

# SEMFWE3-23 – SQA Unit Code HE90 04

## Cutting sheetmetal to shape using hand and machine tools



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### Overview

This standard identifies the competencies you need to cut and shape sheetmetal (up to and including 3 mm) in order to fabricate clips, brackets, covers, trunking and similar components (including templates) in accordance with approved procedures. You will be required to select the appropriate equipment to use for the material and thickness and the accuracy required to be achieved and will use hand tools, hand power tools and machinery as is applicable. The cutting and shaping will involve producing straight cuts, external curved contours, cut-ins, notches and round and square holes.

Materials to be cut and shaped may include ferrous and non-ferrous. This will call for care in selecting the right tools so as to avoid damage or contamination to the tools and danger to oneself.

Your responsibilities will require you to comply with organisational policy and procedures, seeking out relevant information and to report any problems with the cutting equipment, materials or cutting activities that you cannot personal resolve, or are outside your permitted authority, to the relevant person. You will be expected to work with minimum supervision, taking personal responsibility for your own actions and the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work, and provide an informed approach to applying sheetmetal cutting and shaping procedures. You will understand the processes, the equipment and their application, and will know about the materials in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will understand the safety precautions required when working with fabrication tools and machinery. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace.

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### Performance criteria

- You must be able to:*
- P1 work safely at all times, complying with health and safety and other relevant regulations and guidelines
  - P2 follow relevant specifications for the component to be produced
  - P3 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition
  - P4 shape the materials using appropriate methods and techniques
  - P5 check that all the required shaping operations have been completed to the required specification
  - P6 deal promptly and effectively with problems within your control and report those that cannot be solved

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### Knowledge and understanding

*You need to know and understand:*

- K1 the specific safety precautions to be taken when working with sheetmetal equipment and materials in a fabrication environment (general workshop and site safety, appropriate personal protective equipment (PPE), accident procedure; statutory regulations, risk assessment procedures and COSHH regulations)
- K2 the personal protective clothing and equipment that needs to be worn when carrying out the fabrication activities (such as leather gloves, eye/ear protection, safety helmets)
- K3 the correct methods of moving or lifting sheetmetal
- K4 safe working practices and procedures that need to be observed when using manual and power operated tools
- K5 the hazards associated with fabrication work and how they can be minimised, such as using dangerous or badly maintained tools and equipment, operating guillotines and when using hand and bench shears
- K6 the procedures for obtaining the necessary drawings and specifications and how to check that they are the latest issue
- K7 how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate British, European or relevant International standards in relation to work undertaken)
- K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K9 how to interpret the marking out conventions on the materials to be cut and shaped (such as cutting lines, centre lines)
- K10 the tools and techniques available for cutting and shaping sheetmetal (such as tin snips, bench shears, guillotines, portable power tools, bench drills, saws)
- K11 what preparations you may have to carry out on the material prior to cutting it
- K12 the material characteristics and process considerations that need to be taken into account when cutting and shaping sheetmetal
- K13 the use and care of tools and equipment including checks that need to be made to ensure that the tools are fit for purpose (sharp, undamaged, plugs and cables secure and free from damage, machine guards or safety devices operating correctly)
- K14 tool cutting characteristics
- K15 setting and adjusting tools and equipment, the use of back stops on guillotines etc
- K16 the importance of using tools or equipment only for the purpose intended, the care that is required when using the tools or equipment, the

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- proper way of preserving tools or equipment between operations
- K17 the problems that can occur with cutting and shaping sheetmetal and how these can be avoided
- K18 the importance of using the machine guards and safety protection equipment at all times
- K19 inspection techniques that can be applied to check shape and dimensional accuracy are to specification and within acceptable limits
- K20 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve
- K21 reporting lines and procedures, line supervision and technical experts

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### Additional Information

#### Scope/range related to performance criteria

- You must be able to:*
1. cut and finish material to the marked out shape using **six** of the following tools:
    - 1.1 tin snips
    - 1.2 pillar drill
    - 1.3 bench shears
    - 1.4 files
    - 1.5 guillotine
    - 1.6 punch/cropping machine
    - 1.7 hacksaw
    - 1.8 trepanning
    - 1.9 band saw
    - 1.10 nibbling machine
    - 1.11 hand power tools (drill, nibbling)
    - 1.12 thermal devices
  2. perform operations to produce **all** of the following shapes:
    - 2.1 straight cuts
    - 2.2 cut-ins (straight and curved)
    - 2.3 notches
    - 2.4 external and internal curved contours
    - 2.5 round holes
    - 2.6 square holes
  3. use sheetmetal of various thickness up to and including 3 mm for **two** appropriate materials and two thicknesses from the following:
    - 3.1 hot rolled mild-steel
    - 3.2 brass
    - 3.3 cold rolled mild steel
    - 3.4 copper
    - 3.5 coated mild steel (e.g. primer, tinned, galvanised)
    - 3.6 lead
    - 3.7 stainless steel
    - 3.8 titanium
    - 3.9 aluminium
  4. produce cut and shaped components which meet **all** the following quality and accuracy standards:
    - 4.1 company/customer standards requirements
    - 4.2 dimensionally accurate (to drawing or specifications)
    - 4.3 free from distortion
    - 4.4 free from sharp edges, slivers or burrs

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## Cutting sheetmetal to shape using hand and machine tools

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