

SEMFWE3-24 – SQA Unit Code HE91 04

Forming sheetmetal using hand and machine tools



Overview

This standard identifies the competencies you need to form sheetmetal (up to and including 3mm) using hand tools and machine tools in accordance with approved procedures. You will be required to select the appropriate equipment to use based on the operations required, material to be formed and accuracy to be achieved and this will include such things as hammers and stakes, formers, bending machines, rolling machines, wiring and swaging machines. The components/shapes to be produced will include bends/upstands, folds, box sections, wired edges, cylinders and curved sections, square to round trunking, lobsterback trunking, and stretching and shrinking of materials to form cowlings and rounded covers, curved panels with balled corners, concertina ducting or trunking.

Your responsibilities will require you to comply with organisational policy and procedures for the forming activities undertaken and to report any problems with the tools and equipment, materials or activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. 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 sheet metalwork forming procedures. You will understand the forming processes, the equipment used and its application, and will know about the materials and forming techniques in adequate depth to provide a sound basis for carrying out the activities, correcting faults and producing the components to the required specification. You will understand the safety precautions required when working with the forming machines and their associated tools and equipment. 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 the correct component drawing and any other related specifications for the component to be produced
 - P3 determine what has to be done and how this will be achieved
 - P4 use the appropriate tools and equipment for the pressure shaping operations and check that they are in a safe and usable condition
 - P5 shape the materials to the required specification using appropriate methods and techniques
 - P6 check that all the required shaping operations have been completed to the required standard
 - P7 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 apron and gloves, eye/ear protection, safety helmets)
- K3 the correct methods of moving or lifting sheet or plate materials
- K4 the hazards associated with sheetmetal work and how they can be minimised, such as handling sheet/fabricated components, using machinery, using dangerous or badly maintained tools and equipment
- K5 how to obtain the necessary drawings, specifications and work instructions
- K6 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)
- K7 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K8 marking out conventions used in sheetmetal work and how to recognise cutting detail and bending and folding lines
- K9 hand tools used in sheetmetal forming activities and typical operations that they are used for (hammers, stakes, formers, sand bags)
- K10 the various machine tool forming equipment that can be used to produce a range of shapes (such as bends, box sections, cylinders and curved sections, wired edges and swages)
- K11 methods of stretching and shrinking materials and the tools, equipment and techniques used
- K12 how to set up the various machine to produce the required forms (setting up of rolls; setting fingers on bending machines; setting forming tools for swaging)
- K13 ways of limiting distortion, marking, creases, flats (in curved sections)
- K14 how the materials are to be prepared for the forming operations and why some materials may require a heating process prior to forming
- K15 the characteristics of the various materials used with regard to the bending and forming process
- K16 tool and equipment care and maintenance procedures
- K17 the problems that can occur with forming sheetmetal and how these can be avoided

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- K18 organisational quality control procedures and recognition of pressure forming defects
- K19 dimensional and forming inspection checks that need to be carried out and the tools and equipment to be used
- K20 limitations of the various forming processes and accuracy that may realistically be achieved
- K21 ways of avoiding and correcting inaccuracies in forming activities
- K22 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

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Additional Information

Scope/range related to performance criteria

- You must be able to:*
1. ensure that the tools and equipment to be used are appropriate to the application and in a safe and usable condition by carrying out **all** of the following checks:
 - 1.1 hand tools are in a usable condition (hammer shafts secure; stakes, formers and striking faces free from defects and damage)
 - 1.2 the appropriate machine is selected for the operation being performed
 - 1.3 the machine guards and safety devices are in position and function correctly
 - 1.4 forming tools are appropriate and in a serviceable condition (secure, correct shape, free from damage)
 - 1.5 machine settings are suitable for the material thickness and operations to be performed
 2. use **three** of the following types of forming equipment/techniques:
 - 2.1 hammers/panel beating equipment
 - 2.2 wheeling machine
 - 2.3 stakes and formers
 - 2.4 jenny/wiring machine
 - 2.5 bending machine (hand or powered)
 - 2.6 swaging machine
 - 2.7 rolling machine (hand or powered)
 - 2.8 spot heating techniques
 3. perform forming operations which produces **seven** of the following shapes:
 - 3.1 bends/upstands
 - 3.2 cowlings and rounded covers
 - 3.3 folds
 - 3.4 square to round trunking
 - 3.5 box sections
 - 3.6 lobsterback trunking
 - 3.7 wired edges
 - 3.8 domed corners
 - 3.9 swages
 - 3.10 concertina ducting or trunking
 - 3.11 curved panels
 - 3.12 ribbed components
 - 3.13 cylindrical sections
 - 3.14 boxed edges

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- 3.15 concentric cones
- 3.16 offset cones
- 4. produce components made from **two** different materials from the following:
 - 4.1 mild-steel
 - 4.2 aluminium
 - 4.3 tinned steel
 - 4.4 brass
 - 4.5 galvanised plate
 - 4.6 copper
 - 4.7 stainless steel
 - 4.8 lead
 - 4.9 titanium/special steels
- 5. produce components which meet **all** of the following quality and accuracy standards:
 - 5.1 dimensional accuracy is within specification tolerances
 - 5.2 finished components meet the required shape/geometry (to the template profile)
 - 5.3 completed components are free from excessive tooling marks, deformation or cracking

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Developed by SEMTA

Version number 2

Date approved December 2011

Indicative review date December 2016

Validity Current

Status Original

Originating organisation SEMTA

Original URN 24

Relevant occupations Engineering and manufacturing technologies; engineering; Metal Forming, Welding and Related Trades

Suite Fabrication and Welding Engineering Suite 3

Key words engineering, welding, fabrication, manual, machining, form sheetmetal, bending, rolling, stakes and formers, swaging