

## Unit 322

## Marking out components for metalwork

<b>UAN:</b>	M/601/2223
<b>Level:</b>	3
<b>Credit value:</b>	21
<b>GLH:</b>	77
<b>Relationship to NOS:</b>	This unit has been derived from national occupational standard Fabrication and Welding Engineering Unit 22: Marking Out Components for Metalwork (Suite 3).
<b>Endorsement by a sector or regulatory body:</b>	This unit is endorsed by Semta, the Sector Skills Council for Science, Engineering and Manufacturing Technologies.
<b>Aim:</b>	<p>This unit covers the skills and knowledge needed to prove the competences required to mark out sheet and plate work (including simple templates), and rolled sections in accordance with approved procedures. The learner will be required to select the required materials to use and the appropriate marking out tools and equipment based on the information presented to them and the accuracy to be achieved. Marking out will be the preparation required for cutting, shaping and forming sheet materials, plate and sections as is appropriate to the application and will include marking out workpiece datums, centre lines, angles and curved details, cutting and bending details including bending allowances and hole centring and outlining details.</p> <p>Materials to be marked out may include ferrous and non-ferrous. Certain materials will require the learner to take the grain flow into account to avoid later production process problems.</p> <p>The learner's responsibilities will require them to comply with organisational policy and procedures for the marking out activities undertaken and to report any problems with the materials, equipment or marking out activities that they cannot resolve themselves, or are outside their permitted authority, to the relevant people. The learner will be expected to work with minimum supervision, taking personal responsibility for their own actions and the quality and</p>

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accuracy of the work that they produce.

The learner's knowledge will provide a good understanding of their work, and provide an informed approach to applying marking out procedures. The learner will understand the marking out process, and its application, and will know about the materials as well as the care and use of tools in adequate depth to provide a sound basis for carrying out the activities to the required specification.

The learner will understand the safety procedures required when using marking mediums, and when carrying out the marking out activities. The learner will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

<b>Learning outcome</b>	
The learner will:	
1. mark out components for metalwork.	
<b>Assessment criteria</b>	
The learner can:	
1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines	
1.2 obtain and use the correct information for marking out	
1.3 obtain the appropriate marking out equipment and check that it is in a usable condition	
1.4 mark out directly onto sheet or plate from drawings using all of the following tools and instruments:	
• scribe	
• punch	
• rule and tape	
• straight edge	
• square	
• protractor	
• dividers or trammels	
• chalk, bluing or paint	
• laser (where applicable)	
1.5 prepare suitable datum's and marking out surfaces	
1.6 mark out using appropriate methods	
1.7 mark out sheet, plate or section materials on two appropriate materials from the following:	
• hot rolled mild steel (black)	
• cold rolled mild steel (bright)	
• coated mild steel (tinned or galvanised)	
• stainless steel	
• aluminium	

	<ul style="list-style-type: none"> <li>• brass</li> <li>• copper</li> <li>• lead</li> <li>• titanium</li> <li>• non-metallic materials</li> </ul>
1.8	<p>mark out sheet or plate for three of the following forms/shapes of component:</p> <ul style="list-style-type: none"> <li>• flat covers and plates</li> <li>• square and radial bends</li> <li>• square/rectangular/box sections</li> <li>• cylindrical sections (eg trunking, pipes, tanks)</li> <li>• frames or structures</li> <li>• fish plates, gussets</li> <li>• brackets</li> <li>• structural support pads, bed plates</li> <li>• columns, beams or struts</li> <li>• simple seatings (eg boiler saddles, tank cradles)</li> </ul>
1.9	<p>mark out material to include five of the following features:</p> <ul style="list-style-type: none"> <li>• datum and centre lines</li> <li>• square/rectangular profiles</li> <li>• angles</li> <li>• circles</li> <li>• curved profiles</li> <li>• cutting and bending detail (including allowances)</li> <li>• hole centring and outlining (circular and linear)</li> </ul>
1.10	<p>check that the marking out complies with the specification</p>
1.11	<p>produce marked out component which meet all of the following quality and accuracy standards:</p> <ul style="list-style-type: none"> <li>• company/customer standards and codes of practice</li> <li>• dimensionally accurate (to drawing or specification)</li> <li>• clearly defined for required processes</li> <li>• uses recognised marking out conventions</li> </ul>
1.12	<p>deal promptly and effectively with problems within their control and report those that cannot be resolved.</p>

<b>Learning outcome</b>	
The learner will:	
2. know how to mark out components for metalwork.	
<b>Assessment criteria</b>	
The learner can:	
2.1	explain the specific safety precautions to be taken when working in a fabrication environment with sheet, plate or rolled section materials (general workshop and site safety, appropriate personal protective equipment, accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
2.2	describe the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (leather gloves, eye protection, safety helmets etc.)

- 2.3 explain the correct methods of moving or lifting sheet, plate and rolled section materials
- 2.4 describe the hazards associated with marking out fabricated components and explain how they can be minimised (such as working in a fabrication environment, lifting and handling sheet/fabricated components, slivers/burrs on sheet materials, using marking out mediums, using laser marking out equipment)
- 2.5 explain the procedures to be adopted to obtain the necessary drawings and job instructions
- 2.6 explain how to extract information from engineering drawings and related specifications to include symbols and conventions to appropriate BS or ISO standards in relation to work undertaken
- 2.7 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- 2.8 explain how you can produce a three dimensional shape from the two dimensional material
- 2.9 describe the preparations that need to be carried out on the material prior to marking out to enhance clarity and accuracy, and safety
- 2.10 explain the principles of marking out, developing basic shapes (flat, rectangular and cylindrical) from flat sheet, plate or rolled section materials
- 2.11 describe the effective use and care of tools/instruments
- 2.12 explain the use of marking out conventions, datum edges/lines and centre lines
- 2.13 explain the material characteristics and process considerations that need to be taken into account when marking out sheet, plate or rolled section materials
- 2.14 explain how to calculate and mark out true lengths, bend allowances and circumferences
- 2.15 explain the geometrical construction methods used for straight and radius bends, curved or circumference sections, pyramid or cone sections
- 2.16 explain ways of laying out the shapes/patterns to maximise the use of plate or sheet material
- 2.17 explain how to set and adjust the tools, such as squares and protractors
- 2.18 describe the methods of marking out large or long shapes
- 2.19 explain how to mark out and transfer information from templates
- 2.20 explain how to transfer information to the underside of the sheet or plate
- 2.21 explain the importance of using tools only for the purpose intended, the care that is required when using the equipment and tools, the proper way of preserving and storing tools and equipment between operations
- 2.22 explain the need for clear and dimensional accuracy in marking out to specifications/drawings
- 2.23 describe the sort of things that can go wrong in marking out fabrication components, and explain how these can be avoided
- 2.24 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve
- 2.25 explain the reporting lines and procedures, line supervision and technical experts.