higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

RIGGING THEORY N2

27 November 2023

This marking guideline consists of 6 pages.

Copyright reserved

QUESTION 1

1.1 Protection of sheave wheels is efficiently achieved by fitting protective guards which may be made of woven wire, expanded metal or perforated metal.✓✓ (2)

1.2
- A centre wire is covered with small wires.
- Small wires covered by larger wires in grooves and layers in a strand are equal but lengths are unequal.
- Construction wire is 19 (9 0ver 9 × 1) or 19 (12 over 6 × 1) which are flexible. (3)

1.3 1.3.1 Fibre core (1)

1.3.2
- Carries lubricant
- Larger wires to resist heavy abrasion (2)

1.4
- The triangular strand ropes increases wearing surface.
- The triangular strand ropes have greater strength.
- The triangular strand ropes have greater endurance.
- The triangular strand ropes have less wear to drums and pulleys. (4)

1.5 1.5.1
- Material permanently increases in length.
- Ductility increase with heat.
- A material that can be drawn out permanently by a tensile force.

(Any 2 × 1)

1.5.2
- Combined strength of all the wires.
- Excluded strength of the outer wires.

(2 × 2) (4)

1.6
- They hold the thimble or fittings more safely and securely in the loop.
- They prevent lacerated hands which occur when hand spliced ropes are handled.
- They are neater in appearance.
- There is a substantial saving in weight.
- The ferrule may be stamped with the safe working load. (Any 4 × 1) (4)

[20]

QUESTION 2

2.1 2.1.1 Side loading hooks used in lifting applications should not be side loaded. The correct rigging equipment should be used to ensure the load applied is in line with the hook.✓✓✓ (3)

2.1.2 Point Loading
Hooks used in lifting applications should not be point loaded. The load must seat within the bowl of the hook at all times.✓✓ (2)

2.2 2.2.1 A screw jack is based on a simple screw action. Tommy bars are fitted in the holes and the treated spindle rotates to raise the load.✓✓

2.2.2 A hydraulic jack is operated by hydraulic pressure which is activated by the cranking of the jack handle.✓✓

2.2.3 A ratchet jack is based on a simple ratchet action. The jack handle is inserted in the aperture and the jack handle is cranked to raise the load.✓✓

(3 × 2) (6)

2.3
- Ensure that chain slings are stacked on proper hanger brackets.
- Ensure that chain slings are not thrown on the floor and staked on each other.
- Ensure that chain slings are kept away from moisture to prevent rust.
- Ensure that chain slings are not twisted before they are stored. (4)

[15]

QUESTION 3

3.1
- The rollers depress the direction of the rope to guide it on to the drum, fleeting wheel or return and tension the sheave.
- Act as a reflector to the track of the rope when it is required to pass under a bridge or a set of track rails.
- Depressing rollers are usually confined to the dead side of the rope, or immediately in front of the back balance or tension carriage. (3)

3.2 Surge wheel pluck generally results from worn fleeting wheel segments due to an incorrectly designed fleeting wheel profile.✓ Plucking of the rope should be eliminated as soon as possible✓ as the additional stresses cause excessive wear or premature fatigue of the rope and so reduce rope life.✓ (3)

3.3
- Run-overs
- Blasting
- Being trapped at crossings
- Falling or hanging
- Running through badly grooved rollers, guide sleepers, etc.
- Running on or around the shafts of support pulleys or return wheels.

(Any 4 × 1) (4)

[10]

Copyright reserved

QUESTION 4

4.1
- The rope is coiled on a drum and a shaft is put through the drum and then the shaft is placed on a stand by jacks.✓
- Take the rope off the drum slowly and straight ahead.✓ The drum revolves steadily.✓
- Do not let loose loops fall off the drum and bend around the shaft.✓
- Run the rope onto the sheaves so that it bends accordingly when it comes off the drum.✓
- Do not run the rope onto sheaves in a way that will cause reverse bending.✓ (6)

4.2
- Cracks on the winders.
- Wear on the winders.
- Dents and kinks on the winders.
- Corrosion on the winders.
- Mechanical damage on the winders. (Any 4 × 1) (4)

4.3 4.3.1 Seale is used in projects where the rope is submitted to excessive wear, excessive breaking loads and shocks.

4.3.2 Non-spin construction is mainly used in shaft sinking work because they are flexible.

(2 × 1) (2)

4.4
- Not confined to a single rope system.
- Ropes do not have to be coiled in layers.
- Greater payloads can be hoisted with more than one head rope.
- It is simpler than a drum winder. (Any 3 × 1) (3)

[15]

QUESTION 5

5.1
- Firstly detach the rope from the cage in the event of a high speed overwind. This function minimises the damage to infrastructure,✓ but also releases the rope in overwinds at all speeds, including some low speed overwinds.✓
- The second function is to latch into the spectacle plate once the rope has detached✓ and provide a means of holding the cage from falling down the shaft.✓ (2 × 2) (4)

5.2.
- Detaching lever is not working correctly.
- Crack on the eye of the hook.
- Worn-out pins on the detaching hooks.
- Dents on the detaching hook.
- Corrosion or rust on the detachable hook. (5)

5.3 A plate grab is used to lift up flat sheet metal where the jaw grips onto the plate when it is lifted. (1)

[10]

QUESTION 6

6.1
- Cantilever crane
- Half-gantry crane
- Overhead crane
- Wall crane
- Bridge crane (Any 3 × 1) (3)

6.2 6.2.1 Hoisting is the rising of a load by means of a rope or chain which passes over a pulley fitted to the crane.✓✓

6.2.2 Jib centre distance is the shortest distance between the pivoting point of the jib and the centre of rotation of the jib head pulley.✓✓

6.2.3 Outreach is the horizontal distance from the centre line of the lifting hook to the nearest point on the chassis.✓✓

(3 × 2) (6)

6.3 6.3.1 Standing derrick anchor (1)

6.3.2 A standing derrick anchor is a single spar with a tackle at its head for hoisting.✓ Its head is supported by a topping lift or if there are no suitable overhead attachments for the top lifting, it will be supported by a back guy.✓ Side guys are fitted to give stability and lateral support.✓ Attach a fore guy to prevent the derrick swinging upwards and downward when the load is being hoisted.✓ Place a shoe made out of timber at the base to prevent slippage and the trust of the derrick under load is distributed over a larger area.

(Any 4 × 1) (4)

6.4 A Use main hoist✓✓
B Use whip line✓✓
C Raise boom and lower load✓✓

(3 × 2) (6)

[20]

QUESTION 7

7.1 $A = \pi r^2$ ✓
= 3.142 × (0.9 m)² ✓
= 2.55 m² ✓

V = A × H ✓
= 2.55 × (2.5 – 1.3) ✓
= 2.55 × 1.2 ✓
= 3.06 m³ ✓ (7)

7.2 Mass = density × volume ✓
= 900 × 3,06 ✓
= 2 754 kg ✓ (3)
[10]

TOTAL: 100

Copyright reserved