

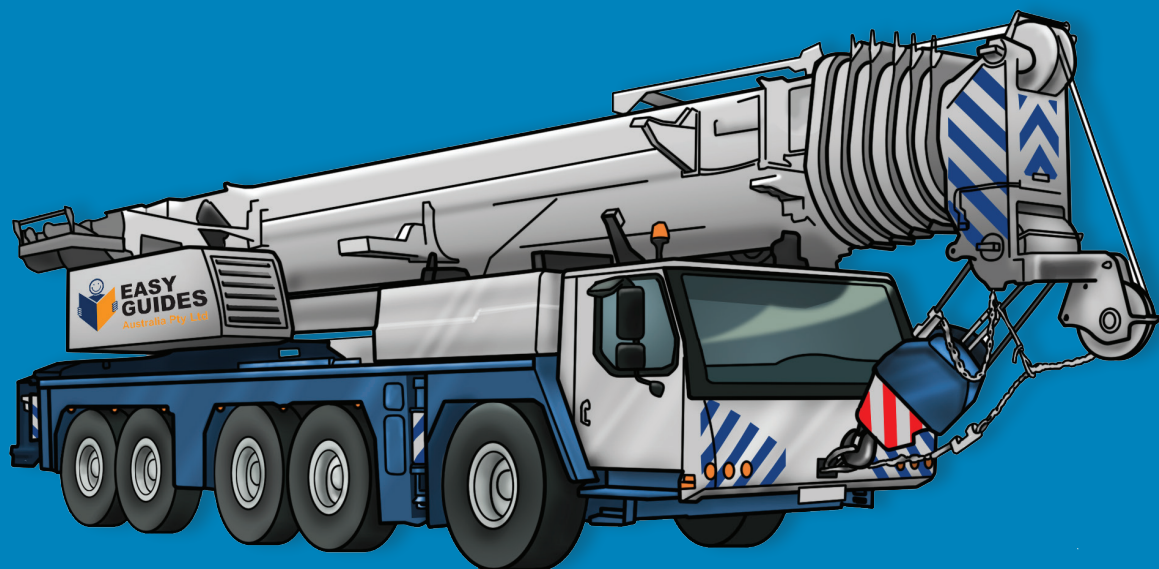
SLEWING MOBILE CRANE LEARNER WORKBOOK

TRAINER'S MARKING GUIDE WITH MODEL ANSWERS

TLILIC0023

Licence to operate a slewing mobile crane (up to 60t)

**With load chart calculations
similar to NAI**



Contents

Language – Literacy – Numeracy (LLN)	1
How to get the most out of this book	2
Things to consider when learning.....	3
Learning support materials	4
Learning and practical tasks.....	5
What is a slewing mobile crane?	6
Introduction to high risk licensing	8
National Vocational Education and Training (VET) Licensing Pathway.....	9
Training and assessment requirements	10
Record of training logbook	11
Who has a duty of care?.....	12
Where to find licensing information	14
Introductory training exercise	15
Part 1 – Prepare for hazards	18
Practical Task 1	25
Practical Task 2	26
Part 2 – Communicate clearly	30
Practical Task 3	34
Part 3 – Check the crane	36
Practical Task 4	46
Part 4 – Plan the lift	48
Load Charts	55
Practical Task 5	64
Part 5 – Set up the crane	67
Practical Task 6	74
Part 6 – Do the lift	77
Practical Task 7	89
Part 7 – Shut down and pack up	93
Practical Task 8	99
Beaufort Wind Scale – Flash/bang rule	101
Acknowledgements.....	103
Continuous improvement page	104

Learning and practical tasks

If you can, have your students train with other learners. Learning is more powerful when you and your learners share ideas and experiences. Below is a brief explanation of how you can use the training tasks in this workbook. Please advise your students if they are to fill in tasks on their own at home or wait until they are in the training room with you.



Theory training tasks

These tasks help the learner understand the underpinning knowledge to safely operate a vehicle loading crane. To help them complete these tasks the learner can use the Information Book and speak to other learners and you, the licensed operator/trainer.



Thinking questions

Thinking questions train your learner to think for themselves. For example, the Information Book does not directly state the answer.



Practical training tasks

These tasks help the learner acquire the practical skills to safely operate a vehicle loading crane. The tasks use high-risk equipment or machinery. Only a licensed operator/trainer can supervise the learner's practical training tasks.



Review

At the end of each element in the workbook, the learner gets to review their training. The review gives the learner a chance to talk with classmates and you about what they learned. Sharing their learning experiences with others helps them learn.



Review questions

You'll find the review questions on the Trainer's Resource CD. Give the questions to the learner toward the end of training to determine if they understand the information they have covered. You can ask your learner to fill in these questions alone or as a group by using the matching questions in the PowerPoint quiz section.



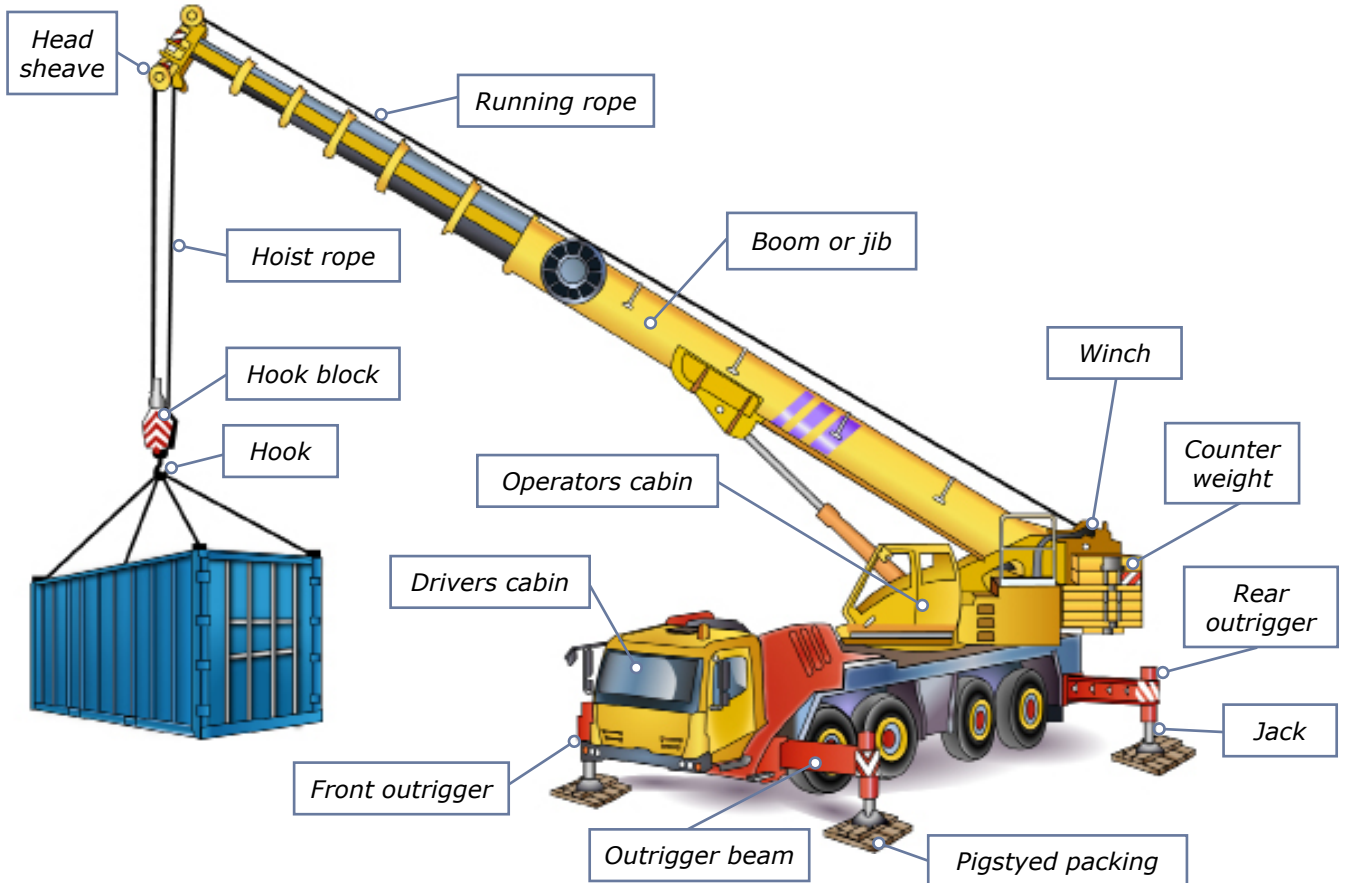
Review—practical tasks

The practical tasks handout is on the Trainer's Resource CD. There is one task for each element and the learner should do all tasks under your supervision.

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.

Parts of a slewing mobile crane



Slewing mobile crane



Crawler crane



Rough terrain slewing crane



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

Part 1

Prepare for hazards



Trainers please note:

The answers in this book are in no way conclusive and are to be used as a guide only. Use your own knowledge and experience to correct the variation of answers that may be given by learners.



Theory Training Task 1

Performance Criteria: 1.5, 2.9

Identify (know) workplace hazards. A hazard is anything that can harm you or others while you work. You need to identify (know) workplace hazards before you start work. Look for hazards. Look above you, look around you and check the ground below you.

a) Give examples of hazards you should look for before you begin work

Answers may include but not limited to:



Above head height

- powerlines and overhead service lines
- trees
- buildings
- other obstructions

Ground level to eye level

- other equipment
- machinery/plant
- people and pedestrians
- things in the path of travel
- environmental conditions
- surrounding structures
- facilities
- dangerous materials
- other obstructions
- insufficient lighting

Ground level (and below)

- stable/level surface
- spills or wet surfaces
- debris and rubbish
- trenches or recently filled trenches
- unstable ground
- underground services
- surface is strong enough to support the weight of any equipment/materials



b) Tick any of these hazards you may have come across in past or present workplaces.

Trainers: encourage your learners to place a tick beside hazards they have seen in their past or present places of employment.

Performance Criteria: 1.5, 2.2

Hazard control measures

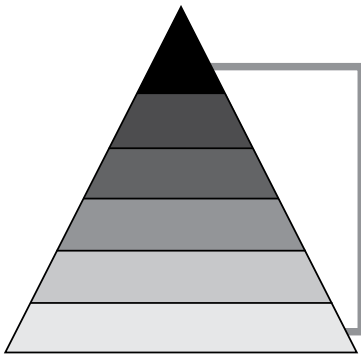
Hazard control measures are actions you take to control or prevent a danger that can injure or hurt you. You use the actions to lower the risk to people and property. Set up the hazard controls before you start work.



Theory Training Task 5

Performance Criteria: 1.5, 2.2

a) List the **six** levels of the Hierarchy of Hazard Control.



1. **Elimination**
2. **Substitution**
3. **Isolation**
4. **Engineering Control Measures**
5. **Administrative Controls**
6. **PPE**



b) What is the first thing you should try if you find a hazard?

Elimination – you should try to remove the hazard entirely.



Theory Training Task 6

Performance Criteria: 1.5

Tick the **hazard control measures** you may need to put in place when using a slewing mobile crane.

- Warning signs and barriers
- Flag person
- Traffic control
- Flashing hazard and lights
- Wash the crane so it looks nice
- Pedestrian exclusion zone
- A hoarding, gantry or scaffolding
- Recharge the battery so it works



PC 2.11

Check the weight of the load

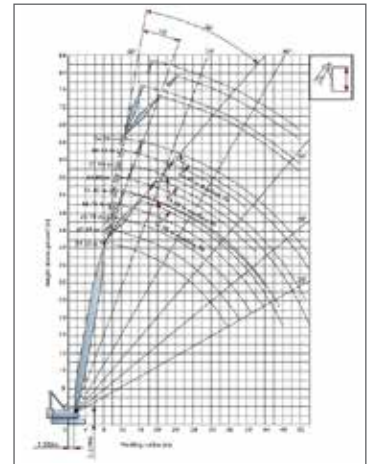
Before moving the load you need to:

- Work out the weight of the load
- Choose the crane that is capable of lifting the load
- Read load charts to check that the load can be lifted.



Identify and estimate the weight of the load

- Make sure you know the weight of the load you are to lift.
- Before you move a load, find out its weight and size.
- Think about how different types of loads will affect your crane.



PC 2.12

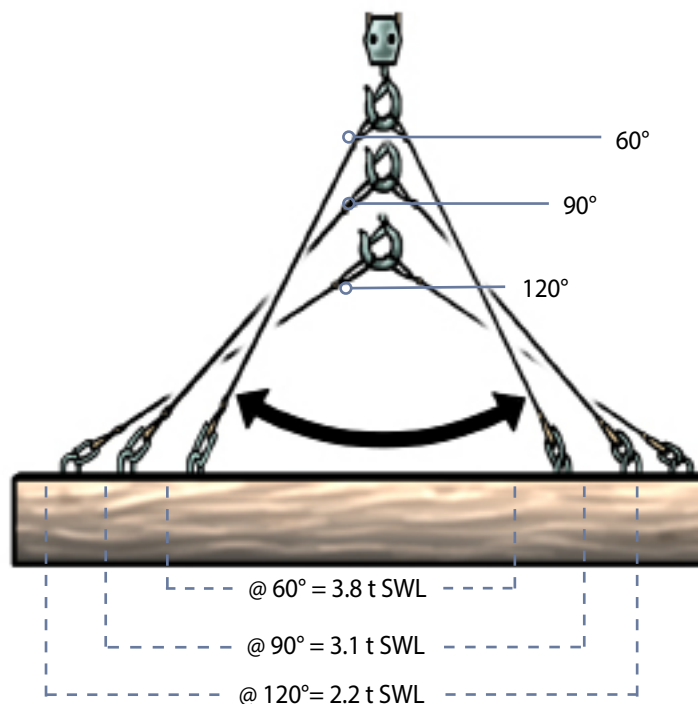
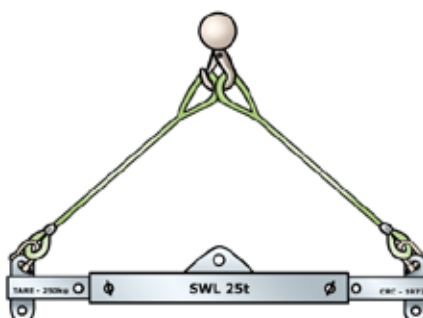
Check the working load limit (WLL) of the load.

WLL refers to the maximum allowed weight that a particular piece of rigging can handle under normal conditions. For instance, a winch strap with a WLL of 10,000 (10T) should not be used to secure any load above that weight, as it exceeds

When you use two slings at an angle, each sling has more force on it.

This means the slings cannot lift as much weight. As the angle goes up, the amount you can lift goes down.

Does the crane and equipment have enough capacity to carry the load? Check the SWL.

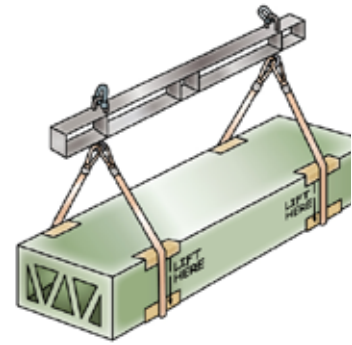


PC 2.13

Lifting or slinging points on a load

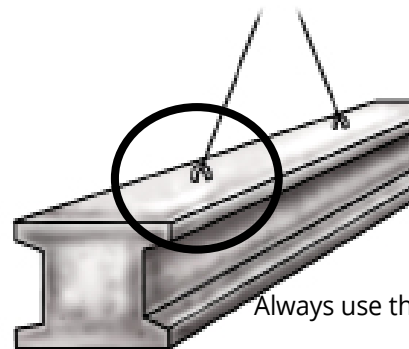
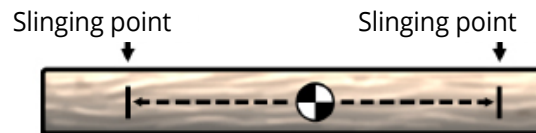
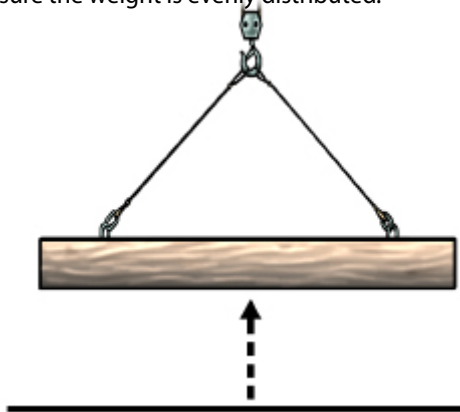
Some loads have specific areas they must be lifted by. These areas may be re-enforced to help distribute the weight evenly when it is being lifted.

Check for manufacturer's specifications/markings on the load. If the load has set points for lifting gear they will be marked by decals (symbols) or writing.



To work out the safe lifting/sling points you can:

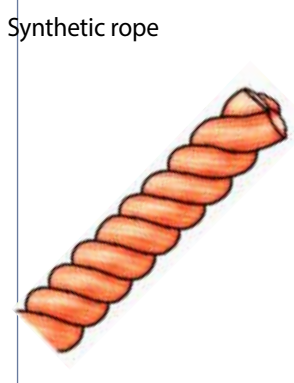
1. Measure the distance from the centre out to the sling points. Make sure the weight is evenly distributed.



PC 2.14

Check that the lifting equipment and gear are safe to use.

Chain	Wire rope	Shackles, eyebolts and lifting rings
Synthetic webbing sling	Natural fibre rope	Synthetic rope



The **minimum diameter** fibre rope you can use for lifting is 12 mm
 The **minimum** you can use for a fibre rope tagline is 16 mm 16 mm

Communicate clearly



Trainers please note:

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Performance Criteria: 1.7

Communicate clearly

Choose the communication equipment you will use for the job. After you have made your choice, test the equipment to make sure it's working.

Make sure you understand the dogger's hand signals if you use hand signals.



Theory Training Task 9

Performance Criteria: 1.7, 3.7

You can communicate many different ways. What are some of the ways you can communicate with other workers while moving a load?

Answer may include:

- Whistle
- Hand signals
- Two-way radio
- Mobile phones
- Written instructions
- Speaking, listening, asking questions
- Signs (ensure you can read and write enough to understand spoken and written instructions and safety signs).

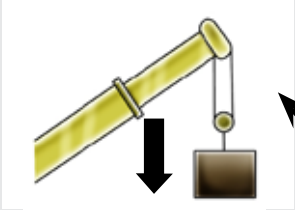



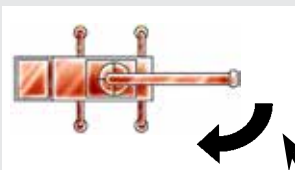


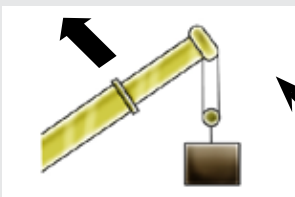

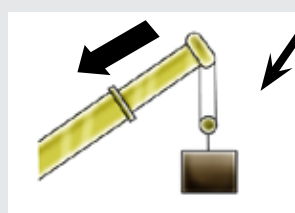





Theory Training Task 12

Performance Criteria: 3.4, 3.7

Match the crane boom motion on the left with the correct hand or whistle signals on the right.

Hoisting down 	
Stop 	 1 long
Slewing right 	
Travel and transverse Indicate the direction you want the crane to go	
Luffing boom up 	 1 long, 2 short
Telescoping boom retract. Jib-trolley in. 	

Part 3

Check the crane



Trainers please note:

The answers in this book are in no way conclusive and are to be used as a guide only. Use your own knowledge and experience to correct the variation of answers that may be given by learners.

Performance Criteria: 2.4

Check signs and labels

Check the signs, labels and decals on the crane. These will tell you the crane's load limits and what it can and can't do. All signs and labels must be readable and clear.



Theory Training Task 16

Performance Criteria: 2.4

List at least 2 things you should be able to read on a data plate.

Answer may include:

- **Weight (GVM)**
- **Model number**
- **Dimensions**
- **Date of manufacture**
- **WLL/SWL**
- **Serial number**



Performance Criteria: 2.4

Do the pre-operational checks

Do the pre-operational checks to make sure the crane is safe to use.



Theory Training Task 17

Performance Criteria: 2.4

What are four (4) pre-operational checks you need to do on the crane?

Answer may include:

- **No safety tags on the crane**
- **Rope drums**
- **Load charts**
- **Lifting hook**
- **Tyres (condition, pressure)**
- **Communication system**
- **Ropes, wires and anchorages**
- **Fluid levels and leaks (oil, water)**
- **Logbook is present and in good condition**
- **Structural damage to crane (including boom/jib)**
- **Signage (including manufacturer's data plate and working load limit)**

Practical Training Task 4

Part 3 – Check the crane

Performance Criteria 2.4, 2.7, 2.8, 3.10

Check the crane

Learners: You **must** do this task under the **control of a licensed operator**. Please wait for your trainer to advise you before trying the task.

First, your trainer will take you to an area where you will use a slewing mobile crane.

Second, your trainer will ask you to do a routine check of the crane before you start the motor.

Third, your trainer will see if you can find any faults or damage on the slewing mobile crane



- Crane is visually checked for any damage or defects. This means have a look around the crane for obvious problems.
- All signage and labels are checked to ensure they are visible and legible in accordance with the appropriate standard. This means you check signs and labels.
- Routine pre-operational crane checks are carried out in accordance with procedures. This means that once you do a visual check of the crane you then do a thorough pre-operational check.
- All controls are located and identified. This means you get to know the position and use of all the controls on the crane.
- Crane service logbook is checked for compliance. This means you find and check the service logbook and daily inspection checklist book.
- Crane is started in accordance with procedures and checked for any abnormal noises. This means you start the crane and listen for strange noises.
- All crane safety devices are tested in accordance with procedures. This means you test the safety devices on the crane for problems.
- Post-start operational checks are carried out in accordance with procedures. This means you do checks after you have started the crane.
- All damage and defects are reported and recorded in accordance with procedures, and appropriate action is taken. This means if you find any defects and faults with the crane, you need to record and report them.

Your trainer will assess your routine checks of the slewing mobile crane. After you finish, the licensed operator/trainer will then sign and date the box below.

Part 3: **Satisfactory** **Not yet satisfactory**

Signature (licensed operator/trainer) Date

Part 4

Plan the lift



Trainers please note:

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Theory Training Task 27

Performance Criteria: 1.3

a) You will lift a steel universal beam. The dimensions are:

- Weight of structural steel = 7840 kg per cubic metre
1 mm = 0.001 m
- Flanges (top and bottom)
 - Length = 12 m
 - Width = 250 mm
 - Thickness = 15 mm
 - Flange = $L \times W \times D \times 2 \times$ weight of structural steel
- Web
 - Length = 12 m
 - Width = 275 mm
 - Thickness = 40 mm
 - Web = $L \times W \times D \times$ weight of structural steel

What is the total weight of the steel universal beam in kilograms?

$$\text{Flange} = 12 \text{ m} \times 0.25 \text{ m} \times 0.015 \text{ m} \times 2 \times 7840 \text{ kg}$$

$$\text{Flange} = 705.6 \text{ kg}$$

$$\text{Web} = 12 \text{ m} \times 0.275 \text{ m} \times 0.04 \text{ m} \times 7840 \text{ kg}$$

$$\text{Web} = 1034.88 \text{ kg}$$

$$\text{Total weight} = 705.6 \text{ kg} + 1034.88 \text{ kg}$$

$$\text{Total weight} = 1740.48 \text{ kg}$$

$$\text{Total weight} = 1740.5 \text{ kg}$$



Performance Criteria: 2.5, 3.1

Check the load charts

Check the load charts and make sure the crane can lift the load.



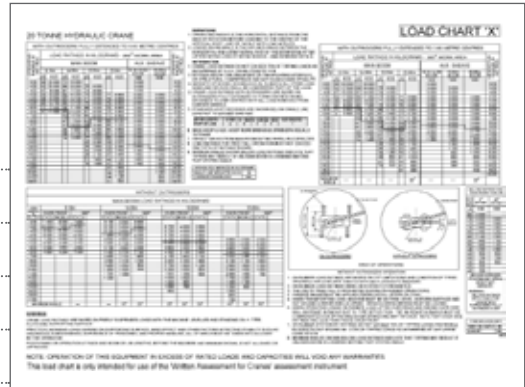
Theory Training Task 28

Performance Criteria: 2.5, 2.6, 3.1

- a) How do you find out the crane's lifting capacities to make sure the crane can lift the load?

You can find out by reading the:

- Crane's lifting limits in the user manual
- Crane's load charts
- May be marked on the crane.



- b) List at least three (3) things a load chart tells you.

Answer may include:

- Rated capacity
- Length of boom
- Operating radius
- Winch capacity
- Maximum wind speed
- Speed
- Outrigger set up
- Angle of boom
- Line load / hoist limits
- Jib ratings
- Mobilising limits

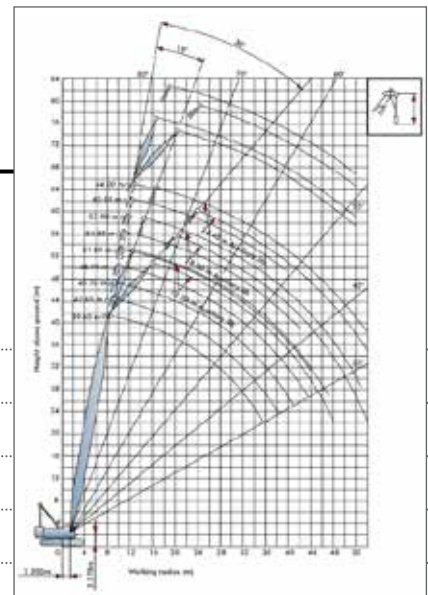


Theory Training Task 29

Performance Criteria: 2.5, 2.6, 3.1

Name at least three (3) things a range diagram shows you.

- Range of boom lengths
- Crane structure (configuration)
- Boom point elevation
- Boom angles
- Radius





Theory Training Task 30

Performance Criteria: 1.3

- a) You are doing a multiple crane lift with two cranes.
The load is 20 tonnes.
How much capacity does each crane need to lift this load safely?

Load share of each crane = total load ÷ number of cranes

$$20 \text{ t} \div 2 = 10 \text{ t}$$

Capacity each crane needs = load share of each crane × safety margin

$$10 \text{ t} \times 1.2 = 12 \text{ t}$$

- b) How much extra capacity (safety margin) do you need for a three crane lift?

33%

Performance Criteria: 1.4

Plan your path

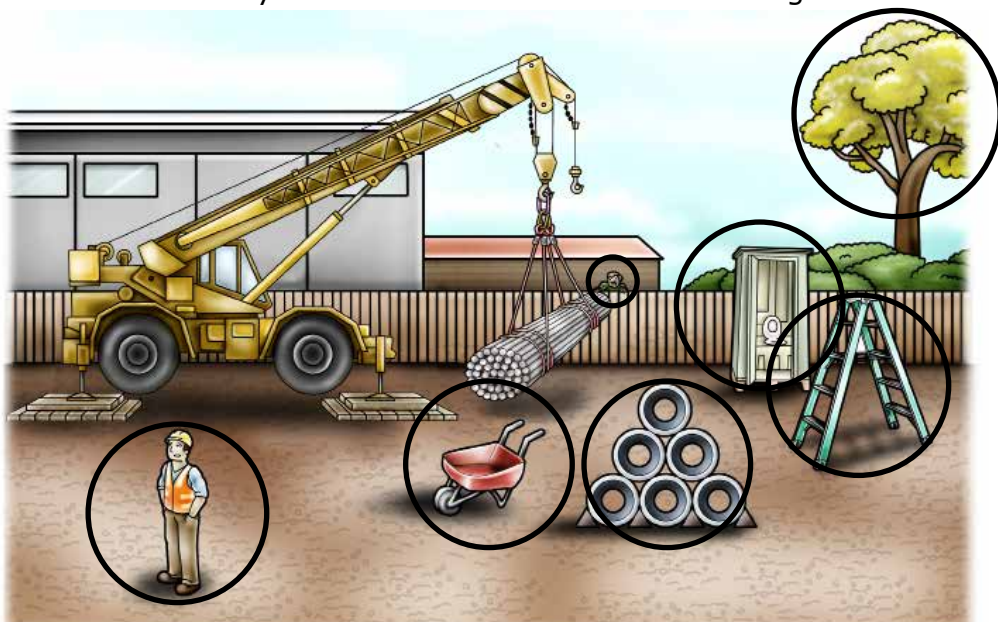
Plan the path you will take to move the load, and look out for hazards.



Theory Training Task 31

Performance Criteria: 1.4

Check the path of movement of loads to avoid hazards.
Circle the **hazards** you should look out for when moving a load.



Mobilkran • Mobile Crane LTM 1055-3.2

Grue mobile • Autogrù
Grúa mòvil • Меби́льный кран

Technische Daten • Technical Data
Caractéristiques techniques • Dati tecnici
Datos técnicos • Технические данные



LIEBHERR

General Questions

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

Answer: =

Answer: = 7t counterweight

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

Answer: =

Answer: = 55 t

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

Answer: =

Answer: = 260 KG

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

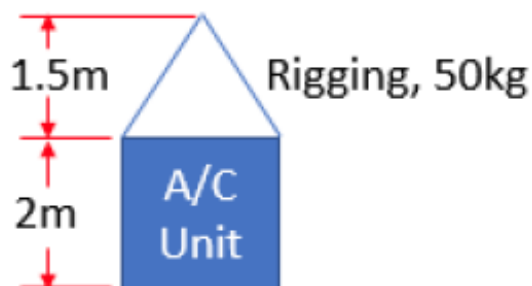
Answer: =

Answer: = From centre of slew

Scenario 1

A Liebherr LTM 1055-3.2 is used to lift an air conditioner to the top of a 30m building. The crane is set up such that the edge of the building is 8m away from the slew centre of the crane. The centre of the air conditioner needs to be landed 2m from the edge of the building.

Dimensions of the air conditioner and rigging are shown below:



e) What is the minimum boom length you should use to lift this air conditioner unit?

Answer: =

Answer: = 37.6 m (must remember to allow for anti-2-block distance from head sheaves)

[Continued next page]

f) With the crane set up in the same configuration as Scenario 1 and with 7 tonnes of counterweight and a 3 sheave hook block, what is the maximum weight in kg that can be lifted? Show your workings.

Calculation:

Rated capacity is 10.3 tonnes

(remember the crane is 8m from building + 2m in off the edge = 10m radius)

10,300 kg - 50 kg (rigging) - 260 kg (3 sheave hook block) =

Answer: =

Answer: = 9,990 kg

Scenario 2

To get additional capacity, an extra 5 tonne counterweight is added to the same LTM 1055-3.2. The crane is used to unload material from a truck positioned directly behind the rear of the crane. The truck unloading bay is 20m away from the crane's slew centre. The crane is pinned with a 34.2m boom length.

What is the maximum weight that can be unloaded from the truck? Assume rigging is 50kg. Show your answer to the nearest 10kg. Show workings.

Calculations:

34.2m main boom, at a radius of 20m, and 12t c/w fitted;

The rated capacity is 5.3 tonnes (using $\pm 10^\circ$ since truck behind rear of crane).

Deductions:

Weight of 3 sheave hook block: 260kg + Rigging gear weight: 50kg

Total weight of deductions 310 kg

Maximum weight = Rated Capacity - Deductions

= 5300kg - 310kg

Answer: =

Answer: = 4990kg

Answer: =

Scenario 2

To get additional capacity, an extra 5 tonne counterweight is added to the same LTM 1055-3.2. The crane is used to unload material from a truck positioned directly behind the rear of the crane. The truck unloading bay is 20m away from the crane's slew centre. The crane is pinned with a 34.2m boom length.

What is the maximum weight that can be unloaded from the truck? Assume rigging is 50kg. Show your answer to the nearest 10kg. Show workings.

[Continued next page]

Set up the crane



Trainers please note:

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Performance Criteria: 1.4, 1.6

Follow safety procedures

Follow all of the safety procedures when you drive the crane to the work area.



Theory Training Task 36

Performance Criteria: 1.4, 1.6

Circle the correct answer for the following statements.

a) When driving a crane you do not have to obey road signs.

True

False

b) When driving a crane you must check for clearances below tunnels and powerlines.

True

False

c) When driving a crane outriggers/stabilisers do not have to be retracted.

True

False

d) Pedestrians don't need to be a safe distance from the crane.

True

False



Part 6

Do the lift



Trainers please note:

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Performance Criteria: 2.3

Access the crane safely

Climb in and out of the crane's cabin safely.



Theory Training Task 47

Performance Criteria: 2.3

How should you get in and out of the crane's cabin?

- **When you're climbing into the cabin, 3 body parts should be touching the crane at the same time.**
- **Use 2 feet and 1 hand, or 2 hands and 1 foot.**
- **Using 3 body parts at the same time will keep you stable while you are climbing in or out.**



Performance Criteria: 1.3, 2.5, 2.6

Check the crane's capacity

Check the crane's load capacity, and always stay within the safe working limit (SWL) of the crane and boom.



Theory Training Task 48

Performance Criteria: 1.3, 2.5, 2.6

How do you know that the load is within the limits of the crane?

- **Check the load chart.**
- **Keep an eye on the crane's computer.**

A detailed load chart for a crane, titled "LOAD CHART 'Z1'". It contains a large table with columns for "LIFTING CAPACITY", "BOOM LENGTH", "LIFTING HEIGHT", and "LIFTING WEIGHT". The table is filled with numerical data. Below the table, there are several sections of text, including "OPERATIONAL LIMITS", "SAFETY INSTRUCTIONS", and "NOTES". A prominent note at the bottom states: "NOTE: OPERATION OF THIS EQUIPMENT IN EXCESS OF RATED LOADS AND DISREGARD OF INSTRUCTIONS VOIDS WARRANTY".



Theory Training Task 52

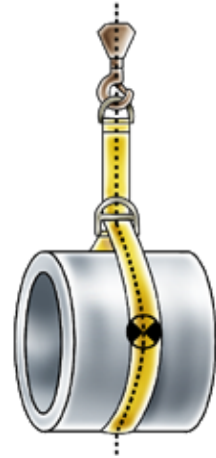
Performance Criteria: 3.2



Why is it important to put the lifting hook over the load's centre of gravity?

Answer includes:

- To reduce the risk of overloading the crane.
- To prevent load swinging on lift.
- To prevent damaging the crane.
- To prevent damage to the load caused by load toppling.



Performance Criteria: 3.4

Do a test lift

Once you've set up, do a test lift to make sure the lift can be done safely.



Theory Training Task 53

Performance Criteria: 3.4



Why should you do a test/trial lift?

Answer includes:

- To check the crane can do the lift.
- To see if all crane equipment works properly.
- To check the load is stable.
- To make sure there is enough clearance for the boom movement.
- To ensure the outriggers/packing are secure.

