higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

CIVIL AND STRUCTURAL STEEL WORK DETAILING

(First paper)

NQF LEVEL 4

7 November 2022

This marking guideline consists of 4 pages.

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QUESTION 1: INTRODUCTION TO CIVIL AND STRUCTURAL STEEL WORK

1.1 R – Mild-steel bar
Y – High-yield bar (2)

1.2
- Tensile force
- Compressive force
- Shear force
- Axial force (4)

1.3
- Moment of a force
- Triangle of forces
- Polygon of forces (3)

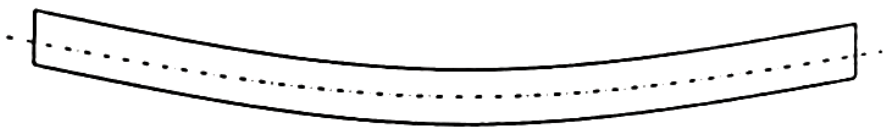
1.4 Moment of force is the product of the force✓ and the perpendicular distance between the force and some defined point.✓ (2)

1.5
- Isolated Footing
- Wall/Strip Footing
- Mat or Raft Foundation
- Strapped Footing
- Stepped Footing
- Spread Footing
- Sloped Footing
- Combined Footing (Any 3 × 1) (3)

1.6
- Concrete drawing
- Reinforcement drawing (2)

1.7 1.7.1 The point load and distributed load will push the beam downwards. (2)

1.7.2



(4)

1.8
- The portion above the neutral axis is in compression.
- Below the neutral axis, the beam is in tension. (2)

1.9 Reinforced concrete (1)

1.10 1.10.1 True
1.10.2 True
1.10.3 False
1.10.4 False
1.10.5 True
(5 × 1) (5)
[30]

QUESTION 2

2.1 Tread plates are thin steel surfaces✓ with extruding patterns.✓ Rectangular grids are thicker✓ with rectangular holes.✓ (2 + 2) (4)

2.2 Angle cleats are steel components that are like a corner✓ that can be used to bolt or weld sections.✓ Gusset plates are flat steel plates with very specific shapes✓ that can be used to weld or bolt steel together.✓ (2 + 2) (4)

2.3 A joint is a point on a truss where two or more✓ members are connected✓ to each other. (2)
[10]

QUESTION 3

3.1

3.1.1	J
3.1.2	E
3.1.3	F
3.1.4	H
3.1.5	G
3.1.6	C
3.1.7	D
3.1.8	I
3.1.9	A
3.1.10	B

(10 × 1) (10)

3.2 Take moments about RR:

$\circlearrowright$ Moment $= \circlearrowleft$ Moment

$RL \times 8 = 10 \times 6 + 4 \times 2$✓

$8RL = 68$ kN✓

$RL = 8{,}5$ kN✓

Take moments about RL:

$\circlearrowright$ Moment $= \circlearrowleft$ Moment

$RR \times 8 = 10 \times 2 + 4 \times 6$✓

$8RR = 44$ kN✓

$RR = 5{,}5$ kN✓

$\uparrow$ Forces $= \downarrow$ Forces✓

$RL + RR = 10 + 4$✓

$8{,}5 + 5{,}5 = 14$ ✓

14 kN $= 14$ kN✓ (10)
[20]

QUESTION 4

4.1
- Place a slump cone on the floor and moisten it with water. Make sure that it is damp, but that no water remains in it.
- Hold the slump cone firmly in place.
- Fill the bottom third of the cone with the concrete mixture. Use the rounded end of the steel rod in a circular motion to tamp the concrete 25 times.
- Add more concrete mixture until it reaches the two-third mark on the cone. Repeat the tamping process.
- Fill the cone until it overflows and repeat the tamping process.
- Remove any excess concrete from the top of the slump cone by using the tamping rod to level it off in a rolling motion.
- Remove the cone by lifting it vertically. Lift it slowly and carefully, making sure that the concrete sample does not move, but do not take longer than five seconds to lift it.
- Wait for the concrete mixture as it slowly slumps.
- After the concrete stabilises, measure the slump height by turning the slump cone upside down next to the sample.
- Place the rod on the slump cone and measure the distance from the rod to the original displaced centre of the slumped concrete. (10)

4.2
4.2.1 Stiff mixture
4.2.2 Sloppy mixture
4.2.3 Unusable/Unacceptable
4.2.4 Stiff mixture
4.2.5 Too sloppy mixture

(5 × 1) (5)
[15]

TOTAL: 75

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