higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

WELDING
NQF LEVEL 2

22 November 2024

This marking guideline consists of 6 pages.

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QUESTION 1

1.1
- Overall
- Work boots
- Hand gloves
- Welding helmet
- Leather apron
- Scalp cap
- Impact goggles (Any 5 × 1) (5)

1.2
- Welding helmet✓ – protects eyes against intense light and sparks.✓
- Clear impact goggles✓ – protect eyes from flying objects.✓
- Hand gloves✓ – protect hands against sharp, hot objects, chemicals and electric shock.✓
- Work boots – protect feet against sharp,✓ hot objects.✓
- Scalp cap – protects head✓ from hot objects.✓
- Overall ✓- protects against sparks and spatter, also OHS requirement.
- Leather Apron ✓ - protection from heat and sparks / spatter. (Any 2 × 2) (4)

1.3
- Fire extinguisher
- Sand bucket
- Fire hose
- Fire biter
- Sprinkler systems (Any 1 × 1) (1)

[10]

QUESTION 2

2.1 2.1.1
- Low-carbon steel expands when heated.
- Contraction takes place and low-carbon steel solidifies after welding.
- Structural stresses occur and metal hardens and warps. (3)

2.1.2
- Heated low-carbon steel reacts chemically with oxygen and nitrogen.
- A protective gas shield is produced by flux coating.
- Cooling takes place, impurities form a hard crust at the joint. (3)

2.2
- Down hand position
- Fat position (Any 1 × 1) (1)

2.3 2.3.1
- Cables criss-crossing the floor
- Highly flammable substances
- Inhaling gas fumes without a respirator or fume extractor
- Metal off-cuts on the floor (Any 2 × 1)

2.3.2
- Over exposure to fumes causes respiratory complications.
- Tripping and falling cause injury or death.
- Fires and explosions can damage equipment and expose workers to dangerous life-threatening conditions. (Any 2 × 1)

(2 × 2) (4)

2.4 Low-carbon steel is easy to bend, machinable and easily wieldable✓✓ whereas high-carbon steel needs special welding rods and is not suitable for general structural steel welding.✓✓ (4)

2.5
- Electrode holder secures electrodes when welding
- Welding cables are conductors of electric current
- Transformer changes AC current from power line into low voltage

(Any 2 × 2) (4)

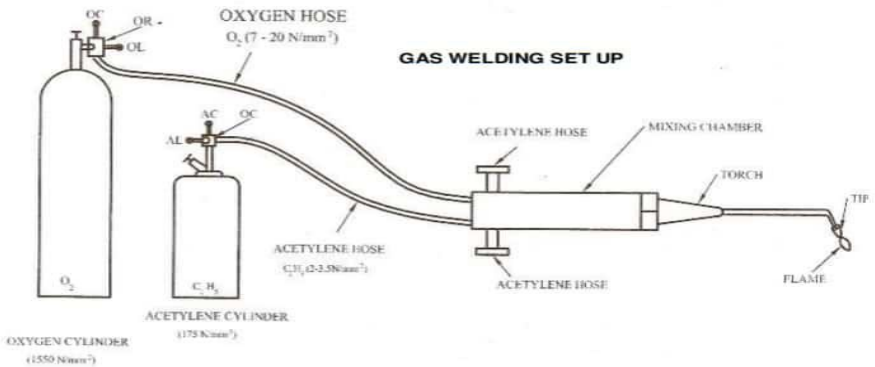
2.6 2,5 mm electrode to be used for thin metal as small diameter electrodes use lower amperage (4)

2.7 Sideways movement of the electrode to create a wider bead (2)

[25]

QUESTION 3

3.1



- Sketch 2 marks each for correct size and shape of cylinders✓✓✓✓
- Consider cylinders only
- Two marks each for labels (Name and colour of cylinder) ✓✓✓✓
- Acetylene: Maroon / deep red
- Oxygen: Black (8)

3.2 With the key-safe mechanism, tempering with cylinders eliminated and remain open✓ whereas hand-wheel cylinders may cause the danger of fire if left open.✓✓ (3)

[11]

QUESTION 4

4.1 4.1.1 Acetylene is the only gas suitable for high temperature welding with high propagation rate. It is ferocious burning gas.

4.1.2 Kilopascal is the unit of measurement of the pressure in a full cylinder.

4.1.3 An area of metal that does not melt but cracks after welding due to change of metal properties.

4.1.4 Gas mixing device that supplies gases equally to the nozzle.

4.1.5 The temperature at which steel starts a chemical reaction, oxidation; the burning of steel in an intense oxygen-induced environment.

(5 × 2) (10)

4.2
- Choose suitable nozzle
- Set correct regulator pressure
- Light and adjust flame to neutral
- Pre-heat metal kindling temperature
- Pierce metal edge (press oxygen trigger)
- Move torch with constant speed along work piece
- Maintain torch nozzle distance from (1 mm–3 mm) metal surface
- Cutting speed (Any 6 × 1) (6)

4.3 4.3.1
- Exposure to metal fumes
- Excess noise
- Burns
- Heat
- Light UVL
- Flying sparks (Any 3 × 1) (3)

4.3.2
- For fumes: install fans✓ and fume extractors✓ or wear respirators✓
- For noise: wear earmuffs✓ or ear plugs ✓
- For flying objects/ sparks: wear clear impact goggles ✓
- For Burns and heat: wear proper overall and leather apron✓
- For light UVL: wear goggles with correct shade of filter✓

(Any 3 × 1) (3)

4.4 Additional oxygen high pressure tubing with high oxygen trigger. (2)

[24]

QUESTION 5

5.1
- Shielding gas cylinder
- Regulator or flow meter
- Wire spool
- Wire feed
- DC power source
- Welding gun
- Earth clamp / connection (7)

5.2
- Carbon dioxide
- Argon
- Helium
- Mixture carbon dioxide and argon (Any 3 × 1) (3)

5.3
- Slag inclusions
- Surface porosity
- Weld undercut
- Weld cracks
- Dimensional conformance
- Weld size and form
- Insufficient leg
- Excessive convexity
- Standing seam welds (Any 3 × 1) (3)

5.4
- Gas tube
- Electrode passage
- Electric current conductor (Any 2 × 1) (2)

5.5
- Metal mill scale causes slag
- Oil/grease contaminants cause weld cracks
- Setting correct shielding gas flow
- Incorrect wire speed
- Incorrect current settings
- Incorrect arc length
- Incorrect travel speed (Any 2 × 2) (4)

5.6 Prevent oxidation that causes weld or structural failure (2)
[21]

QUESTION 6

6.1
- Braze profile
- Braze size
- Mechanical properties
- Other specified characteristics when applicable

(Any 3 × 1) (3)

6.2
- PPE-prevents bodily injury
- Avoid oil on rig – causes explosions
- Install flashback arrestor to prevent fire or explosions
- Remove combustible substances
- Maintain acetylene pressure below 103 kPa – curtails explosion.

(Any 3 × 2) (6)
[9]

TOTAL: 100

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