

CRANES

NATIONAL CERTIFICATE OF COMPETENCY

ASSESSMENT INSTRUMENT AUGUST 2000
WorkCover NSW Health and Safety Assessment Instrument

Dis

This publication contains information regarding occupational health, safety, injury management or workers compensation. It includes some of your obligations under the various workers compensation and occupational health and safety legislation that WorkCover NSW administers. To ensure you comply with your legal obligations you must refer to the appropriate Acts.

This publication may refer to WorkCover NSW administered legislation that has been amended or repealed. When reading this publication you should always refer to the latest laws. Information on the latest laws can be checked at www.nsw.gov.au or contact (02) 9238 0950 or 1800 463 955 (NSW country only).

**OHS Certificates of Competency
National Assessment Instrument**

**Written Assessment
for Cranes**

August 2000

(Revision 1)

NB: This document must be used in conjunction with the specific crane assessment instruments listed below:

National OHS Certification Standard

Cranes and Hoists

**Tower Cranes, Derrick Cranes,
Portal Boom Cranes,
Bridge and Gantry Cranes
Vehicle Loading Cranes,
Non-Slewing Mobile Cranes and
Slewing Mobile Cranes
(Up to 20 tonnes, Up to 60 tonnes,
Up to 100 tonnes and
Over 100 tonnes)**

Written Assessment for Cranes

AUGUST 2000

Assessor should refer to clauses 6.7 and 7.9 of the Assessment Guidelines for National Occupational Health and Safety Certification Standard for Users and Operators of Industrial Equipment.

Contents

| | Page |
|---|------|
| Assessor Guidelines – General | 1 |
| Assessor Guidelines – Specific | 3 |
| Oral/Written Assessment | 5 |
| Section A: Slings (chain, wire rope, fibre rope, synthetic slings | 5 |
| Section B: Sheaves and Drums | 8 |
| Section C: Rope Terminations, Anchors and Attachments | 10 |
| Section D: Operational Manual | 13 |
| Section E: Load Assessment | 15 |
| Section F: Crane Load Charts | 17 |
| Tower Cranes | 17 |
| Derrick and Portal Boom Cranes | 18 |
| Bridge and Gantry Crane | 19 |
| Vehicle Loading Crane | 19 |
| Non-Slewing and Mobile Cranes | 20 |
| Answers to Written Questions | 32 |
| Relationship to National Certification Standard | 45 |
| Assessment Summary | 46 |

ASSESSOR GUIDELINES- GENERAL

1 Introduction

1.1 Scope

These general guidelines apply to all the assessment instruments for the certificates of competency prescribed by Schedule B of the *National Occupational Health and Safety Certification Standard for Users and Operators of Industrial Equipment*. (NOHSC: 1006)

Assessors should also be familiar with the publication *Assessment guidelines for National Occupational Health and Safety Certification Standard for users and operators of industrial equipment*.

1.2 Additional guidelines

Guidelines which provide additional specific information to certificate assessors are also included in each assessment instrument. Included, where appropriate, are specific instructions on the usefulness of training records (such as logbooks) and other certificates with overlapping competencies.

1.3 Evidence of competence

Evidence of competence is established in a number of ways. The methods used in the following instruments involve:

- assessment of practical performance
- written and/or oral answers to questions on underpinning knowledge.

2 Preparing for the assessment

2.1 Study the instruments

You need to read the assessment instruments and specific instructions carefully before beginning an assessment.

2.2 Confirm appointments

Prior to an assessment, you need to confirm the date, time and location of the assessment with the applicant and any other relevant people.

2.3 Equipment availability

The availability of equipment, materials and a suitable working area must be organised and confirmed, prior to the assessment.

2.4 Workplace factors

Because procedures and processes vary greatly between workplaces, it is important for assessors to plan their approaches to meet the requirements of the individual workplace.

Make sure you take the timeframe into account when planning the assessment and also make applicant aware of any time limits.

2.5 Selecting questions

Questions for the written/oral assessment should be randomly selected from each unit as indicated, either by hand or using the computer system, if applicable.

3 Conducting the assessment

3.1 Provide an explanation

Begin by explaining clearly to the applicant what is required of them. Check that applicant have provided (or have been provided with) the necessary tools and equipment.

3.2 Practical performance

Complete the performance checklist, as the applicant works through the required tasks. Wherever possible, this should be done in a normal working environment. Do not ask the applicant questions while he or she is performing a task, as this can be distracting, and may affect the time taken to complete the assessment.

If, at any time, the applicant is endangering himself/herself or others, stop the assessment immediately. This indicates that the applicant is not yet competent and may require further training, before been reassessed. Assessments should also be stopped, if equipment or property is likely to be damaged.

3.3 Knowledge

The oral/written assessment determines the applicants under pinning knowledge. The model answers provided with the oral/written assessment instruments are not necessarily exhaustive. Use your own judgement when scoring alternative answers.

3.4 Written Assessment

Refer to the Written assessment instrument for cranes.

3.5 Recording responses

Each item and question on the assessment forms you use is accompanied by a box. Assessors must complete every box as follows:

CORRECT
PERFORMANCE/ANSWER

X NOT YET ACHIEVED

NA NOT APPLICABLE

If a box is marked incorrectly, cross out the mistake, mark the correct response alongside, and initial the change.

4 Determining competencies

4.1 Assessment summary

A specific assessment summary is given for each certificate class. This is to be filled in and signed by the assessor, and countersigned by the applicant. The original and duplicate are given to the applicant. The applicant provides the original to the certifying authority. The triplicate is retained by the assessor.

4.2 Competency requirements

In order for you to deem an applicant competent, he or she must have completed each section of the assessment to the standard required. You should note any time constraints when arriving at your decision.

The standard required for each instrument is specified in the specific guidelines and/or on the summary page at the end of each assessment.

In the case of a re-assessment, the assessor can decide to apply the whole or only the part of the assessment that was not achieved.

4.3 Additional comments

Where an applicant fails to meet the standard of competence, you should add a written comment on the Assessment Summary, which briefly explains the problem.

Advice to the applicant, on the appropriate remedial action should also be included. This will also assist the certificate assessor, in the event that the applicant undergoes future reassessment.

Likewise, if an applicant demonstrates outstanding or remarkable performance, this should be noted.

4.4 Further investigation

As a certificate assessor, it is your role to determine whether or not an applicant has achieved the standard necessary for the certifying authority to be able to grant a certificate of competency.

Whenever you are unsure of the applicant's performance or knowledge, ask additional questions, and obtain additional evidence, before making your final decision.

ASSESSOR GUIDELINES - SPECIFIC

This written assessment covers the following crane certificate classes:

Tower Cranes, Derrick Cranes, Portal Boom Cranes, Bridge and Gantry Cranes, Vehicle Loading Cranes, Non-Slewing Mobile Cranes and Slewing Mobile Cranes (up to 20 tonnes, up to 60 tonnes, up to 100 tonnes and over 100 tonnes).

This written assessment consists of questions grouped into a number of sections, as follows -

- A. Slings
- B. Sheaves and Drums
- C. Rope Terminations, Anchors and Attachments
- D. Operational Manual
- E. Load Assessment
- F. Load Charts

The number of questions asked from each section should be as follows in the applicable tables-

For Non-Slewing Mobile Cranes and Slewing Mobile Cranes (up to 20 tonnes, up to 60 tonnes, up to 100 tonnes and over 100 tonnes)

26 questions must be undertaken including 5 critical Load Chart Questions

| Section | No. of Critical Questions To Select | No. of Non-Critical Questions To Select | Total |
|--------------|-------------------------------------|---|-----------|
| A | 0 | 7 | 7 |
| B | 0 | 4 | 4 |
| C | 0 | 4 | 4 |
| D | 0 | 2 | 2 |
| E | 0 | 1 | 1 |
| F | 5 | 3 | 8 |
| Total | 5 | 21 | 26 |

For Tower, Derrick and Portal Cranes classes, 22 questions must be undertaken, including 2 critical questions from Section F - Load Charts.

| Section | No. of Critical Questions To Select | No. of Non-Critical Questions To Select | Total |
|--------------|-------------------------------------|---|-----------|
| A | 0 | 7 | 7 |
| B | 0 | 4 | 4 |
| C | 0 | 4 | 4 |
| D | 0 | 2 | 2 |
| E | 0 | 1 | 1 |
| F | 2 | 2 | 4 |
| Total | 2 | 20 | 22 |

For Bridge & Gantry Cranes, 21 questions must be undertaken, including 2 critical questions from Section F - Load Charts.

| Section | No. of Critical Questions To Select | No. of Non-Critical Questions To Select | Total |
|--------------|-------------------------------------|---|-----------|
| A | 0 | 7 | 7 |
| B | 0 | 4 | 4 |
| C | 0 | 4 | 4 |
| D | 0 | 2 | 2 |
| E | 0 | 1 | 1 |
| F | 2 | 1 | 3 |
| Total | 2 | 19 | 21 |

For Vehicle Loading Cranes, 24 questions must be undertaken, including 4 critical questions from Section F - Load Charts.

| Section | No. of Critical Questions To Select | No. of Non-Critical Questions To Select | Total |
|--------------|-------------------------------------|---|-----------|
| A | 0 | 7 | 7 |
| B | 0 | 4 | 4 |
| C | 0 | 4 | 4 |
| D | 0 | 2 | 2 |
| E | 0 | 1 | 1 |
| F | 4 | 2 | 6 |
| Total | 4 | 20 | 24 |

WRITTEN LOAD CHART

Questions 103–145 are separated as follows: -

- Q 103 - 114 apply to Tower Cranes
- Q 115 - 121 apply to Derrick & Portal Cranes
- Q 122 - 124 apply to Bridge & Gantry Cranes
- Q 125 - 129 apply to Vehicle Loading Cranes
- Q 130 - 145 apply to Non-Slewing Mobile Cranes and Mobile Slewing Cranes

Questions 146-174 are Load Chart questions for Mobile Slewing Cranes, Non Slewing Mobile Cranes and Vehicle Loading Cranes. The questions applying to particular certificate classes are indicated.

- Q146-147 Vehicle Loading Cranes
- Q148-155 Non-Slewing Mobile Cranes
- Q156-163 Slewing Mobile Crane to 20 tonne
- Q164-168 Slewing Mobile Cranes to 60 tonne
- Q169-171 Slewing Mobile Cranes up to 100 tonne
- Q172-174 Clewing Mobile Cranes over 100 tonne

The assessor must select 2 questions from the questions above in accordance with the relevant certificate class.

The written assessment can take up to 1 hour to complete.

To satisfy the requirements for competency the applicant must correctly answer (either in writing or orally) all critical questions as indicated by a star ★ and a minimum of 75% of the non-critical questions from each operational area.

Assessor note: The assessment summary specifies the appropriate number of non-critical questions to be achieved.

Assessor note:

Working load limit (WLL) in the past was referred to as safe working load (SWL) for slings and lifting gear only. WLL is now used when there is no conditions imposed on the sling (example, direct lifting). SWL is used when there are conditions imposed on the sling (example, reeving, backhooking and angles between sling legs).

**SECTION A:
SLINGS (Chain, Wire rope, Fibre rope,
Synthetic)**

1. What is the formula or "rule of thumb" for determining the working load limit (WLL) of an unidentified synthetic rope?

2. Calculate the working load limit (WLL) of one of the following:

- (i) 12 mm diameter unidentified Synthetic rope
- (ii) 15 mm diameter unidentified Synthetic rope
- (iii) 20 mm diameter unidentified Synthetic rope

3. What is the smallest size diameter synthetic rope allowed for load lifting purposes?

4. What is the smallest size diameter fibre rope allowed for use as a hand-held tagline?

5. What will condemn a fibre rope from safe use for lifting purposes? List at least six defects.

6. What is the maximum temperature that a fibre rope can be exposed to before it is unsafe for lifting purposes?

7. Is it safe to use slings to raise or lower loads near or over people?

8. How is the working load limit (WLL) determined for synthetic webbing slings?

9. What factors should be considered when inspecting synthetic webbing slings for safe use? List at least six points.



10. When should a synthetic webbing sling be discarded? List at least six points.



11. List at least three requirements for the safe storage of synthetic webbing slings.



12. What is the “rule of thumb” formula used to calculate the WLL of a flexible steel wire rope (FSWR)?



13. Calculate the WLL of one of the following:

- (i) 15mm diameter FSWR.
- (ii) 20mm diameter FSWR.
- (iii) 25mm diameter FSWR.



14. What is the minimum allowable size FSWR for load handling purposes?



15. What is the maximum allowable temperature that FSWR can be exposed to before it is unsafe for lifting purposes?



16. What is the formula that indicates the maximum amount of broken wires permitted in FSWR?



17. Using the formula for maximum amount of broken wires permitted in FSWR for lifting purposes, work out one of the following:-

- (i) The construction of rope is 6/19 and 12 mm diameter.
- (ii) The construction of rope is 6/24 and 20 mm diameter.
- (iii) The construction of rope is 6/36 and 54 mm diameter.

18. What is meant by the term "Core Slippage"?

19. What will condemn a FSWR sling from safe use? List at least six defects.

20. What is the "rule of thumb" formula for calculating the WLL for a grade 80 high tensile chain?

21. Calculate the WLL of grade 80 high tensile chain for one of the following diameters: -

- (i) 10 mm
- (ii) 12 mm
- (iii) 15 mm

22. What is the smallest size diameter chain allowable for safe load handling for:

- (i) Grade 30 chain
- (ii) High tensile grade 80 chain

(i) _____

(ii) _____

23. What is the maximum temperature that a sling can be subjected to before the SWL is affected for :

- (i) Grade 30 chain sling
- (ii) High tensile grade 80 chain sling

(i) _____

(ii) _____

24. What will condemn a chain from safe use? List at least four defects.

25. What is the maximum amount of wear permitted in the link of a chain?

26. Where on a chain link is wear most likely to occur? List two points.

27. What action would you take if a chain has:

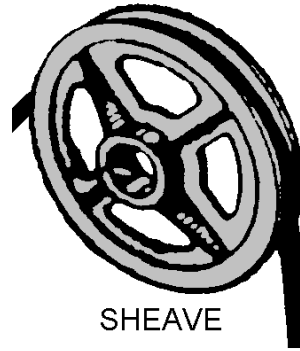
- (i) no WLL tag?
- (ii) no WLL tag & grade marking?

(i)

(ii)

28. What does the marking on a link of a chain indicate?

SECTION B: SHEAVES AND DRUMS

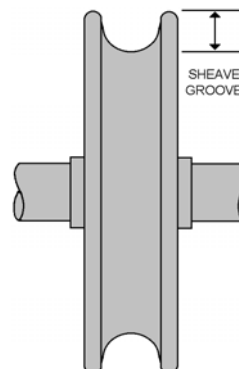


SHEAVE

29. What will condemn a sheave from safe use? List at least three defects.

30. List two effects "double blocking" can have on the crane and equipment.

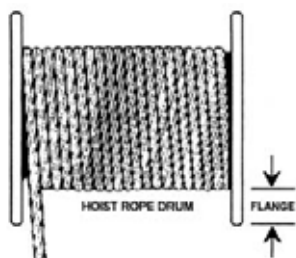
31. When the rope construction is unknown, what is the "rule of thumb" method used to calculate a sheave size?



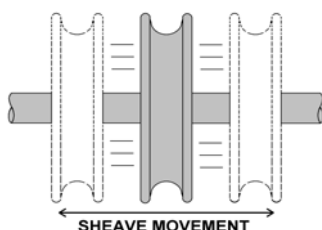
32. How much of the FSWR should sit neatly in the base of the groove of a sheave?

33. How deep must the sheave groove be in relation to the rope diameter been used?

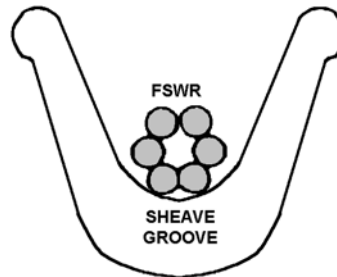
34. When the maximum number of turns is wound on a drum, how far must the flange of the drum extend above the outer layer of rope?



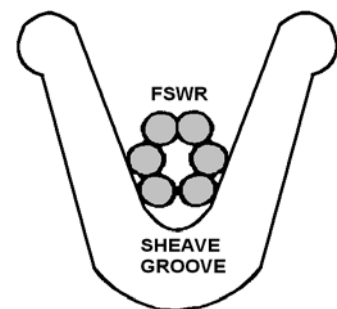
35. What is the advantage of using a jockey sheave?



36. What will occur if the sheave groove is too large for the diameter of the given rope?



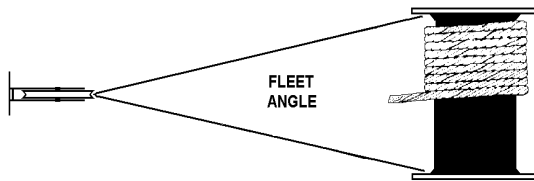
37. What will occur if the sheave groove is too small for the diameter of the given rope?



38. How is the diameter of a sheave measured?

39. When the hook or the block is at the lowest possible point, what is the minimum amount of full turns of wire rope that must remain on the winch drum?

40. What happens if the fleet angle of the hoist rope is incorrect?



41. What problem would occur if the jockey sheave seized?

**SECTION C:
ROPE TERMINATIONS, ANCHORS
AND ATTACHMENTS ASSOCIATED
DURING LIFTING OPERATIONS**

42. Why must you pack/lag the edges/corners of sharp loads?

43. How can the lifting capacity of a hook be identified?

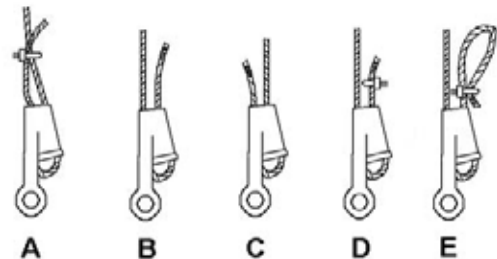
44. What are the approved methods of fixing the hoist wire to the boom head? List two methods.

45. What may be fitted (where applicable) to the hook to prevent the slings from dislodging?

46. If the hook spins rapidly what may it indicate? List two examples.

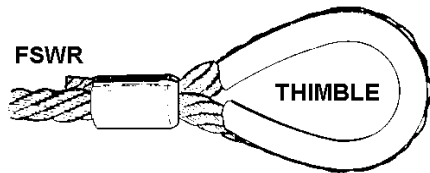
47. List two methods used to secure/fix the tail of the hoist rope to the winch drum.

48. From the diagrams below, select the correct methods of reeving a hoist rope in a wedge rope socket.



49. Are you permitted to use wire rope (bulldog) grips to connect two lengths of wire rope for lifting purposes? Explain your answer.

50. Explain the use and advantages of a wire rope thimble?



51. Name the two principal shapes of shackles.

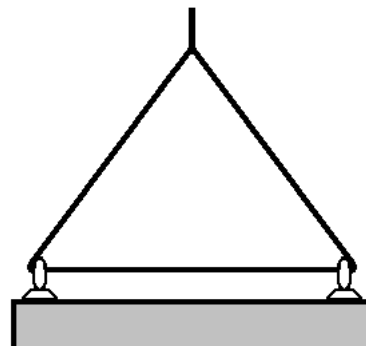
52. What must be marked on a shackle to be used for load handling?

53. Which type of shackle should be used for multi-legged slings? Explain your answer.

54. Why is it unsafe to interchange components of a shackle?

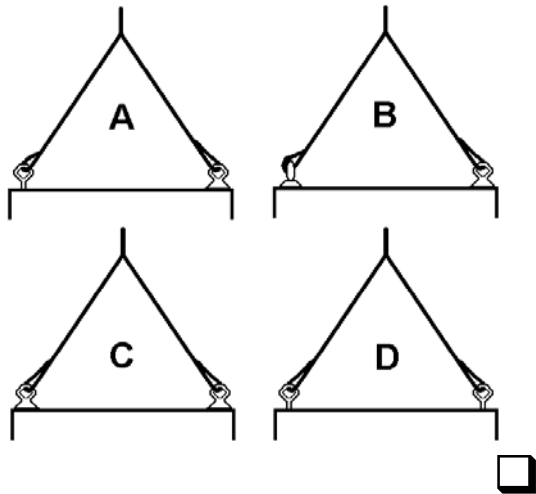
55. Name two types of lifting eye bolts.

56. Is it permissible to reeve a sling through two or more eyebolts and what effect does this have on the eyebolts?



57. Which type of eye bolt should be used for lifts where the pull on the sling is off centre to the axis of the eye bolt?

58. Select the correct method of using eyebolts with a two-legged sling.



59. What precautions should be taken when using a single eyebolt for lifting?

60. What advantage does a swivel fitting provide?

61. Why is it important to mouse a lifting hook or seize the pin of a shackle?

62. What should a lifting ring and the slings attached to it have in common?

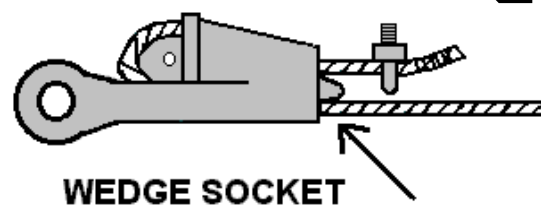
63. What defects can occur in lifting rings, eye-bolts and shackles? List two defects.

64. If a lifting ring or shackle is placed on a hook and it does not hang freely what does this indicate?

65. To what amount can the beak / bill of a hook be stretched before it is condemned?

66. What will condemn a hook from use? List two defects.

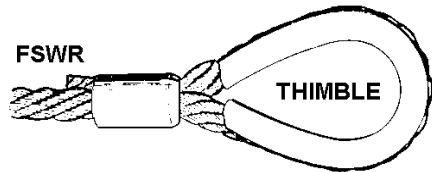
67. Should the wedge protrude outside the narrow end of the socket fitting? (as in the diagram)



68. What is the minimum amount of tail projection for the dead end of a rope used with a wedge socket?

69. What should be secured to the tail of a rope when in use with a wedge socket fitting, to indicate slippage?

70. Explain the reason for using a swaged aluminium alloy fitting or a thimble fitting.



71. What is the most obvious indication, of a defective swage fitting?

72. What details are displayed on a spreader-lifting beam? (List at least three)

SECTION D OPERATIONAL MANUAL

73. A sling of 2.0 tonnes WLL is reeved around a circular load. What is the sling now capable of lifting?

74. A sling of 8.0 tonnes WLL is reeved around a circular load. What is the sling now capable of lifting?

75. A sling of 4.0 tonnes WLL is reeved around a circular load. What is the sling now capable of lifting?

76. A sling of 6.0 tonnes WLL is reeved around a circular load. What is the sling now capable of lifting?

77. A sling of 5.0 tonnes WLL is reeved around a square load. What is the sling now capable of lifting?

78. A sling of 4.0 tonnes WLL is reeved around a square load. What is the sling now capable of lifting?

79. A sling of 3.0 tonnes WLL is reeved around a square load. What is the sling now capable of lifting?

80. A four (4) legged bridle sling arrangement is attached to a rigid load. How many and which sling legs would be assumed to support the load?

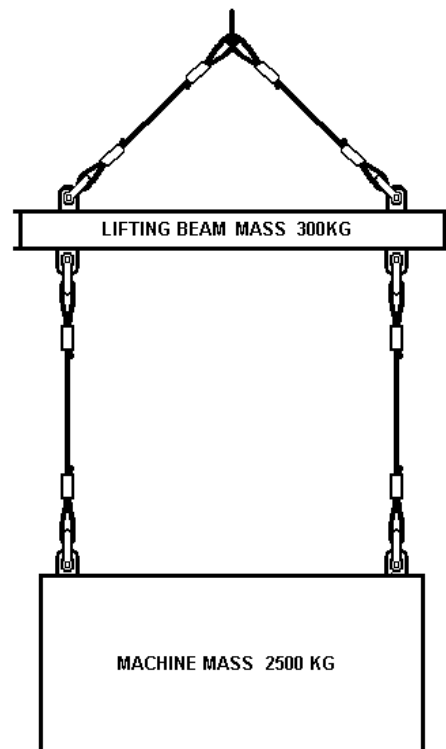
81. A three (3) legged bridle sling arrangement is attached to a rigid load. How many sling legs would be assumed to support the load?

82. A four (4) legged bridle sling arrangement is attached to a flexible load. How many sling legs would be assumed to support the load?

83. A sling of 1.5 tonnes WLL, is used in basket hitch around a square load. What is the sling now capable of lifting?

84. A sling of 1.5 tonne WLL is reeved around a square load. What is the sling now capable of lifting?

85. A lifting beam with a mass (weight) 300 kg is supported by a two legged sling shackled to the beam forming an included angle of 90 degrees at the crane hook. See diagram



Two slings are shackled to the underside of the lifting beam and vertically down to lifting eyes on a machine of mass 2,500 kg. What is the minimum SWL required of each of the four slings?

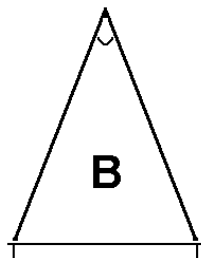
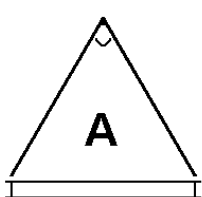
86. If two slings are spread at an included angle of 90 degrees, what is the load factor applied to the load been lifted?

87. If two slings are spread at an included angle of 30 degrees, what is the load factor applied to the load been lifted?

88. If two slings are spread at an included angle of 60 degrees, what is the load factor applied to the load been lifted?

89. If two slings are spread at an included angle of 120 degrees, what is the load factor applied to the load been lifted?

90. From the drawings below select the included angle closest to 90 degrees.



91. What reduction must be made to the WLL of a FSWR sling when it is reeved on a round load?

92. What reduction must be made to the WLL of a FSWR sling when it is reeved on a square load?

93. What safety factor must be applied to the WLL of a FSWR sling when a basket hitch is used to cradle a square load?

94. What safety factor must be applied to the WLL of a FSWR sling when a basket hitch is used to cradle a round load?

**SECTION E
LOAD ASSESSMENT**

95. What is the weight of a 25mm thick steel plate 3 metre long x 2 metre wide?

Note: Structural steel weighs 7,840 kg per cubic metre.

Answer to be provided in KILOGRAMS.
(All workings to be shown)

96. What is the weight of a 25mm thick steel plate 3 metre long x 3 metre wide?

Note: Structural steel weighs 7,840 kg per cubic metre.

Answer to be provided in KILOGRAMS.
(All workings to be shown)

99. What is the weight of a 50mm thick steel plate 5 metre long x 2 metre wide?

Note: Structural steel weighs 7,840 kg per cubic metre.

Answer to be provided in KILOGRAMS.
(All workings to be shown)

97. What is the weight of a 1.5 cubic metre concrete kibble filled with concrete if the tare weight of the kibble is 600 kg?

Note: Concrete weighs 2,400 kg per cubic metre.

Answer to be provided in KILOGRAMS.
(All workings to be shown)

100. What is the weight of a 50mm thick steel plate 3 metre long x 3 metre wide?

Note: Structural steel weighs 7,840 kg per cubic metre.

Answer to be provided in KILOGRAMS.
(All workings to be shown)

98. What is the weight of a 2 cubic metre concrete kibble filled with concrete if the tare weight of the kibble is 700 kg?

Note: Concrete weighs 2,400 kg per cubic metre.

Answer to be provided in KILOGRAMS.
(All workings to be shown)

101. What is the weight of a 25mm thick steel plate 5 metre long x 2 metre wide?

Note: Structural steel weighs 7,840 kg per cubic metre.

Answer to be provided in KILOGRAMS.
(All workings to be shown)

102. One metre of universal beam weighs 125 kg. One metre of scaffold plank weighs 7 kg. One square metre of mild steel plate weighs 156 kg.

Find the total weight of a load made up of the following:

- 4 universal beams each 8 metres long;
- 15 scaffold planks each 4.4 metres long;
- 2 mild steel plates 4 metres long and 0.5 metres wide.

Answer to be given in KILOGRAMS.
(All workings must be shown)



**SECTION F
CRANE LOAD CHART**

The load chart questions have been separated into sections pertaining to each specific crane class. Select the section that corresponds to the crane type you are assessing for.

Questions 103 to 114 apply only to Tower Cranes.

103. State three essential items of information you would expect to obtain from a load chart.



104. When dealing with a crane load chart, what is meant by the term "operating radius"?



105. List three items that need to be calculated to determine the crane capacity at radius?



106. If a heavy load is to be lifted What precautions would you take to work within a given radius?



107. On the Load Chart, the hoist capacities for the winch in low speed is 12 tonnes and high speed, 6 tonnes. What precaution is necessary if changing from low to high speed?



108. On a crane Load Chart, define the terms GBS, MBS and GBL?



109. The crane you are operating has a single fall capacity of 7 tonnes, the load to be lifted is 10 tonnes. How can this lift be achieved using this crane?

110. On a level luffing Tower Crane, rigged with a 2-part hook, the Load Chart specifies not to exceed more than half the maximum radius. What is the reason for this restriction?

111. The load indicator mechanism fails, could you still operate the crane?

112. The crane load chart is virtually unreadable from age or wear, could you still operate the crane and what action would you need to take?

113. How would you identify that the correct load chart is affixed to the crane?

114. On a Tower Crane, the load chart displays single fall maximum load 12 tonnes and double fall maximum load 16 tonnes. Why is the double fall capacity not twice the single fall capacity?

Questions 115 to 121 apply only to Derrick and Portal Cranes.

115. State three essential items of information you would expect to obtain from a load chart.



116. When dealing with a crane load chart, what is meant by the term "operating radius"?

117. List three items that need to be calculated to determine the crane capacity at radius?



118. If a heavy load is to be lifted what precautions would you take to work within a given radius?

119. The crane you are operating has a single fall capacity of 7 tonnes, the load to be lifted is 10 tonnes. How can this lift be achieved using this crane?



120. The crane load chart is virtually unreadable from age or wear, could you still operate the crane and what action would you need to take?



121. The Load Chart shows 30 tonnes at minimum and maximum radii. What is the reason for this constant capacity?



Questions 122 to 124 apply only to Bridge and Gantry Cranes.

122. Where would you locate the Safe Working Load (SWL) of a Bridge and Gantry Type Crane.



123. Bridge and Gantry type Cranes are sometimes fitted with a spreader attachment. If the spreader attachment is removed to allow lifting with a heavy lift hook, does the slings/lifting attachments weight (mass) have to be taken into consideration in the total weight (mass) to be lifted?



124. While operating a Bridge and Gantry Crane you observe the overload light glow on the instrument panel, what is your responsibility as an operator?




Questions 125 to 129 apply only to Vehicle Loading Cranes.


125. State three essential items of information you would expect to obtain from a load chart.




126. When dealing with a crane load chart, what is meant by the term "operating radius"?





127. List three items that need to be calculated to determine the crane capacity at radius? 


128. If a heavy load is to be lifted what precautions would you take to work within a given radius? 


129. The crane load chart is virtually unreadable from age or wear, could you still operate the crane and what action would you need to take? 


Questions 130 to 145 apply only to Non-slewing Mobile Cranes and Slewing Mobile Cranes (up to 20 tonnes, up to 60 tonnes, up to 100 tonnes and over 100 tonnes).


130. State three essential items of information you would expect to obtain from a load chart. 

131. When dealing with a crane load chart, what is meant by the term "operating radius"? 

132. List three items that need to be calculated to determine the crane capacity at radius? 

133. If a heavy load is to be lifted what precautions would you take to work within a given radius? 

134. What do you understand when it is said that the load chart is based on 75% of tipping? 

135. The load chart may have a heavy black line across the chart. What are the figures based on above the line and below the line? 

136. Is a rubber-tyred mobile crane normally more stable when lifting over the rear or over the side?

137. How do you determine when to include the fall of the hoist rope as part of the rated load?

138. When the fly jib is offset at 15 degrees do you consider it could have a higher rated load than at 0 degrees offset?

139. When the precise reading is not available on a load chart, do you increase or decrease the load capacity?

140. When mobilising a load on level ground what is the margin of stability based. (express as a percentage of tipping)?

141. If a crane has a fly jib stowed on the main boom section what may happen to the SWL of the crane?

142. How do you determine how the ratings are worked out on a fly jib?

143. Explain three uses of a range diagram?

144. How do you know if a hydraulic boom can be extended to lift a load?

145. How would you identify that the correct load chart is affixed to the crane?

Select 2 from the following questions (146 and 147) for assessments related to Vehicle Loading Cranes.

146. **Refer to Load Chart (R).**
A vehicle-loading crane with Load Chart (R) is set up as follows:

- Main boom length 12.00 metres
- Boom horizontal
- Set up on stabilisers

What is the maximum load that can be raised on the hook?

(Workings and adjustments must be shown in your written answer).



147. **Refer to Load Chart (R).**
A vehicle-loading crane with Load Chart (R) is set up as follows:

- Main boom length 5.00 metres
- Boom horizontal
- Set up on stabilisers

What is the maximum load that can be raised on the hook?

(Workings and adjustments must be shown in your written answer).



Select 2 from the following questions (148 to 155) for assessments related to Non-slewing Mobile cranes.

148. **Refer to Load Chart (V).**
A tractor crane with Load Chart (V) is set up as follows:

- Main boom length 11.50 metres
- Boom angle 40.00 degrees
- Two fall hook block fitted.

What is the maximum load that can be raised on the hook?

(Workings and adjustments must be shown in your written answer).



149. **Refer to Load Chart (V).**
A tractor crane with Load Chart (V) is set up as follows:

- Main boom length 8.50 metres
- Boom angle 40.00 degrees
- Two fall hook block fitted.

What is the maximum load that can be raised on the hook?

(Workings and adjustments must be shown in your written answer).



150. **Refer to Load Chart (V).**
A tractor crane with Load Chart (V) is set up as follows:

- Main boom length 12.50 metres
- Boom angle 35.00 degrees
- Two-fall hook blocked fitted.

What is the maximum load that can be raised on the hook?

(Workings and adjustments must be shown in your written answer).



151. **Refer to Load Chart (V).**
A tractor crane with Load Chart (V) is set up as follows:

- Main Boom length 7.00 metres
- Boom Angle 5 degrees
- Four fall hook block fitted.

(i) What is the maximum load that can be raised on the hook?

(ii) Determine the speed to travel at when mobilizing this load?

(Workings and adjustment must be shown in your answer).



(i) _____

(ii) _____

152. **Refer to Load Chart (U).**
An articulating crane with Load Chart (U) has a boom length that gives a working radius of 15.00 metres from the front axle at zero degrees boom angle.

When the chassis is straight, what is the maximum load that can be raised on the 2-fall hook block, with the boom elevated to an angle of 10 degrees?

(Workings and adjustments must be shown in your written answer).



153. **Refer to Load Chart (U).**
An articulating crane with Load Chart (U) has a boom length that gives a working radius of 12.00 metres from the front axle, at zero degrees boom angle.

When the chassis is straight, what is the maximum load that can be raised on the two-fall hook block, with the boom elevated to an angle of 55 degrees?

(Workings and adjustments must be shown in your written answer).



154. **Refer to Load Chart (U)**
An articulating crane with Load Chart (U) has a boom length that gives a working radius of 13.00 metres from the front axle, at zero degrees boom angle.

When the chassis is articulated, what is the maximum load that can be raised on the 2-fall hook block, with the boom elevated to an angle of 50 degrees?

(Workings and adjustments must be shown in your written answer).



155. **Refer to Load Chart (U).**
An articulating crane with Load Chart (U) has a boom length which maintains a working radius of 2.00 metres from the front axle at a 60 degree boom angle.

- (i) When the chassis is straight, what is the maximum load that can be raised?
- (ii) Determine whether the crane can articulate while lifting this load?
- (iii) Determine whether this load can be telescoped, by extending the crane boom?

(Workings and adjustments must be shown in your written answer).



(i) _____

(ii) _____

(iii) _____

Select 2 from the following questions (156 to 163) for assessments related to Slewing Mobile cranes up to 20 tonnes capacity.

156. **Refer to Load Chart (X).**
A mobile crane with Load Chart (X) is set up as follows:

- Main boom length 16.00 metres
- Working radius 10.50 metres
- Outriggers extended to 5.63 metres
- 6.3 metre auxiliary jib, with single line and auxiliary hook fitted.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your answer).



157. **Refer to Load Chart (Y).**
A mobile crane with Load Chart (Y) is set up as follows:

- Main boom length 8.2 metres
 - Working radius 4.5 metres
 - On rubber (no outriggers)
 - "A" frame jib stowed.
- (i) What is the maximum load that can be raised and carried on the MAIN hook over the front at creep speed?
- (ii) How many parts of line are required to support the load?

(Workings and adjustments must be shown in your written answer).



(i) _____

(ii) _____

158. **Refer to Load Chart (Y).**
A mobile crane with Load Chart (Y) is set up as follows:

- Main boom length 13.00 metres
- Working radius 4.50 metres
- Outriggers fully extended
- 4.6 metre "A" frame jib erected with single line and auxiliary hook fitted.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



159. **Refer to Load Chart (Y).**
A mobile crane with Load Chart (Y) is set up as follows:

- Main boom length 17.00 metres
- Working radius 6.50 metres
- Outriggers fully extended.
- 4.6 metre "A" frame jib erected with single line and auxiliary hook fitted.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



160. **Refer to Load Chart (X).**
A mobile crane with Load Chart (X) is set up as follows:

- Main boom length 16.00 metres
 - Working radius 5.50 metres
 - Without outriggers mobile (on rubber)
- (i) What is the maximum load that can be raised and carried (Pick & Carry) on the MAIN hook over the front of the crane?
- (ii) How many parts of the line are required to support the load?

(Workings and adjustments must be shown in your written answer).



i) _____

(ii) _____

161. **Refer to Load Chart (X).**
A mobile crane with Load Chart (X) is set up as follows:

- Main boom length 25.80 metres
- Working radius 12.00 metres
- Outriggers extended to 3.60 metres
- 6.3 metre auxiliary jib with single line and auxiliary hook fitted.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



162. **Refer to Load Chart (W).**
A crawler crane with Load Chart (W) is set up as follows:

- Main boom length 24.38 metres
- Working radius 11.00 metres
- Work area 360 degrees
- Auxiliary jib erected with single line hook.
- 3 sheave hook block fitted on main hoist rope.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



163. **Refer to Load Chart (W).**
A crawler crane with Load Chart (W) is set up as follows:

- Main boom length 21.34 metres
- Working radius 7.50 metres
- Work area 360 degrees
- Auxiliary jib erected with single line hook.
- 3 sheave hook block fitted on main hoist rope.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



Select 2 from the following questions (164 to 168) for assessments related to Slewing Mobile cranes up to 60 tonnes capacity.

164. Refer to Load Chart (W).

A crawler crane with load chart (W) is set up as follows:-

- Main boom length 15.24 metres
- Working radius 12.00 metres
- Work area 360 degrees
- Auxiliary jib erected with single line hook.
- 3 sheave hook block fitted on main hoist rope.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



165. Refer to Load Chart (W)

A crawler crane with load chart (W) is set up as follows:-

- Main boom length 30.48 metres
- Working radius 8.00 metres
- Work area 360 degrees
- Auxiliary jib erected with single line hook.
- 3 sheave hook block fitted on main hoist rope.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



166. Refer to Load Chart (W)

A crawler crane with Load Chart (W) is set up as follows:

- Main Boom length 9.14 metres
- Working Radius 3.50 metres
- Work area 360 degrees
- Auxiliary jib is not erected.

(i) What is the maximum load that can be raised on the MAIN hook?

(ii) Determine the applicable hook block and reeving requirements?

(Workings and adjustment must be shown in your answer).



(i) _____

(ii) _____

167. **Refer to Load Chart (S).**
A mobile hydraulic crane with Load Chart (S) is set up as follows:

- Main Boom length 34.75 metres
- Working Radius 20.00 metres
- Work area: Over side and over rear with outriggers
- 21.00 metre length Auxiliary jib with single line and auxiliary hook fitted with a 10 degree offset incorporated.
- 3 sheave hook block fitted on main hoist rope

- (i) What is the maximum load that can be raised on the MAIN hook?
- (ii) What is the maximum load that can be raised on the AUXILIARY hook at the same radius as question (i)?
- (iii) Determine the maximum AUXILIARY hook load with the main boom at an 80-degree boom angle and with the boom fully retracted?

(Workings and adjustment must be shown in your answer).



- (i) _____

- (ii) _____

- (iii) _____

168. **Refer to Load Chart(S).**
A mobile hydraulic crane with Load Chart (S) is set up as follows:

- Main Boom length 23.00 metres
- Working Radius 18.00 metres
- Work area: Over side and over rear with outriggers
- Auxiliary jib stowed
- 5 sheave hook block fitted on main hoist rope

- (i) What is the maximum load that can be raised on the MAIN hook?
- (ii) Determine how the capacity of the crane can increase at this radius, describe to what extent?

(Workings and adjustment must be shown in your answer).



- (i) _____

- (ii) _____

Select 2 from the following questions (169 to 171) for assessments related to Slewing Mobile cranes up to 100 tonnes capacity.

169. **Refer to Load Chart (Z).**
A crawler crane with load chart (Z) is set up as follows:-

- Main boom length 39.62 metres
- Working radius 12.00 metres
- Work area 360 degrees
- 12.19 metre length jib erected with 300kg ball hook.
- 3 sheave hook block on main hoist rope.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



170. **Refer to Load Chart (Z)**

A crawler crane with Load Chart (Z) is set up as follows:

- Main boom length 45.72 metres
- Working radius 12.00 metres
- Work area 360 degrees
- 18.29 metre length jib erected with 300kg ball hook.
- 3 sheave hook block on main hoist rope.

What is the maximum load that can be raised on the MAIN hook?

(Workings and adjustments must be shown in your written answer).



171. **Refer to Load Chart (Z)**
A crawler crane with Load Chart (Z) set up as follows:

- Main Boom length 54.86 metres
 - Working Radius 23.00 metres
 - Work area: 360 degrees
 - 5 sheave hook block fitted on the main hoist rope
- (i) What is the maximum load that can be raised on the MAIN hook?
- (ii) Determine whether the crane can lower the entire boom length to the ground, explain your answer determining the appropriate zone to lower the boom in?
- (iii) State whether mid point suspension (centre hitch) supports are required for this boom length?
- (iv) Identify which boom sections require replacement when re-configuring the boom length to a 48.77 metre length?

(Workings and adjustment must be shown in your answer).



- (i) _____

- (ii) _____

- (iii) _____

- (iv) _____

Select 2 from the following questions (172 to 174) for assessments related to Slewing Mobile cranes over 100 tonnes capacity.

172. **Refer to Load Chart (Z)**
A crawler crane with Load Chart (Z) set up as follows:

- Main Boom length 48.77 metres
- Working Radius 12.00 metres
- Work area: 360 degrees
- 12.19 metre length jib erected with 300 kg ball hook
- Single sheave hook block fitted on main hoist rope

- (i) What is the maximum load that can be raised on the JIB hook?
- (ii) Determine whether the crane can raise the entire boom and jib length off the ground, explain your answer determining the appropriate zone to raise the boom in?
- (iii) Determine what the appropriate counterweight for this crane?
- (iv) Identify the warning requirement when erecting this boom and jib length?

(Workings and adjustment must be shown in your answer).



- (i) _____

- (ii) _____

- (iii) _____

- (iv) _____

173. **Refer to Load Chart (T)**
A mobile lattice boom crane with Load Chart (T) is set up as follows:

- Main Boom length 12.20 metres
- Working Radius 7.00 metres
- Work area: Over rear
- Three sheave 135 tonne hook block fitted on main hoist rope

(i) What is the maximum load that can be raised on the MAIN hook?

(ii) Identify the requirement to prevent forward tipping of the crane when using boom length less than 36.58 metres.

(iii) Identify the applicable boom type/construction for this lift.

(iv) Determine the reduction factor for lifting over the front of the carrier. (Workings and adjustment must be shown in your answer).



(i) _____

(ii) _____

(iii) _____

(iv) _____

174. **Refer to Load Chart (T).**
A mobile lattice boom crane with Load Chart (T) is set up as follows:

- Main Boom length 88.40 metres
- Working Radius 27.40 metres
- Work area: Over side
- Single sheave 60 tonne hook block fitted on main hoist rope

(i) What is the maximum load that can be raised on the MAIN hook?

(ii) Determine whether the crane can lower the entire boom length to the ground over the side.

(iii) Determine the applicable counterweights when set up on outriggers.

(iv) Determine whether the crane can travel with the 88.40 metre boom length.

(Workings and adjustment must be shown in your answer).



(i) _____

(ii) _____

(iii) _____

(iv) _____

ANSWERS TO WRITTEN QUESTIONS

SECTION A:

SLINGS (Chain, Wire rope, Fibre rope, Synthetic)

1. Diameter in mm Squared = The WLL in kg.

Note:

If unknown, the formula for fibre rope should apply or be accepted.

2.

- (i) 12mm = $12 \times 12 = 144$ kg WLL.
- (ii) 15mm = $15 \times 15 = 225$ kg WLL.
- (iii) 20mm = $20 \times 20 = 400$ kg WLL.

Note:

If unknown, the formula for fibre rope should apply or be accepted.

3. 12 mm diameter.

4. 16 mm diameter.

5.

- Strands are fraying,
- Strands are cut,
- Rope rotted by acid or alkali,
- Rope affected by mildew,
- Rope affected by heat, sun rot,
- Rope has been overloaded,
- Rope chafed inside or outside,
- Unlaid strands,
- Knotted rope.

6. 65 degrees celsius.

7. No, not under any circumstances.

8. By reading the manufacturer's Tag, or by colour code chart.

Note:

If no manufacturer's tag, do not use.

9.

- No external wear; abrasions.
- No internal wear; is often indicated by the thickness of the sling or the presence of grit and dirt.
- No damage caused by high temperatures, sunlight or chemicals.
- No damage to the label/tag or stitching.
- No damage to eyes, terminal attachments or end fittings.
- Label has not been removed, destroyed or is not legible.
- No damage to sleeve or protective coating.
- Nylon sling has not come into contact with acid; polyester sling has not come into contact with organic solvents such as; paint, coal tar or paint stripper etc.
- No visible cuts or tears or contusions.

10.

- Label/Tag has been removed/destroyed or not legible.
- Damage to sleeve
- Evidence of external wear or abrasions
- Evidence of internal wear.
- If damaged by temperatures, sunlight or chemicals
- Damage to stitching
- Damage to eyes, terminal attachments or end fittings
- Nylon sling has come into contact with acid; polyester sling has come into contact with organic solvents such as; paint, coal tar or paint stripper etc.
- There are any visible cuts, tears or contusions.

- 11.
- Stored in a clean, dry and well ventilated place.
 - Never store on the ground or floor.
 - Store out of direct sunlight, ultra-violet light or fluorescent lighting.
 - Store under cover.
 - Store away from chemicals.
 - Stored away from oils
 - Stored away from sand/grit
 - Stored away from machinery
 - Stored in a vermin free environment

Note:

The working life of synthetic slings will be shortened if exposed to any of the above.

12. Diameter in mm squared x 8 = the WLL in kg.

13.

- (i) $15 \text{ mm} = 15 \times 15 \times 8 = 1800 \text{ kg WLL.}$
- (ii) $20 \text{ mm} = 20 \times 20 \times 8 = 3200 \text{ kg WLL.}$
- (iv) $25 \text{ mm} = 25 \times 25 \times 8 = 5000 \text{ kg WLL.}$

14. 5 mm diameter.

15. 95 degrees celsius

16. Where 10% of the total number of wires are broken in one rope lay or over 8 diameters of rope.

17.

- (i) $6/19 = 6 \times 19 = 114 \text{ wires}$
 $10\% \text{ of } 114 = 11.4 \text{ wires}$
 in one rope lay, therefore 11 wires ($12 \text{ mm} \times 8 = 96\text{mm}$ length of rope to inspect)
- (ii) $6/24 = 6 \times 24 = 144 \text{ wires}$
 $10\% \text{ of } 144 = 14.4 \text{ wires}$
 in one rope lay, therefore 14 wires ($20 \text{ mm} \times 8 = 160\text{mm}$ length of rope to inspect)

- (iii) $6/36 = 6 \times 36 = 216 \text{ wires}$
 $10\% \text{ of } 216 = 21.6 \text{ wires}$
 in one rope lay, therefore 21 wires ($54 \text{ mm} \times 8 = 432\text{mm}$ length of rope to inspect)

18. Core slippage occurs where the outer wire strands slip over the inner core of the opposite lay.

19.

- Kink or fractures from bending or reeving,
- Crushed or jammed strands,
- Damaged splice,
- Exposure to high temperature,
- Abrasion
- Core collapse.
- Bird-caging where the strands loosen from their proper tight lay
- Stretched or overloading.
- High stranding.
- Corrosion - loose and springy wires indicate serious corrosion, knotted.
- Wear caused by badly maintained or misaligned sheaves.
- The number of broken wires exceeding allowable limit.

20. Grade 80 High tensile chain

Diameter in mm squared x Grade x 0.4 = WLL in kg; or

Diameter in mm squared x 32 = WLL in kg.

21. Grade 80 chain

- (i) $10 \text{ mm} = 10 \times 10 \times 32 = 3,200 \text{ kg WLL.}$
- (ii) $12 \text{ mm} = 12 \times 12 \times 32 = 4,608 \text{ kg WLL.}$
- (iii) $15 \text{ mm} = 15 \times 15 \times 32 = 7,200 \text{ kg WLL.}$

22. Basic grade 30 = 8 mm
 High tensile grade 80 = 5.5 mm

23. Basic grade 30 - 260°C
High tensile grade 80 - 400°C

Note:

If 260°C is exceeded, the W.L.L. of the chain is reduced.

- 24.
- Twisted, kinked, knotted.
 - Stretched, locked or does not move freely.
 - Gouged, cut or crushed more than 10% of the link's original diameter.
 - Pitting.
 - More than 10% wear in the diameter of the link.
 - Exposed to excessive heat.
 - Cracked, spot welded.
25. The maximum amount of wear permitted in a chain is 10% of the diametrical cross section.
- 26.
- (i) Links will wear at the link ends from metal wear down.
 - (ii) Links will wear on the outer sides of the link from being dragged.
- 27.
- (i) Check the grade markings and use accordingly until a new tag is obtained. If unsure about markings treat as mild steel grade 30, until the chain is checked by the manufacturer / supplier or competent person.
 - (ii) It should be removed from service immediately as it is not a load chain.
28. The marking indicates it is a lifting chain and also indicates the grade of a chain.

Note:

Most chains are marked with an identification letter or number every 20th link or at intervals of not more than 1 metre.

Examples:

Grade 30 = L or 30 or 3
Grade 40 = M or 40 or 4 or 04
Grade 50 = P or 50 or 5 or 05
Grade 60 = S or 60 or 6 or 06
Grade 80 = T
Grade 100 = V

If unsure, refer to manufacturer.

SECTION B:
SHEAVES AND DRUMS

- 29.
- (i) Excessive wear in the groove of a sheave.
 - (ii) Cracks or any damage in the flange of a sheave.
 - (iii) Twisted/deformed or out of shape.
 - (iv) Worn sheave pins, hinge pin wear.
 - (v) Damaged cheek plates or cheek plate wall/partition is too close or too far from sheave.
- 30.
- (i) Can cause the FSWR to break.
 - (ii) Can cause the load to drop.
 - (iii) Can damage sheave.
 - (iv) Can cause structural damage to the crane
31. The basic “rule of thumb” used to calculate sheave size is rope diameter X 20.
32. 1/3 or 120 degrees.
33. The sheave groove depth should not be less than 1½ times the diameter of the FSWR being used.
34. The drum flange must extend above the outer layer of the wire rope by at least two rope diameters.
35. Ensures Hoist wire remains at the correct fleet angle to the winch drum.
36. Will cause flattening of the rope.

37. Will cause pinching and abrasion to the rope.
38. A sheave is measured across the face of the sheave to the inside of the grooves on either side in mm.
39. Minimum of 2 full turns (2).
40. (I) Spooling or uneven coiling of the hoist rope on the hoist drum.
- (ii) The Hoist rope may be pulled off the sheave and jam.
41. (I) Spooling or uneven coiling of the hoist rope on the hoist drum.
- (ii) The Hoist rope may be pulled off the sheave and jam.

SECTION C:

ROPE TERMINATIONS, ANCHORS AND ATTACHMENTS ASSOCIATED DURING LIFTING OPERATIONS

42. To protect load slings and lifting gear from damage.
43. It should be stamped or marked on the hook, in SWL.
- 44.
- (i) By using a hambone wedge socket.
- (ii) By using a hand splice or machine splice with thimble
- (iii) By using wire adjusters
45. A safety latch/device shall be fitted (where applicable) across the mouth of the hook
- Note:
Mousing is another acceptable method but should only be used in a temporary situation.
- 46.
- (i) The rope has been twisted when running on to the drum.
- (ii) The rope used may be the wrong type (eg Rotating FSWR)
- (iii) The rope may be incorrectly fixed at the head of the boom.
- (iv) The rope may be incorrectly fitted to the winch drum.
- 47.
- (i) Socket and wedge.
- (ii) Clamp and bolts.
48. Correct answer is 'B', 'D' and 'E'.
49. No, wire rope could crush or pull through the bulldog grip.
50. Designed to protect the load bearing area inside the crown of the eye from chafing and distortion and to form a hard eye in a rope.
51. The "D" and "Bow" shackle.
52. The shackle must be clearly marked with its WLL.
53. The "bow" shackle should be used which allows room around the inside of the crown for the sling legs. Pin to be placed on hook.
- 54.
- Shackle failure could occur causing load to drop
 - It is against regulations
 - Shackles could be of different WLLs or material grade
 - Incorrect fitting or loose fitting
55. Collared and uncollared.
56. No, slings should never be reeved through two or more eye bolts. The strain on the eye bolt is doubled. Could damage or bend the eye bolt.
57. Collared eye bolts.
58. Correct answer is 'C'.

59. Ensure that eyebolt is firmly tightened and secured to prevent unwinding when load is suspended.
60. A swivel will prevent a chain, rope or tackle from twisting and will allow any twists to unwind.
61. Stop the dislodging of loads from the hook and the pin from unscrewing.
62. The lifting ring and the sling should have equal WLL/SWL
- 63.
- (i) More than 10% wear
 - (ii) For a ring 5% wear
 - (iii) Gouged, cut, nicked.
 - (iv) Stretched, elongated.
 - (v) Twisted, kinked.
 - (vi) No SWL/WLL displayed and/or illegible.
 - (vii) Exposed to excessive heat
 - (viii) Fractures
 - (ix) Incorrect fitting pins
64. The shackle or lifting ring is too small for the hook.
65. Not more than 5%.
- 66.
- (i) The bill has been stretched more than 5%.
 - (ii) Cuts, gouges more than 10% wear.
 - (iii) Cracks, twisted and overloaded hook.
 - (iv) Exposed to excessive heat (280 degrees celsius).
67. Under no circumstances should the wedge protrude at the narrow end of the socket.
68. In most cases, the tail on the dead end of the rope should project at least 200 mm.
69. A bulldog grip must be applied only to the tail of the rope below the socket.
70. To form an eye splice or thimble eye in a wire rope.
- 71.
- The tail of FWSR has slipped inside the swage fitting
 - Steel collar thimble is loose on the rope
 - The fitting is loose
 - There is a broken wire at either end of the swaged fitting
- 72.
- Tare weight of the beam.
 - SWL / WLL
 - Approval plate
 - Registration number
73. 1.5 tonne.
74. 6 tonne.
75. 3 tonne.
76. 4.5 tonne.
77. 2.5 tonne.
78. 2 tonne.
79. 1.5 tonne.
80. 2 diagonally opposite sling legs must be capable of supporting the load.
81. Any two legs of the sling arrangement.
82. The 4 sling legs.
83. 1.5 tonne.
84. 0.75 tonne.
85. Slings between machine and beam 1,250 kg. The slings between the beam and hook use the formula- weight \square load factor (for 90 degrees the load factor is 1.41) 2800 kg \square 1.41 equals 1986 kg.
86. For 90 degrees the load factor is 1.41.

87. For 30 degrees the load factor is 1.91.
88. For 60 degrees the load factor is 1.73.
89. For 120 degrees the load factor is 1.00.
90. D is correct
91. 25%
92. 50%
93. Safety factor of 1 is applied.
(The SWL remains the same as the WLL).
94. Safety factor of 2 is applied.
(The SWL is double the WLL).
95. 1,176 kg
96. 1,764 kg
97. 4,200 kg
98. 5,500 kg
99. 3,920 kg
100. 3,528 kg
101. 1,960 kg
102. 5,086 kg
104. The distance of the hook from a known point on the crane at which a crane can operate safely with a known load.
- 105.
- **The hook block**
 - **Lifting attachments**
 - **The weight of the load.**
106. Reduce the operating angle of the crane and allow for boom deflection.
107. Make sure the load is in the high speed capacity range before changing over as failure to do so could cause hoist motor damage.
- 108.
- GBS = Guaranteed Breaking Strain
 - MBS = Maximum Breaking Strain
 - GBL = Guaranteed Breaking Load.
- 109.
- Double reeve the hook block
 - Break down the load into smaller parts.
110. Because of the two part reeving, half the weight of the load is transferred back to the hydraulic luffing rams. Any over-loading could cause damage or structural collapse of the rams.
111. No, the indicator must be fixed immediately.
112. No, the Load Chart must be replaced or cleaned immediately.
- 113.
- Measure the boom length.
 - Check the boom section lengths against drawings or specifications.
 - Measure the radius to verify.

| |
|--|
| <p>Answers 103 to 114 apply only to Tower Cranes.</p> |
|--|

103.

- **Mass of hook block.**
- **Winch line pull in tonnes or kilograms.**
- **SWL for a given crane configuration (eg, crane radius and boom length).**

Note: Other answers may also be considered applicable.

114. The double fall capacity is restricted because of the boom length. (The double fall capacity will increase to 24 tonnes if the boom length is shortened)

**Answers 115 to 121 apply only to
Derrick and Portal Cranes.**

115.

- Mass of hook block.
- Winch line pull in tonnes or kilograms.
- SWL for a given crane configuration (eg, crane radius and boom length).

Note: Other answers may also be considered applicable.

116. The distance of the hook from a known point on the crane at which a crane can operate safely with a known load.

117.

- **The hook block**
- **Lifting attachments**
- **The weight of the load.**

118. Reduce the operating angle to allow for boom deflection.

119.

- Double reeve the hook block
- Break down the load into smaller parts.

120. No. The Load Chart must be replaced immediately.

121. The crane is based on structural strength at the maximum radii.

**Answers 122 to 124 apply only to
Bridge and Gantry Cranes.**

122. Depending on the type of Bridge and Gantry Crane, the SWL would be located on the sill beam, the operator's cabin door or on a manufacturer's plate inside the operator's cabin.

123. Yes. All slings and attachments must be included when calculating the total weight (mass) to be lifted.

124. Stop operating immediately, lower the load to the ground and report incident to an authorised person. Await instructions

**Answers 125 to 129 apply only to
Vehicle Loading Cranes.**

125.

- **Mass of hook block.**
- **Winch line pull in tonnes or kilograms.**
- **SWL for a given crane configuration (eg, crane radius and boom length).**

Note: Other answer may also be considered applicable.

126. The distance of the hook from a known point on the crane at which a crane can operate safely with a known load.

127.

- **The hook block**
- **Lifting attachments**
- **The weight of the load.**

128. Reduce the operating angle of the crane and allow for boom deflection.

129. No. The Load Chart must be replaced immediately.

Answers 130 to 145 apply only to Non-slewing Mobile Cranes or to Slewing Mobile Cranes (up to 20 tonnes, up to 60 tonnes, up to 100 tonnes and over 100 tonnes).

130.

- Mass of hook block.
- Winch line pull in tonnes or kilograms.
- SWL for a given crane configuration (eg, crane radius and boom length).

Note: Other answer may also be considered applicable.

131. The distance of the hook from a known point on the crane at which a crane can operate safely with a known load.

132.

- The hook block
- Lifting attachments
- The weight of the load.

133. Reduce the operating angle of the crane and allow for boom deflection.

134. It is a reference to the SWL based on stability requirements for a stationary mobile crane.

135.

- (a) The figures above the line are based on structural strength.
- (b) The figures below the line are based on stability.

136. Over rear.

137. From the load chart or as per manufacturer's recommendations.

138. When the fly jib is offset at 15 degrees it would have a lower SWL.

139. Decrease the capacity of load.

140. 66% of tipping.

141. There may be a reduction of the SWL.

142. Usually by the angle of the flyjib, or as per the Load Chart.

143.

- Boom elevation height verses height of building or structure.
- Can determine the crane configuration requirements
- Sometimes the only way to determine jib load radii (when it can't be measured)

- Identifies the minimum allowable clearances between load blocks and boom tip

144. As specified by the Load Chart.

145.

- Measure the boom length.
- Check the boom section lengths against drawings or specifications.
- Measure the radius to verify.

Answers 146 to 147 apply only to Vehicle Loading Cranes

**146. Refer to Load Chart R.
12.0 metre boom at horizontal angle (Take the 13.8 metre length)
SWL 1000 kg**

**147. Refer to Load Chart R.
5.0 metre boom at horizontal angle (Take the 6.2 metre length)
SWL 2640 kg**

Answers 148 to 155 apply only to Non-slewing Mobile Cranes

**148. Refer to Load Chart V.
Adjustments:
2 fall hook block 60 kg
Total: 60 kg**

**12.0 metre boom at boom angle 40 degrees:
SWL 1500 kg
Deductions 60 kg
Maximum load: 1440 kg**

**149. Refer to Load Chart V.
Adjustments:
2 fall hook block 60 kg
Total: 60 kg**

**9.00 metre boom at boom angle 40 degrees:
SWL 2500 kg
Deductions 60 kg
Maximum load: 2440 kg**

150. Refer to Load Chart V.

Adjustments:

| | |
|-------------------|-------|
| 2 fall hook block | 60 kg |
| Total: | 60 kg |

13.00 metre boom at boom angle
35 degrees:

| | |
|---------------|---------------|
| SWL | 1000 kg |
| Deductions | 60 kg |
| Maximum load: | <u>940 kg</u> |

151. Refer to Load Chart V.

Adjustments:

| | |
|--------------------------|-------|
| 4 Fall Hook block weight | 80 kg |
| Total: | 80 kg |

(i) 7.00 metre boom at boom
angle 5 degrees:

| | |
|--------------|----------------|
| SWL | 2000 kg |
| Deductions | 80kg |
| Maximum Load | <u>1920 kg</u> |

(ii) The applicable speed is not in
excess of 3 km/h as per chart
conditions.

152. Refer to Load Chart U.

Adjustments:

| | |
|-------------------|-------|
| Hook block weight | 90 kg |
| Total: | 90 kg |

15.0 metre boom reach at boom
angle 10 degrees with straight
chassis:

| | |
|---------------|---------------|
| SWL | 800kg |
| Deductions | 90 kg |
| Maximum load: | <u>710 kg</u> |

153. Refer to Load Chart U.

Adjustments:

| | |
|-------------------|-------|
| Hook block weight | 90 kg |
| Total: | 90 kg |

12.0 metre boom reach at boom
angle 55 degrees with straight
chassis:

| | |
|---------------|---------------|
| SWL | 3000kg |
| Deductions | 90kg |
| Maximum load: | <u>2910kg</u> |

154. Refer to Load Chart U.

Adjustments:

| | |
|-------------------|-------|
| Hook block weight | 90 kg |
| Total: | 90kg |

13.0 metre boom reach at boom
angle 50 degrees with articulated
chassis:

| | |
|---------------|----------------|
| SWL | 2000kg |
| Deductions | 90kg |
| Maximum load: | <u>1910 kg</u> |

155. Refer to Load Chart U.

Adjustments:

| | |
|-------------------|-------|
| Hook block weight | 90 kg |
| Total: | 90 kg |

(i) 2.0 metre boom reach at
boom angle 60 degrees with
straight chassis:

| | |
|--------------|----------------|
| SWL | 12000kg |
| Deductions | 90 kg |
| Maximum Load | <u>11910kg</u> |

(ii) The crane cannot articulate
while lifting 11910 kg

(iii) The crane cannot telescope
while lifting 11910 kg as per
chart conditions.

Answers 156 to 163 apply only to
Slewing Mobile cranes up to 20 tonnes
capacity.

156. Refer to Load Chart X.

Adjustments:

| | |
|----------------|---------------|
| Main hook | 200 kg |
| Auxiliary hook | 80 kg |
| Auxiliary jib | 500 kg |
| Total: | 780 kg |

19.93 metre boom at 11 metres
radius with outriggers extended to
5.63 metre centres:

| | |
|----------------------|-----------------------|
| SWL | 4550kg |
| Deductions | 780kg |
| Maximum load: | <u>3770 kg</u> |

157. Refer to Load Chart Y.

Adjustments:

| | |
|----------------------|---------------|
| Main hook | 215kg |
| "A" frame jib stowed | 180 kg |
| Total: | 395 kg |

(i) 8.2 metre boom at 4.5 metres
radius on rubber:

| | |
|----------------------|-----------------------|
| SWL | 5650kg |
| Deductions | 395kg |
| Maximum load: | <u>5255 kg</u> |

(ii) Single fall max. load –
3000kgs.

Two (2) parts of line are required.

158. Refer to Load Chart Y.

Adjustments:

| | |
|------------------|----------------------|
| Main hook | 215 kg |
| Single line hook | 45 kg |
| "A" frame jib | 320 kg |
| Total: | <u>580 kg</u> |

13.0 metre boom at 4.5 metres
radius with outriggers fully
extended:

| | |
|----------------------|------------------------|
| SWL | 11150 kg |
| Deductions | 580kg |
| Maximum load: | <u>10570 kg</u> |

159. Refer to Load Chart Y.

Adjustments:

| | |
|------------------|----------------------|
| Main Hook | 215 kg |
| Single line hook | 45 kg |
| "A" frame jib | 320 kg |
| Total: | <u>580 kg</u> |

17.0 metre boom at 6.5 metres
radius with outriggers fully
extended:

| | |
|----------------------|-----------------------|
| SWL | 6220 kg |
| Deductions | 580 kg |
| Maximum load: | <u>5640 kg</u> |

160. Refer to Load Chart X.

(i) Adjustments:

| | |
|--------------|--------------|
| Main hook | 200 kg |
| Total | 200kg |

19.93 metre boom at 5.5 metres
radius without outriggers over the
front (Pick & Carry):

| | |
|----------------------|-----------------------|
| SWL | 3650 kg |
| Deductions | 200 kg |
| Maximum load: | <u>3450 kg</u> |

(ii) Single line maximum Load:
3340 kg

Two (2) parts of line are required.

161. Refer to Load Chart X.

Adjustments:

| | |
|----------------|---------------|
| Main hook | 200 kg |
| Auxiliary hook | 80 kg |
| Auxiliary jib | 500 kg |
| Total: | 780 kg |

25.80 metre boom at 12.00 metres
radius with outriggers extended to
3.60 metre centres:

| | |
|----------------------|-----------------------|
| SWL | 2000 kg |
| Deductions | 780 kg |
| Maximum load: | <u>1220 kg</u> |

162. Refer to Load Chart W.

Adjustments:

| | |
|---------------------|--------|
| 3 sheave hook block | 215 kg |
| Single line hook | 45 kg |
| Auxiliary jib | 700 kg |
| Total: | 960 kg |

24.38 metre boom at 12.00 metre radius:

| | |
|---------------|----------------|
| SWL | 2910 kg |
| Deductions | 960 kg |
| Maximum load: | <u>1950 kg</u> |

163 Refer to Load Chart W.

Adjustments:

| | |
|---------------------|--------|
| 3 sheave hook block | 215 kg |
| Single line hook | 45 kg |
| Auxiliary jib | 700 kg |
| Total: | 960 kg |

21.34 metre boom at 8.00 metre radius:

| | |
|---------------|---------------|
| SWL | 5330 kg |
| Deductions | 960kg |
| Maximum load: | <u>4370kg</u> |

Answers 164 to 168 apply only to Slewing Mobile cranes up to 60 tonnes capacity.

164. Refer to Load Chart W.

Adjustments:

| | |
|---------------------|--------|
| 3 sheave hook block | 215 kg |
| Single line hook | 45 kg |
| Auxiliary jib | 700 kg |
| Total: | 960 kg |

15.24 metre boom at 12.00 metre radius:

| | |
|---------------|----------------|
| SWL | 3150 kg |
| Deductions | 960 kg |
| Maximum load: | <u>2190 kg</u> |

165. Refer to Load Chart W.

Adjustments:

| | |
|---------------------|---------------|
| 3 sheave hook block | 215 kg |
| Single line hook | 45 kg |
| Auxiliary jib | 700 kg |
| Total: | <u>960 kg</u> |

30.48 metre boom at 8.00 metre radius:

| | |
|---------------|----------------|
| SWL | 5090 kg |
| Deductions | 960 kg |
| Maximum load: | <u>4130 kg</u> |

166. Refer to Load Chart W.

Adjustments:

| | |
|---------------------|--------|
| 3 Sheave Hook block | 215 kg |
| Total: | 215 kg |

(i) 9.14 metre boom at 3.50 metres radius:

| | |
|--------------|----------------|
| SWL | 18130kg |
| Deductions | 215kg |
| Maximum Load | <u>17915kg</u> |

(ii) The applicable hook block would be the 3 sheave type and reeving up to 7 falls would be required.

167. Refer to Load Chart S.

Adjustments: for Task (i)

| | |
|---------------------|---------|
| 3 Sheave Hook block | 400 kg |
| Auxiliary jib | 2260 kg |
| Auxiliary hook | 205kg |
| Total: | 2865 kg |

Adjustments: for Task (ii)

| | |
|---------------------|-------|
| 3 Sheave Hook block | 400kg |
| Auxiliary hook | 205kg |
| Total: | 605kg |

Adjustments: for Task (iii)

| | |
|---------------------|-------|
| 3 Sheave Hook block | 400kg |
| Auxiliary hook | 205kg |
| Total: | 605kg |

Answers 169 to 171 apply only to Slewing Mobile cranes up to 100 tonnes capacity.

(i) 34.75 metre boom at 20.00 metres radius
 SWL 3680 kg
 Deductions 2865 kg
 Maximum Load 815 kg

(ii) 21.00 metre Auxiliary jib with a 10 degree offset at 20.00 metres radius:
 SWL 1550 kg
 Deductions 605 kg
 Maximum Load 945 kg

(iii) 21.00 metre Auxiliary jib with a 10 degree offset with the main boom at a 80 degree boom angle and with the boom retracted fully:
 SWL 2100 kg
 Deductions 605 kg
 Maximum Load 1495 kg

168. Refer to Load Chart S.
 Adjustments:
 5 Sheave Hook block 450 kg
 Auxiliary jib stowed 375 kg
 Total: 825 kg

(i) 23.00 metre boom at 18.00 metres radius:
 SWL 3600 kg
 Deductions 825 kg
 Maximum Load 2775 kg

(ii) The capacity can increase by extending the boom to a 34.75 metre boom length achieving a capacity of 4660 kg (an increase of 1060 kg) keeping the same radius.

169. Refer to Load Chart Z.
 Adjustments:
 3 sheave hook block 900 kg
 No adjustment for 300 kg ball hook
 (Deduction is included in the jib)
 Total 900 kg

39.62 metre boom with 12.19 metre jib erected with 300kg ball hook at 12.00 metre radius:
 SWL 13400 kg
 Deductions 900 kg
 Maximum load: 12500 kg

170. Refer to Load Chart Z.
 Adjustments:
 3 sheave hook block 900 kg
 No adjustment for 300 kg ball hook
 Total 900 kg

45.72 metre boom with 18.29 metre jib erected, with 300kg ball hook at 12.00 metre radius:
 SWL 12700 kg
 Deductions 900 kg
 Maximum load 11800 kg

171. Refer to Load Chart Z.
 Adjustments:
 5 Sheave Hook block 1400 kg
 Total: 1400 kg

(i) 54.86 metre boom at 23.00 metre radius:
 SWL 4900 kg
 Deductions 1400 kg
 Maximum Load 3500 kg

(ii) Yes, the crane can lower the boom to the ground only in the front and rear zones.

(iii) Yes, mid point suspension (centre hitch) supports are required when the boom length is 51.82 metres or longer.

(iii) The boom section 'B' (6.10 metre length) needs to be removed.

Answers 172 to 174 apply only to Slewing Mobile cranes over 100 tonnes capacity.

172. Refer to Load Chart Z.

Adjustments:

Single Sheave Hook block

No adjustment for 300 kg ball hook (deduction is included in the jib)

Total: 700 kg

(i) 12.19 metre jib at 12.00 metres radius:

SWL 13000 kg

(Actual SWL is only 8000 kg due to the single fall auxiliary hoist capacity)

SWL 8000 kg

Deductions 700 kg

Maximum Load 7300 kg

(ii) Yes, the crane can raise the boom and jib length off the ground only in the front and rear zones.

(iii) The applicable counterweights are 19900 kg.

(iv) Warning - wedge 'treadle' into the crawler front when erecting or lowering a 48.77 metre boom with a 12.19 metre jib erected.

173. Refer to Load Chart T.

Adjustments:

Three Sheave Hook block

Total: 1542 kg

(i) 12.20 metre boom at 7.00 metre radius:

SWL 94850 kg

(utilising the 7.30 metre radius)

Deductions 1542 kg

Maximum Load 93308 kg

(ii) The requirement is the front bumper jacks must be extended.

(iii) The applicable boom type for this lift is of a hammerhead construction.

(iv) The reduction factor is 60% for lifting over the front of the carrier.

174. Refer to Load Chart T.

Adjustments:

Single Sheave Hook block 544 kg

Total: 544 kg

(i) 88.40 metre boom at 27.40 metre radius:

SWL 7200 kg

Deductions 544 kg

Maximum Load 6656 kg

(ii) No, the crane cannot lower the boom length to the ground over the side.

(iii) The applicable counterweights when set up are the 40,550 kg counterweight and a 10,330 kg bumperweight.

(iv) No, the crane may not be moved on site if the total boom and jib length exceeds 51.82 metres.

ALL CRANES - WRITTEN

RELATIONSHIP TO THE NATIONAL CERTIFICATION STANDARD

THE UNITS OF COMPETENCE

The items in this portion of the written assessment are intended to assess the competencies of the applicant in the safe use of Tower Cranes, Derrick Cranes, Portal Boom Cranes, Bridge & Gantry Cranes, Vehicle Loading Cranes, Non Slewing Mobile Cranes and Slewing Mobile Cranes (all classes), as described in Schedule B of the *National Occupational Health and Safety Certification Standard for Users and Operators of Industrial Equipment*. [NOHSC: 1006]

These are as follows:

- 1.0 Assess and secure equipment and work area.
- 2.0 Secure and transfer load.
- 3.0 Set up and dismantle cranes.
- 4.0 Carry out special operations with cranes.

Each unit of competence is subdivided into elements of competence, for which performance criteria are prescribed. The questions in each section of the assessment cover the following competencies:

SECTIONS A to C:

Performance Criteria 1.3.6, 1.4.4, 1.4.5

SECTION D:

Performance Criteria 1.3.6, 2.1.2, 2.1.3

SECTIONS E and F:

Performance Criteria 1.2.6, 1.3.5, 3.1.4, 3.2.1

THE RANGE STATEMENT

This portion of the written assessment takes into account, factors described in the range statements, including relevant standards and relevant State/Territory Occupational Health and Safety legislation.

WRITTEN ASSIGNMENT

| SECTION | Number of critical criteria required | Number of critical criteria achieved | Number of non-critical criteria | Number of non-critical criteria achieved | Competent? (tick) | |
|--|--------------------------------------|--------------------------------------|---------------------------------|--|--------------------------|--------------------------|
| | | | | | YES | NO |
| A | 0 | <input type="text"/> | 6 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| B | 0 | <input type="text"/> | 3 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| C | 0 | <input type="text"/> | 3 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| D | 0 | <input type="text"/> | 2 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| E | 0 | <input type="text"/> | 1 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F – CN / C1 | 5 | <input type="text"/> | 3 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F – CT / CP | 2 | <input type="text"/> | 2 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F - CB | 2 | <input type="text"/> | 1 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| F - CV | 4 | <input type="text"/> | 2 | <input type="text"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Assessment start time: | | : am/pm | Finish time: | | : am/pm | |
| Written Assessment completed within time allowed - approx 1 hour | | | | | <input type="checkbox"/> | <input type="checkbox"/> |

Applicant is: **COMPETENT**
 (tick or circle the result obtained) **NOT YET COMPETENT**

Name of Assessor:..... **Name of Applicant:**.....
Signature:..... **Signature:**.....
Date: / /

Comments/Feedback (Assessor to make additional comments which clarify the assessment results)
