higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE

METAL WORKERS' THEORY N1

28 November 2023

This marking guideline consists of 7 pages.

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QUESTION 1: SAFETY AND HOUSEKEEPING

1.1 Occupational Health and Safety Act (2)

1.2 Horseplay (1)

1.3 This will ensure that the whole scaffold remains level for its full height and length. (1)

1.4 Full body harness with double lanyard (safety harness) or similar (1)

(5 × 1) **[5]**

QUESTION 2: CARE AND USE OF TOOLS

2.1 They are used to shape metals✓ and do work in confined spaces.✓ (2)

2.2 That the jaws are in full contact with the nut or bolt head
OR
That the nut or bolt head fits snug between the jaws of the spanner (1)

2.3 It is used to check the squareness of small jobs. (1)

2.4
- Podger spanner
- Box spanner
- Ring spanner
- Flat spanner
- Ratchet spanner
- Adjustable spanner
- Wrench (Any 3 × 1) (3)

2.5 To measure an angle, take the measurement (angle required) on the line of chords✓ and open the legs of the ruler so that the points of the dividers are exactly in the dots. The legs of the ruler will be at the required angle.✓ (2)

2.6 $H^2 = X^2 + Y^2$

$H^2 = (2,5)^2 + (1,5)^2$ ✓

$H = \sqrt{6,25 + 2,25}$ ✓

Y = 2,916 m✓ (3)

[12]

QUESTION 3: DEVELOPMENTS

3.1 See Addendum A (2)

3.2 See Addendum A (2)

3.3 Circumference = 3,142 × diameter
3,142 × 40 mm✓
157,0796 mm✓ (2)

3.4 See ADDENDUM A (4)
[10]

QUESTION 4: METALS AND PLATES AND SECTIONS

4.1 4.1.1
- Corrosion-resistant
- High tensile strength
- Durable
- Ductile
- Temperature-resistant (cannot be heat-treated)
- Impact-resistant
- Abrasion-resistant (Any 2 × 1) (2)

4.1.2 It is very light,✓ tough,✓ malleable,✓ ductile and corrosion-resistant,✓ and is a good conductor of heat and electricity.✓
(Any 2 × 1) (2)

4.2 4.2.1 It refers to the material's ability to withstand impact✓ or hammering loads without cracking or breaking.✓ (1)

4.2.2 It refers to the ability of metal to return to its original shape after being stretched, bent, compressed or deformed. (1)

4.2.3 Metal can be hammered into shape without cracking. (1)

4.3 4.3.1 Centre line
4.3.2 Other side up
4.3.3 Mild steel plate
(3 × 1) (3)

4.4 A Angle iron
B Diamond mesh sheet
C I-beam
D Checked plate
(4 × 1) (4)
[14]

QUESTION 5: MACHINES

5.1 5.1.1 It is used for drilling holes in steel plates, flat bars, etc. (up to 13-mm shank diameter).

5.1.2 It is used to bend steel plates or flat bars into various angles.

5.1.3 It is used to roll steel plates into circular shapes.

5.1.4 It is used to shear steel plates (long or short lengths).

5.1.5 It is used to cut various steel sections using a rotating blade.

(5 × 1) (5)

5.2
- Check the grinding wheels for cracks.
- Wear safety goggles.
- Ensure that the machine guards are in position.
- Only one person may operate the machine.
- Wear ear protection.
- Ensure that the work rest is set at a suitable distance.
- Set the machine at the correct working speed.
- Do not overload the machine.
- Do not grind on the side of the wheel. (Any 5 × 1) (5)

[10]

QUESTION 6: JOINTS AND BOLTED JOINTS

6.1
- Black bolt
- Machined bolt
- Countersunk bolt
- Huck bolt (4)

6.2 Total length = total material thickness + washer thickness + nut height + two threads✓

= Mt + W + N + S
= (10 + 10) + 3 + 12 + 4✓
= 39 mm✓

(4)

The standard length of the bolt closest to that is 40 mm.✓

6.3 They are used in general steel work and structures in direct bearing situations where bolt shearing is minimal✓ and where hole clearance is not a problem (up to 2-mm clearance between hole and bolt can be found).✓ (2)

[10]

QUESTION 7: ARC WELDING

7.1
- Leather apron✓ – Protects the body against burns from sparks, drops of molten metal and radiation✓
- Leather spats✓ – Cover the shoes, protecting the feet from any molten metal or sparks✓
- Leather gloves✓ – Protect the hands and arms from burns, cuts and scratches✓
- Welding cap✓ – Protects the head from welding sparks✓
- Leather yoke✓ – Protects the chest and arms from welding sparks and molten droplets, especially when doing overhead welding✓
- Safety boots✓ – Prevent injury to feet due to falling objects or sharp metal edges✓
- Overall✓ – Must provide sufficient coverage to prevent burns caused from sparks, spatter or radiation✓ (Any 5 × 2) (10)

7.2
- The DC welding machine has a lower operating efficiency than the AC welding machine.
- Maintenance costs are much higher on the DC welding machine than on the AC welding machine.
- The DC welding machine is initially more expensive than an AC welding machine of the same size.
- There is no arc blow with an AC welding machine. Above 200 amperes, the magnetic effect of the electric arc created by the direct current causes arc blow.
- The DC welding machine is noisier than the AC welding machine

(Any 4 × 1) (4)
[14]

QUESTION 8: OXYACETYLENE AND LPG CUTTING AND WELDING

8.1
- Tinted safety goggles
- Leather gloves
- Leather spats
- Leather apron
- Full body overall
- Safety shoes (Any 5 × 1) (5)

8.2
- Incorrect regulator pressure (pressure too low)✓– Ensure that the regulator pressure is correctly set before lighting the torch.✓
- The nozzle is too close to the material✓– Lift the nozzle and ensure that it does not get closer than 3 mm from the inner to the metal.✓
- The nozzle is blocked or dirty✓– Clean the nozzle or replace it if it cannot be cleaned properly.✓

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- Attempting to light the torch with a mixture of fuel and oxygen✓ – Light the torch with only the fuel open.✓
- The nozzle is overheated✓ – Replace the nozzle.✓
- The hoses were not purged before lighting the torch✓– Purge the hoses properly.✓ (Any 4 × 2) (8)

8.3 An approved leak detecting fluid✓ that must be applied at all joints✓ (2)

[15]

QUESTION 9: CALCULATIONS AND PLANNING

Calculation of half circle:

Half circle length = (mean diameter × π) ÷ 2✓ or (radius + ½ thickness) × π
= ([310 + 6] × π) ÷ 2 = (155 + 3) x π
= (316 × π) ÷ 2 = 158 × π
= 980,177 ÷ 2 = 496,372 mm
= 496,372 mm✓

Calculation of long leg length:

Leg length = leg length – plate thickness✓
= 175 – 6
= 169 mm✓

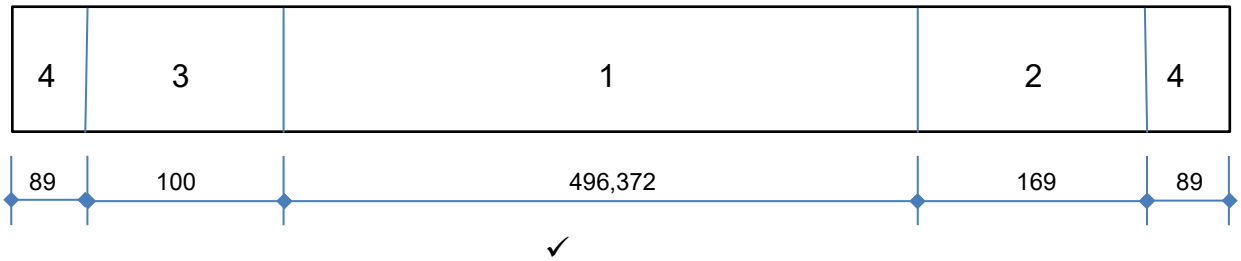
Calculation of short leg length:

Leg length = 100 given✓

Calculation of foot length:

Foot length = foot length – plate thickness✓
= 95 – 6
= 89 mm✓

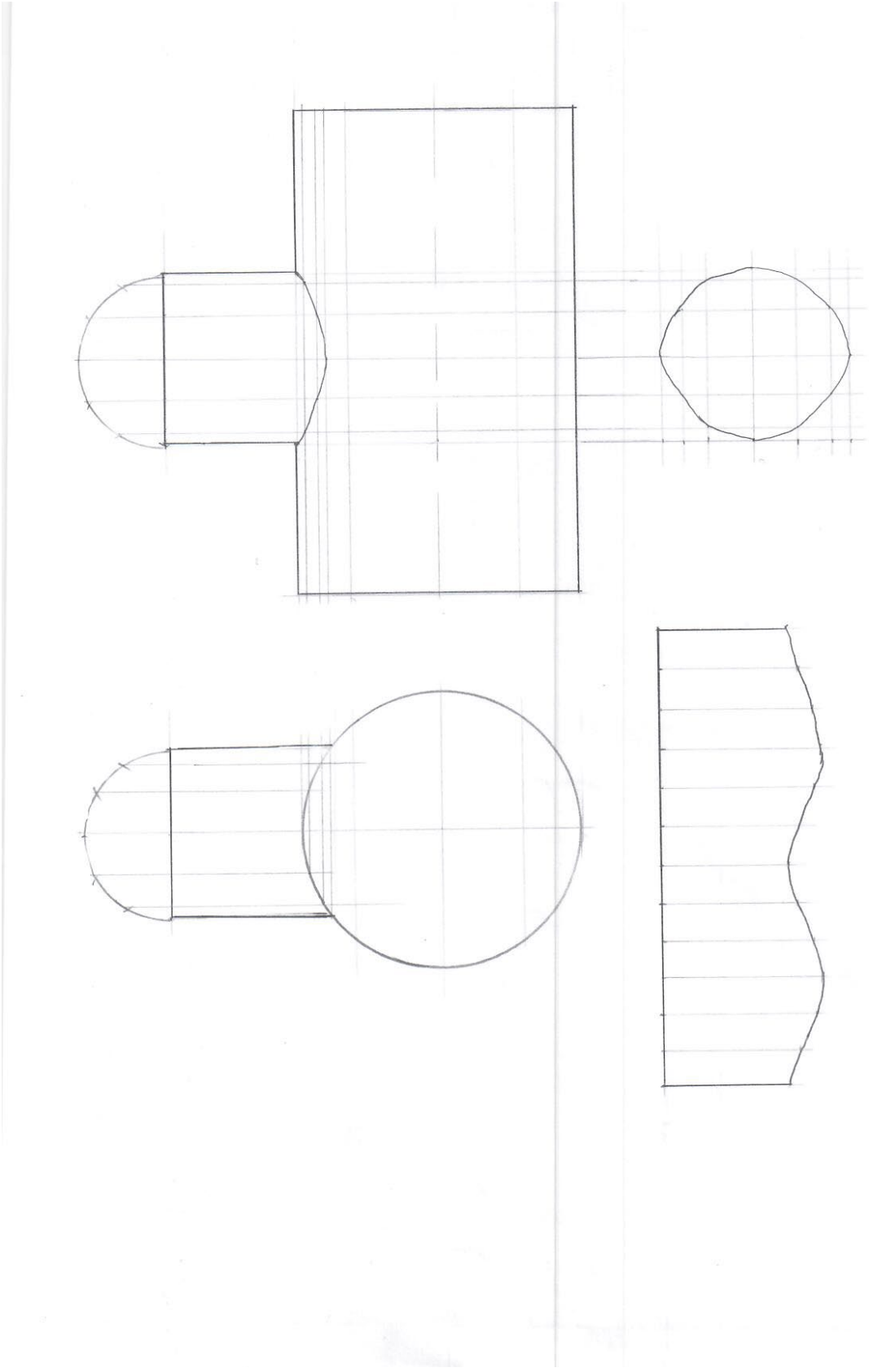
Total length of bracket = half circle + (2 × leg length) + (2 × foot length) ✓
= 496,372 + (169 + 100) + (2 × 89)
= 943,372 mm ✓



✓

[10]

TOTAL: 100



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