



Province of the
EASTERN CAPE
EDUCATION

DIRECTORATE SENIOR CURRICULUM MANAGEMENT (SEN-FET)

HOME SCHOOLING SELF-STUDY WORKSHEET ANSWER SHEET

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