



Province of the  
**EASTERN CAPE**  
EDUCATION

**DIRECTORATE SENIOR CURRICULUM MANAGEMENT (SEN-FET)**

**HOME SCHOOLING SELF-STUDY WORKSHEET ANSWER SHEET**

<b>SUBJECT</b>	WELDING & METALWORK	<b>GRADE</b>		<b>DATE</b>	
<b>TOPIC</b>	JOINING METHODS	<b>TERM 1 REVISION</b>	(Please tick)	<b>TERM 2 CONTENT</b>	(Please tick)

**QUESTION 1 JOINING METHODS (INSPECTION OF WELD)**

**1.1 Inspection during arc welding:**

- Amount of penetration and fusion
- Rate of electrode burning and progress of the weld
- The way the weld metal is flowing (no slag inclusion)
- The sound of the arc, indicating correct current and voltage for the particular weld  (Any 3)

**1.2 Causes of the following welding defects:**

**1.2.1 Welding spatter:**

- Too high current
- Too long arc

- Not applying anti-spatter spray
  - Electrode angle too small
  - Welding speed too fast
- (Any 2)

**1.2.2 Incomplete penetration:**

- Too low current
  - Too slow welding speed
  - Electrode angle too small
  - Poor joint preparation
  - Insufficient root gap
- (Any 2)

**1.3 Prevention of weld defects:**

**1.3.1 Porosity:**

- Ensure that the surface is clean.
  - Prevent atmospheric contamination.
  - Use dry electrodes.
- (Any 1)

**1.3.2 Slag inclusion:**

- Remove slag from previous run before doing the next run.
  - Ensure that the surface is clean.
  - Use the correct current.
- (Any 1)

**1.4 Nick-break test:**

To determine the internal □ quality/defects □ of the weld metal.

**1.5 Guided bend test:**

- Lack of fusion of the base metal and weld metal.

- Incomplete penetration of the weld metal.

#### 1.6 Free-bend test:

Ductility

#### 1.7 Visual inspection process:

- Shape of profile
  - Uniformity of the surface
  - Overlap
  - Undercutting
  - Penetration bead
  - Root groove
- (Any 3)

#### 1.8 Liquid dye penetration test:

- Clean the surface tested.
- Spray the liquid dye penetrant onto the surface.
- Allow liquid dye to penetrate.
- Remove excess dye with cleaner.
- Spray a developer onto the surface to bring out the colour.
- Areas where the dye has penetrated (defects) will show up clearly.

### QUESTION 2 JOINING METHODS (STRESSES AND DISTORTION)

#### 2.1 Distortion:

Weld distortion is the warping of the base metal □ caused by heat from the welding arc/flame. □

## 2.2 Residual stress:

As the weld proceeds, □ the surrounding areas expand and contract □ at varied rates, which set up stresses □ in the welded joint. These stresses remain when the weld has cooled □ and are known as residual stresses.

## 2.3 Distortion and residual stress:

- If expansion, which occurs when a metal is heated, is resisted then deformation occurs.
- When contraction, which occurs on cooling, is resisted then a stress will be applied.
- If the applied stress causes movement, then distortion occurs.
- If the applied stress does not cause movement, then there will be residual stress in the welded joint. (Any 3)

## 2.4 Methods to reduce distortion:

- Do not overweld.
- Apply intermittent welding.
- Place welds near the neutral axis.
- Use as few passes as possible.
- Use back-step welding.
- Anticipate the shrinkage forces.
- Plan the welding sequence.
- Use strongbacks.
- Use clamps, jigs and fixtures. (Any 3)

## 2.5 Difference between cold working and hot working of steel:

Cold working is when deformation of steel takes place below □ the recrystallisation temperature □ of the steel.

Hot working is when deformation of steel takes place above □ the recrystallisation temperature □ of the steel

## 2.6 Factors that affect the grain size of steel:

- The prior amount of cold work.
- The temperature and time of the annealing process.
- The composition.
- The melting point.

(Any 2)