higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

RIGGING THEORY N2

9 April 2021

This marking guideline consists of 6 pages.

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QUESTION 1

1.1
- Wear
- Corrosion
- Fatigue
- Accidental damage and distortion (4)

1.2
- Load to be lifted
- Safe working load
- Length
- Construction (3)

1.3 1.3.1 Resistance to crushing occurs when the wire ropes are subjected to extremely high tension or pressure. Ensure that the grooves are the correct size and freely movable because if not, this can cause the rope and load to crush. Where winding or crossover winding occurs, ensure that it is properly secured to prevent the drum and load from crushing.

1.3.2 Resistance to bending fatigue ensures that the ropes are not rolled over sharp corners or incorrect sheave wheel sizes. It ensures that the speed of the rope moves gradually and slowly over the sheaves and there is not a fast forward and quick reverse on the ropes that will cause fatigue on the rope. Excessive vibration in any part of the rope can cause fatigue.

(2 × 3) (6)

1.4
- It has the advantage of a thimble while retaining the flexibility of a soft eye.
- The eye bearing is protected from wear, thus giving a longer life.
- The loop is also protected when the sling is withdrawn from under a load.
- It can be used without the additional mass and cost of a reeving thimble.
- If the thimble is damaged it can be easily replaced. (Any 4 × 1) (4)

1.5
- Extreme flexibility
- Greater gripping power
- No damage to load
- Ease of handling
- No kinking
- No spin
- Resistance to shock loading (Any 3 × 1) (3)

[20]

QUESTION 2

2.1 A: Screw jack
B: Single-hook sling
C: Automotive/Mobile crane (3 × 1) (3)

2.2
- Oil leaking from the plunges of the jack.
- Damage to the housing.
- Screw for releasing and locking the hydraulic arms not functioning.
- Damage to the handle.
- Wear on the screw cap.
- Insufficient oil in the jack. (Any 5 × 1) (5)

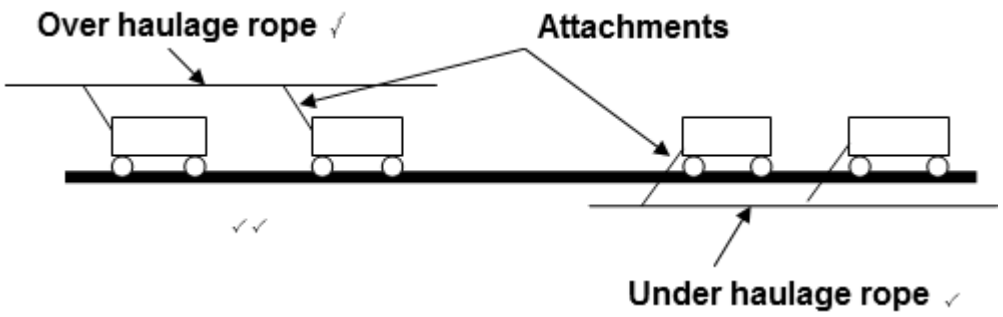
2.3
- Chain slings are made of links joined together whereas wire rope slings are made of strands of wire and a core.
- Wire rope slings can accommodate thimbles, ferrules and stirrups that are fitted whereas chain slings cannot accommodate these fittings.
- Chain slings often get twisted whereas wire rope slings do not twist easily.
- Links on chains stretch and break and become very unsafe during a lift whereas when a strand of wire breaks the sling will still be intact due to the number of wire strands on it. (4)

2.4
- Cracks
- Stretching
- Kinks
- Wear
- Damage or no locking latch
- Swivel worn (Any 3 × 1) (3)

[15]

QUESTION 3

3.1



(2 × 1 labels and 2 × 1 drawing) (4)

3.2
- Incorrect sizes of rollers or sheave guides
- Being trapped by crossings
- Runovers
- Plating
- Hanging
- Running on or around shafts of support pulleys or return wheels (Any 3 × 1) (3)

3.3
- Check that the correct sheave is ordered for the correct rope.
- Check that the sheave is not cracked.
- Check that the bushes or bearings are correctly fitted and not loose on the sheave wheel.
- Check for any wear on the groove of the sheave wheel.
- Check for kinks on the sheave wheel. (Any 3 × 1) (3)

[10]

QUESTION 4

4.1
- Reduced rope swing.
- Not left out in undesirable weather conditions.
- Reduced rope oscillation.
- Available space around and on top of shaft better utilised. (4)

4.2 4.2.1 In reverse-lay ropes alternate strands are more ordinary than in lang lay.✓ The advantage of an ordinary lay is that it works against the lang lay.✓ It also develops a type of nonspin rope.✓

4.2.2 Nonspin ropes are called concentric-stranded ropes.✓ It has a high degree of flexibility, either with round or flatten strands.✓ It is used for shaft sinking or special circumstances for winding.✓

(2 × 3) (6)

4.3 Ferrules are fitted at the end and front of ropes to ensure that it does not slip out of the drum, sheave and rollers when in operation. It also prevents the wire strands from splitting open. (2)

4.4
- Lifting of load whilst the chassis rests on springs is not permitted.
- The crane must be level.
- With the jib in high position the load must not bump against the jib.
- The crane must not be moved whilst the load is hanging from the jib.
- There must be free movement of the cabin on the platform. (Any 3 × 1) (3)

[15]

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QUESTION 5

5.1 Lifting beam (1)

5.2 A: Oblong/Lifting ring
B: Safe working load indicator
C: Beam
D: Shackle
E: Lifting hook (5 × 1) (5)

5.3 Lower the lifting beam to the ground.✓ Lower the crane hook until there is slack on the sling and the lifting beam is properly placed.✓ Remove the sling from the crane hook.✓ Release the shackle and sling on the oblong ring and keep it away in a safe place.✓ (4)

[10]

QUESTION 6

6.1 6.1.1 Load indication is required to bear a legible and prominent inscription naming the length of the jib, the safe working load and the appropriate radius.

6.1.2 Blocking-up base is the effective span of the supporting base when outriggers, jacks or blocks are used to increase the stability by making contact with the ground at points further from the centre line of the crane than the normal wheels or tracks.

6.1.3 Derricking is the movement of the crane jib when it is pivoting on a vertical plane.

(3 × 2) (6)

6.2
- Overhead cranes are mounted on runway beams to move in a secluded area whereas automotive cranes have wheels to move from one point to another.
- Overhead cranes are controlled by a pendent box or a cabin operator whereas automotive cranes must be driven by a crane driver.
- Overhead cranes cannot move into different areas and can only work in an enclosed area whereas automotive cranes can move around any area to carry out the job. (3)

6.3 A gin pole is erected with a hoisting tackle suspended from the upper end and led through a snatch block at the base of the mast.✓ The gin pole is then supported by a number of guys away from the load.✓ The gin pole can be constructed from timber, pipes or structural steel masts.✓ The gin pole must be securely tied on the appropriate joints and supports securely mounted to the floor or dead-man anchorages.✓ (4)

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6.4
- Hydraulic jack
- Screw jack
- Ratchet jack
- Trolley jack
- Bottle jack (Any 2 × 1) (2)

6.5 Ensure that the load does not pass the safe working load stipulated on the gantry of the crane.✓ Use slings to lift the load at a certain height.✓ Leave the load hanging and check if there is movement of the load lowering on its own without any controls.✓ The brakes are not holding therefore lower the load to the ground and then adjust the brakes until there is no lowering of the load on its own.✓ Continue the process a few times to ensure that the brakes are adjusted correctly and ready to lift the load.✓ (5)
[20]

QUESTION 7

7.1 $\text{He} = \text{h1} - \text{h2}$

$= 2{,}5\ \text{m} - 0{,}6\ \text{m}$✓

$= 1{,}9\ \text{m}$✓

$V = l \times l \times 1{,}9$

$= 3 \times 3 \times 1{,}9\ \text{m}$✓

$= 17{,}1\ \text{m}^3$✓ (4)

7.2 $M = 1\,000\ \text{kg/m}^3 \times 17{,}1\ \text{m}^3$✓✓

$= 17\,100\ \text{kg}$✓ (3)

7.3 $P = p \times g \times h$

$= 1\,000\ \text{kg/ m}^3 \times 9{,}81 \times 2{,}5\ \text{m}$✓✓

$= 24\,525\ \text{Pa}$✓

$= 24{,}525\ \text{kPa}$ (3)
[10]

TOTAL: 100

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