



**higher education  
& training**

Department:  
Higher Education and Training  
**REPUBLIC OF SOUTH AFRICA**

# **MARKING GUIDELINE**

**NATIONAL CERTIFICATE**

**METAL WORKERS' THEORY N1**

**31 JULY 2018**

**This marking guideline consists of 7 pages.**

**QUESTION 1**

- Cylinders must be stored in a special fire-resistant storeroom.
- Storerooms must be built above ground level and both the top and the bottom must be well ventilated.
- Light fittings and switches in the storeroom must be flame resistant.
- Full and empty cylinders must be clearly marked and separated to avoid confusion.
- Storerooms must be equipped with suitable fire extinguishers and appropriate warning signs must be prominently displayed.
- Storeroom should be far away from all heat sources such as furnaces, boiler rooms and heaters. (Any 5 × 1) **[5]**

**QUESTION 2**

- 2.1
- Stand firmly on both feet.
  - Clamp the job in a bench vice.
  - Check that the hacksaw blade is fitted correctly.
  - Use full, even strokes.
  - Do not use a hacksaw blade with missing teeth.
  - Do not apply excessive downward pressure when cutting. (Any 5 × 1) (5)
- 2.2
- 2.2.1 A ball-peen hammer is used for striking the center punch and for general hammering work in the workshop.
- 2.2.2 A parallel drift is used for riveting or bolting when three or more plates must be aligned.
- 2.2.3 A flat file is used for general filing work on flat surfaces. (3 × 1) (3)
- 2.3
- 2.3.1 Chalk line is used for striking long, straight lines.
- 2.3.2 Inside calipers are used to obtain the inside diameter of a hole.
- 2.3.3 A try square is used to check the accuracy of small jobs.
- 2.3.4 A bevel gauge is used to mark off bevels or miters on steel sections. (4 × 1) (4)
- 2.4
- $$R^2 = X^2 + Y^2$$
- $$Y = (185 \text{ mm})^2 + (350 \text{ mm})^2$$
- $$Y = 156725$$
- $$Y = 395,885 \text{ mm} \quad (3)$$
- [15]**

**QUESTION 3**

- 3.1 See ANSWER SHEET (2)
- 3.2 See ANSWER SHEET (2)
- 3.3 Circumference =  $3,142 \times \text{diameter}$   
 $3,142 \times 50 \text{ mm}$   
 $157,0796 \text{ mm}$  (2)
- 3.4 See ANSWER SHEET (4)

**[10]****QUESTION 4**

4.1		MILD STEEL	HIGH-CARBON STEEL
4.1.1	Carbon content	Between 0,1% and 0,3%	Between 0,8% and 1,0%
4.1.2	Metal properties	Malleable, ductile, elastic, tough, fusible	Hard, brittle, tough, elastic
4.1.3	Uses	Used in the manufacturing of steel plates, bars, angle irons, H-beams, rivets, bolts and nuts	Used in the manufacturing of shear blades, twist drills, metal cutting tools, files

(3 × 2) (6)

- 4.2 *Brittleness* is a metal's ability to withstand an impact without breaking. (1)

4.3 4.3.1 RSJ

4.3.2 DRG

4.3.3 OD

(3 × 1) (3)

- 4.4 Back mark =  $(70 + 12) / 2$  =  $(70 + 6) / 2$   
 $= 82 / 2$  =  $76 / 2$   
 $= 41 \text{ mm}$  =  $38 \text{ mm}$

(2 × 1) (2)

**[12]**

**QUESTION 5**

- 5.1
- Ensure that the steel section to be cut is firmly secured before starting to machine it.
  - Keep the area around the machine clean and tidy at all times.
  - Only mild steel angles may be cropped.
  - Wear suitable clothing for a workshop.
  - Do not leave the machine unattended at any time during the operation.
  - Take note of the emergency switch.
  - Make sure that the blades of the cropper are firmly tightened.
  - Adjust the foot or stopper correctly to hold the angle section before any cropping work is done. (Any 5 × 1) (5)
- 5.2
- Make sure that the table is clean and free from grease or oil.
  - Wear safety goggles.
  - Check that the metal you are going to cut is a mild steel.
  - Only one person may operate the machine.
  - Ensure that the area behind the guillotine is clear before cutting a plate.
  - Do not overload the machine.
  - Wear suitable gloves to protect your hands against sharp edges of the plate. (Any 5 × 1) (5)
- [10]**

**QUESTION 6**

- 6.1
- Conical head
  - Cup or snap head
  - Pan head
  - Countersunk head (Any 3 × 1) (3)
- 6.2
- 6.2.1 Landing is the distance measured from the edge of the plate to the center of the hole. (1)
- 6.2.2 Pitch is the distance measured from the center of one hole to the center of the next hole along a straight line. (1)
- 6.3
- Length =  $1,5 \times \text{bolt diameter} + \text{thickness of material} + \text{thickness of the washer}$   
 $= 1,5 \times 12 \text{ mm} + 2 \times 18 \text{ mm} + 6 \text{ mm}$   
 $= 18 \text{ mm} + 36 \text{ mm} + 6 \text{ mm}$   
 $= 60 \text{ mm}$  (3)
- 6.4 They are used where smooth surface is the required finish to the job. (2)
- [10]**

**QUESTION 7**

- 7.1      7.1.1      A welding torch is used for welding metal.
- 7.1.2      An acetylene gas cylinder is used to store LP-gas.
- 7.1.3      A pressure regulator regulates the flow of the oxygen gas leaving the cylinder to the welding hose.
- 7.1.4      A flash back arrestor is used to prevent the burning gas from entering back into the cylinder.
- 7.1.5      A welding hose transports the gas from the cylinder to the cutting or welding torch. (5 × 1)      (5)
- 7.2      7.2.1      A neutral flame is used for welding mild steel, stainless steel, cast iron, copper and aluminum. (2)
- 7.2.2      An oxidising flame is used for welding brass and brazing. (2)
- 7.3      • Dirty nozzle
- Unequal amounts of gases
- An overheated nozzle
- The welding nozzle is held too close to the work pièce.
- Incorrect cutting speed (Any 4 × 1)      (4)
- 7.4      Close the acetylene gas first and then the oxygen gas. (2)
- [15]**

**QUESTION 8**

- 8.1      *Shielded arc welding process* refers to all types of electric welding where the molten metal is shielded from the atmosphere by a neutral gas. (2)
- 8.2      • Overalls for body protection
- Leather apron to protect the body against ultra violet rays and arc rays
- Safety boots to protect the feet against heavy falling objects
- Leather spats to protect the feet
- Leather gloves to protect the hands
- Leather yoke to protect the back and shoulders from sparks and hot globular metals (Any 6 × 1)      (6)
- 8.3      8.3.1      True
- 8.3.2      True
- 8.3.3      False (3 × 1)      (3)

- 8.4
- The generator is complex and has many moving parts which will cause wear.
  - Maintenance costs are much higher on the generator than on the transformer.
  - The generator is considerably more expensive than a transformer producing comparable welding current.
  - Above 200 amperes, the magnetic effect of the electric arc created by the direct current causes arc blow.

(4)  
[15]

### QUESTION 9

- 9.1 The length required to form the internal stiffening ring:

$$\text{Mean diameter} = 840 \text{ mm} - 10 \text{ mm}$$

$$= 830 \text{ mm}$$

$$\text{Circumference} = 830 \text{ mm} \times 3,142$$

$$= 2607,86 \text{ mm}$$

- 9.2 The length required to form external stiffening ring:

$$\text{Mean diameter} = 840 \text{ mm} + 20 \text{ mm} + 10 \text{ mm}$$

$$= 870 \text{ mm}$$

$$\text{Circumference} = 870 \text{ mm} \times 3,142$$

$$= 2733,54 \text{ mm}$$

(2 × 4) [8]

**TOTAL: 100**

**QUESTION 3: ANSWER SHEET**

