

### Overview

This standard covers a range of basic competences that you need, to carry out hand forging activities to engineering materials/components. It will prepare you for entry into the engineering or manufacturing sectors, creating a progression between education and employment, or it will provide a basis for the development of additional skills and occupational competences in the working environment.

You will be expected to prepare for the hand forging activities by obtaining all the necessary job instructions, materials, tools, equipment and any documentation that may be required.

You will use the specified techniques to prepare the materials and equipment in readiness for the hand forging activities. The forging activities will include operations such as bending, twisting, drawing down, upsetting, swaging, punching, cutting off and flame welding, as applicable to the task.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the hand forging activities undertaken. You will need to report any difficulties or problems that may arise with the hand forging activities, and to carry out any agreed actions. You will work under a high level of supervision, whilst taking responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide an understanding of your work, and will enable you to apply appropriate hand forging techniques and procedures safely. You will understand the hand forging techniques used, and their application, and will know about the equipment, materials and consumables, to the required depth to provide a sound basis for carrying out the activities to the required specification.

You will understand the safety precautions required when carrying out the hand forging activities, and when using the associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand your responsibility for taking the necessary safeguards to protect yourself and others in the workplace.

### Specific Standard Requirements

At least one of the heat treated components must require a combination of different hand forging techniques to be used: such as drawing down the section of material to produce a long taper, and upsetting the end of the bar to produce a flange/head.

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### Performance criteria

- You must be able to:*
- P1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines
  - P2 prepare the materials in readiness for the forging operations
  - P3 prepare the forging equipment in readiness for the forging operations
  - P4 carry out the hand forging operations, using appropriate techniques and procedures
  - P5 report any difficulties or problems that may arise with the hand forging activities, and carry out any agreed actions
  - P6 shut down the forging equipment to a safe condition on completion of the activities
  - P7 leave the work area in a safe condition on completion of the hand forging activities

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### Knowledge and understanding

*You need to know and understand:*

- K1 the specific health and safety precautions which must be taken when carrying out hand forging processes (such as wearing protective clothing and protective equipment, using fume extraction equipment)
- K2 the hazards associated with carrying out hand forging processes (such as handling hot materials, fume inhalation, fire), and how they can be minimised
- K3 the personal protective equipment (PPE) that should be used (such as leather aprons, eye/ear protection, overalls, face masks, breathing equipment); how to obtain it and check that it is in a safe and usable condition
- K4 the importance of ensuring that fume extraction equipment is operating effectively, and that good housekeeping and fire prevention procedures are observed
- K5 the importance of following job instructions and defined hand forging techniques and procedures
- K6 the meaning of forging terminology (such as drawing down, upsetting swaging, twisting, punching and flame welding)
- K7 how to prepare the equipment for the hand forging activities (such as setting furnace controls to give the correct temperature; the procedure for lighting and extinguishing the blacksmith's forge; setting up gas torches; ensuring that suitable tongs/handling devices are available)
- K8 the material preparation methods and techniques to be undertaken prior to carrying out the hand forging operations (such as removing scale, oil and dirt; heating the material to the correct forging temperature)
- K9 how to determine when the material is ready for the forging operations (by checking the colour of the hot material)
- K10 the various hand forging methods used, and the types of tooling required (including types of hammers, formers, swages, stakes, punches and drifts)
- K11 the use of the various parts of the blacksmith's anvil for the forging operations
- K12 the problems that can occur with the hand forging operations, and how these can be overcome
- K13 when to act on your own initiative and when to seek help and advice from others
- K14 the importance of leaving the work area and equipment in a safe and clean condition on completion of the forging activities (such as returning tools and equipment to the designated location, cleaning the work area, and removing and disposing of waste)

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### Additional Information

#### Scope/range related to performance criteria

*You must be able to:*

1. Carry out all of the following during the hand forging activities:
  - 1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
  - 1.2 follow job instructions and hand forging specifications and procedures
  - 1.3 ensure that the material handling equipment and hand tools are in a safe and usable condition
  - 1.4 return all tools and equipment to their correct designation on completion of the hand forging activities
  - 1.5 dispose of waste and excess materials, in line with organisational procedures
  
2. Use **one** of the following methods of heating the components:
  - 2.1 Furnace/oven
  - 2.2 blacksmith's forge
  - 2.3 gas torch
  - 2.4 induction heating
  
3. Carry out **three** of the following hand forging operations:
  - 3.1 bending
  - 3.2 upsetting
  - 3.3 cutting off
  - 3.4 twisting
  - 3.5 swaging
  - 3.6 flame welding
  - 3.7 drawing down
  - 3.8 punching
  
4. Carry out hand forging operations on **one** of the following types of material:
  - 4.1 wrought iron
  - 4.2 alloy steel
  - 4.3 copper
  - 4.4 low carbon steel
  - 4.5 brass
  - 4.6 high carbon steel
  - 4.7 other materials (specify)

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5. Use **three** of the following during the forging process:
  - 5.1 hand hammers
  - 5.2 formers
  - 5.3 punches
  - 5.4 pneumatic hammers
  - 5.5 swages
  - 5.6 drifts
  - 5.7 blacksmith's anvil
  - 5.8 stakes
  - 5.9 other (specify)
  
6. Carry out the hand forging activities, to include **all** of the following:
  - 6.1 lighting up the furnace/forge or torch, using approved procedures
  - 6.2 checking that the components are correctly prepared for the required hand forging activities (such as free from scale or excessive rust, heated to the correct colour/temperature)
  - 6.3 using appropriate tools and techniques to forge the required shapes/profiles
  - 6.4 re-heating the forged components at suitable periods during the forging process
  - 6.5 using appropriate tools/gauges to determine when the required shape is achieved
  
7. Produce hand forged components which comply with **all** of the following:
  - 7.1 all dimensions are within job requirements
  - 7.2 finished components meet the required shape/geometry (such as flat, straight, angles, twists)
  - 7.3 completed components are free from excessive tooling/hammer marks, deformation or cracks

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## Hand forging engineering materials

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**Developed by** SEMTA

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**Version number** 2

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**Date approved** December 2011

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**Indicative review date** December 2016

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**Validity** Current

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**Status** Original

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**Originating organisation** SEMTA

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**Original URN** 36

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**Relevant occupations** Engineering; Engineering and manufacturing technologies; Blacksmith

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**Suite** Performing Engineering Operations Suite 1; Craft (Blacksmithing)

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**Key words** performing engineering operations, hand forging, manufacturing, bending, twisting, drawing down, upsetting, swaging, punching, flame welding; Blacksmithing