higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

# MARKING GUIDELINE

## NATIONAL CERTIFICATE (VOCATIONAL)

## WELDING
## NQF LEVEL 3

**16 November 2022**

**This marking guideline consists of 5 pages.**

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## QUESTION 1

1.1 Do not over-weld.
- If more metal is welded in a joint, there will be larger shrinkage forces. Good weld design may minimise the amount of distortion.

Use intermittent welding.
- This will decrease the heat build-up in the work piece and therefore minimise distortion.

Plan the weld sequence.
- Welding alternately on both sides of the work piece may counteract the effects of distortion. (6)

1.2
- Gas pores (also known as porosity)
- Incomplete penetration
- Lack of fusion
- Cracks (4)

**[10]**

## QUESTION 2

2.1
A Weld size
B Reference line
C Arrow pointing at weld
D Weld all around
E Site weld
F Root penetration
G Included angle
H Pitch centres of weld
I Weld length
J Weld symbol (fillet weld)

(10 × 1) (10)

2.2
- Incorrect welding technique
- The incorrect setting for the welding machine
- Arc length is too long
- Arc force setting is too high (4)

2.3
- Burns can occur from UV radiation and hot surfaces.
- Very bright light coming from electric arc can cause arc eyes.
- Toxic fumes are produced during welding.
- Electric shock can occur if not wearing protective clothing.
- The arc can produce high levels of noise, which may damage your ears.
- Welding equipment can have damaged connections, raising the potential for electric shock.
- Faulty welding equipment can be hazardous in a number of ways, so maintenance must be performed regularly.
- There are ergonomic considerations when working in uncomfortable positions repeatedly, which can cause major damage. (Any 6 × 1) (6)

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2.4
- It protects the weld from atmospheric contamination, and prevents gases like oxygen and hydrogen from entering the weld.
- It stabilises the arc, allowing more accurate and predicable welding.
- It provides de-oxidants and fluxing agents, which remove impurities from the weld.
- It provides a blanket of slag that further protects the hot metal from the air.
- It provides a means for adding alloying elements during welding.
- Most fluxes decrease the viscosity of the weld metal, making it flow more easily. (Any 5 × 1) (5)

**[25]**

## QUESTION 3

3.1
A Butt joint
B Fillet/T joint
C Corner joint
D Lap joint
E Edge joint (5)

3.2
A – Oxidising flame
B – Neutral flame
C – Carburising flame (3)

3.3
- Cracking
- Surface porosity
- Incomplete root penetration
- Weld undercut
- Convexity or concavity
- Excessive reinforcement
- Insufficient reinforcement
- Incomplete fusion (Any 3 × 1) (3)

3.4 3.4.1
- The gas cylinder used in oxy-acetylene welding contains gases under very high pressure.✓
- If the cylinder is breached in any way, the gas will flow out at a very high speed, forcing the cylinder to shoot in the opposite direction at a high speed.✓✓

3.4.2
- Gas pressure was set incorrectly by the welder.
- The oxygen cylinder can run out of oxygen, causing low pressure in the oxygen hose.
- The high-pressure acetylene forces the flame back into the oxygen hose.

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3.4.3
- The gauges of the regulator might malfunction, causing them to show incorrect values.
- This could lead to a dangerous gas explosion.
- Blockage in the regulators reduces the flow of gases.

(3 × 3) (9)
**[20]**

**QUESTION 4**

4.1
A Solidified weld material
B Molten weld metal
C Shielded gas
D Welding torch
E Tungsten electrode
F Arc
G Filler wire
H Base metal/work piece (8 × 1) (8)

4.2
- Sub-surface porosity is difficult to detect since it occurs inside the weld.
- Porosity happens when gases are trapped inside a solidifying weld.
- When the molten metal becomes solid before the gas has a chance to escape.
- Porosity appears in the form of small holes inside the weld.
- The causes of porosity include moisture and dirty filler wire or base metal.

(5 × 1) (5)

4.3
- 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)

4.4
- It is suitable for welding most metals and alloys.
- There is 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. (7)

**[25]**

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## QUESTION 5

5.1
- Keep your head away from the fumes.
- Work in a well-ventilated area.
- Wear an approved air respirator if ventilation is poor and cannot be corrected.
- Do not weld near degreasing, cleaning or spraying operations as the heat and rays generated from welding can react with the chemical vapours to produce highly toxic gases.
- Do not weld on coated metals because the coating gives of toxic fumes if welded. (5 × 1) (5)

5.2
- Leather shoes or boots
- Full length pants or overall
- A flame-resistant long-sleeved jacket
- Leather gloves
- Welding helmet
- Safety glasses
- Bandana or skull cap (Any 5 × 1) (5)

5.3
- To ensure a high-quality job, make certain that all components are securely located before welding.
- It is always preferable to have both hands free when welding to ensure the MIG gun is held steady throughout the weld.
- Construct the work piece in a jig and tack weld it.
- The purpose of tack welding the components is to ensure that it does not move during welding.
- A good tack can be achieved by using a slightly higher voltage and a smaller electrode extension.
- Tack welding is a semi-permanent method of joining the work piece.
- If there is a mistake, the tack weld can be easily broken and the work piece can be repaired. (Any 5 × 1) (5)

5.4
- This is a non-destructive testing method.
- It uses X-rays to determine the quality of the weld.
- It is the best inspection method.
- It is very expensive.
- It is not very portable.
- It uses X-rays, which can be dangerous. (Any 5 × 1) (5)

**[20]**

**TOTAL: 100**

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