higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

MARKING GUIDELINE

NATIONAL CERTIFICATE (VOCATIONAL)

WELDING
NQF LEVEL 3

21 November 2024

This marking guideline consists of 5 pages.

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QUESTION 1

1.1
- Gas pores (porosity)
- Incomplete penetration
- Lack of fusion
- Cracks (4)

1.2
- Shielded metal arc welding (SMAW) is versatile and adaptable to a wide variety of situations
- SMAW is cheap to operate and maintain
- It is easy to use in confined spaces
- Equipment is simple and portable (4)

1.3
- The process is not very productive compared to other welding processes
- The electrodes must be replaced frequently (2)

[10]

QUESTION 2

2.1
A – Direction of weld
B – Base metal
C – Weld metal
D – Solidified slag
E – Weld pool
F – Shielding gas
G – Core wire
H – Electrode covering (flux)
I – Metal and slag droplets
J – Penetration depth (10)

2.2
A – Type of current and coating
B – Welding position
C – Tensile strength
D – electrode (4)

2.3 Electrodes must be baked in an oven prior to welding. (2)

2.4 Run out length is the length of the weld produced by a single electrode.
Run out ratio is the ratio of a run out length to the length of the electrode.
(2 × 2) (4)

2.5
- Burns may result from UV radiation and hot surfaces such as the electrode and the work piece
- A very bright light as a result of the electric arc may cause arc eyes due to UV radiation
- Toxic fumes can be produced during welding
- Electric shock can occur when one handles shielded metal arc welding equipment without using personal protective equipment (PPE)
- The arc can produce high levels of noise which might damage one's ears
- Welding equipment may have damaged connections and can result in electric shock
- Faulty welding equipment can be hazardous in many ways – it is very important for it to be maintained well
- Ergonomic considerations such as repeatedly working in uncomfortable positions may cause lasting damage (Any 5 × 1) (5)

[25]

QUESTION 3

3.1
- Equal-pressure type
- Injector type welding torch (2)

3.2
- Horizontal welding
- Vertical welding
- Overhead welding (3)

3.3 3.3.1
- Ensure that flashback arrestors are installed on the regulator outlets.
- Ensure that the check valves are installed on the torch inlets.
- Follow the correct start-up procedures.
- Keep acetylene pressure below 1 bar. (4)

3.3.2
- When cylinders are not in use, remove the regulator and place a valve cap.
- All cylinders should be secured tightly in the upright position to prevent them from falling over. (2)

3.3.3
- Remove all sources of oil and grease from the weld area.
- Ensure that one's clothes and personal protective equipment (PPE) are free from grease and oil (2)

3.4
- Use a wire brush or grinder to remove all paint or rust from the work piece
- Clean any oil or grease from work piece as it is flammable
- Clean all signs of dirt from the work piece (3)

3.5
- Wrong weld position
- The torch is too powerful
- The welding speed is too fast
- Rust in the base part (4)

[20]

QUESTION 4

4.1
- It is suitable for welding most metals and alloys
- No slag formation during welding
- It can be used in all-positional welding
- It can be used to join very thin base metals
- The welder can see both the arc and the weld pool during the process
- It leaves a good, weld bead appearance
- It has a low heat input (Any 5 × 1) (5)

4.2
- Shielding gas protects the welding area from atmospheric gases such as nitrogen and oxygen
- If these gases come into contact with the welding area it will lead to fusion defects, porosity and a brittle weld
- The shielding gas also transfers heat from the tungsten electrode to the metal
- The heat helps to start and maintain a stable arc (4)

4.3
A – Solidified weld metal
B – Molten weld metal
C – Shielding gas
D – Welding torch
E – Tungsten electrode
F – Arc
G – Filler wire (7)

4.4 4.4.1 The area of the weld where the base metal has reached its melting point and is ready to be mixed with the filler material

4.4.2 When electrons flow from the negative pole to the positive pole.
(2 × 2) (4)

4.5
- Using a weld metal that is not ductile enough
- Using a base metal that is high in carbon or sulphur
- Using a base metal that is too thick
- Assembly that is under very heavy restraint
- Using damp electrodes (5)

[25]

QUESTION 5

5.1 A – Torch/gun
B – Wire feeder
C – Regulator
D – Inert gas
E – Power source/welding machine (5)

5.2
- Do not touch live electrical components
- Wear appropriate personal protective equipment (PPE)
- Ensure that the earth is properly installed
- Cables must be kept free from oil, grease, sparks and hot metal
- Inspect the cables frequently
- Cables should not be draped over one's body (6)

5.3 Amperage = $\frac{\text{Material thickness}}{0{,}0254}$ ✓

$= \frac{8}{0{,}0254}$ ✓

= 314,96 ✓

The correct amperage setting is approximately 315 A. ✓ (4)

5.4
- This is a non-destructive testing method
- Uses X-rays to determine the quality of the weld
- It is the best inspection method
- It is very expensive
- Not very portable
- It uses X-rays that may be dangerous (Any 5 × 1) (5)

[20]

TOTAL: 100

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