROM PREVIOUS PAGE

What is the role of the dogger man?

The reason why we monitor a load and its crane movement is to ensure safe operation of tasks to be performed.

What sequence of hand singles would you use to tell the crane operator to stop and make adjustments to the crane lift?

One role from many others of a dogger man is to monitor the movement of the crane and its load.

What sequence of hand singles would you use to tell the crane operator to stop and make adjustments to the crane lift?

So that, the load can be lifted up by 2 meters and swing to the right of the vehicle because a tree branch fell and caused a major hazard.

Stop **Luffing boom up** **Slew right /Travel right** **Lower**

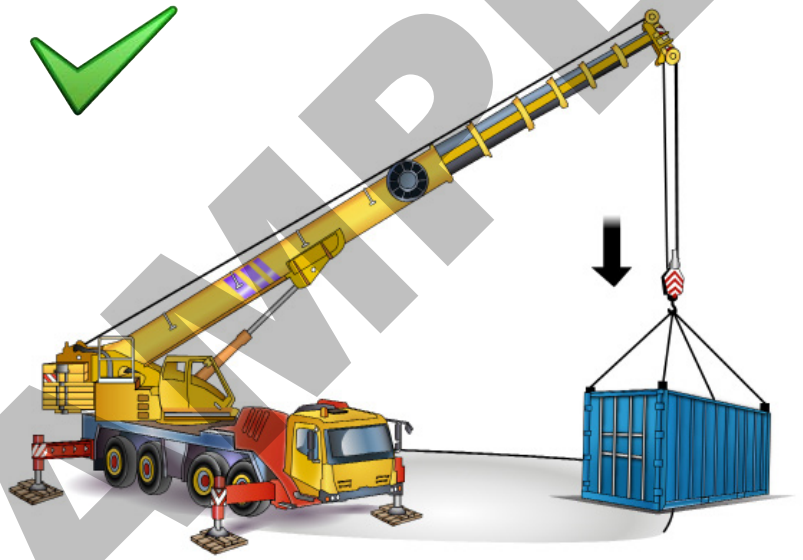
QUESTION 185

You are releasing a heavy load from the crane hook.

How do you control boom deflection?

Lower the boom/jib slightly as the load settles on the supporting surface before lowering the hook.

- This releases some tension (force) from the slings
- This stops the boom/jib from springing upwards when it is released.



When unhooking a load, make sure controls are not active to safe guard from boom deflection and monitor crane movement for safety.

Element 4 – Pack up

Shut down and pack up

This part of the book is about how to shut down, pack up and put away equipment.

It covers:

- Stowing and securing equipment
- Using motion locks
- Shutting down the crane
- Post-operational checks.

Stow boom/jib and equipment

Stow your boom as shown in the manufacturer's instructions or the specifications.

Remove any lifting parts from the boom and securely attach them to the correct position on the vehicle.

Apply motion locks and brakes

When shutting down the crane or leaving it unattended, check that you have turned on all motion locks and brakes.