

Overview

This standard covers a broad range of basic competences you need for cutting and shaping plate (3mm thickness and above), rolled sections, pipe and tube using thermal cutting equipment. This 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.

The thermal cutting will include equipment such as hand-held oxy-fuel gas cutting equipment, plasma cutting equipment, simple portable machines running on tracks, and fixed bench cutting machines. You will be expected to prepare for the cutting activities by obtaining all necessary information, documentation, tools and equipment required, and to plan how you intend to carry out the required cutting operations.

You will be required to assemble and set up the appropriate equipment for the material and thickness to be cut, the type of operation to be carried out and the accuracy to be achieved. Materials to be cut and shaped may include mild steel, stainless steel, special steels and other appropriate materials, and the work will include guided cuts, vertical cuts, overhead cuts, external curved contours, round and square holes, as appropriate.

Your responsibilities will require you to comply with health and safety requirements and organisational policy and procedures for the thermal cutting activities undertaken. You will need to take account of any potential difficulties or problems that may arise with the activities, and to seek appropriate help and advice in determining and implementing a suitable solution. 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 thermal cutting techniques and procedures safely. You will understand the cutting process, and its application, and will know about the tools, equipment, materials and consumables used, 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 thermal cutting activities, and when using the various tools and equipment, especially with regard to fire and potential explosion, and the necessary safeguards for undertaking the activities safely and correctly. You will be required to demonstrate safe working practices throughout, and will understand

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the responsibility you owe to yourself and others in the workplace.

Specific Standard Requirements

In order to prove your ability to combine different thermal cutting operations, at least one of the components produced must be of a significant nature, and must involve a minimum of **four** of the operations listed in scope 3.

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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 plan the thermal cutting activities before you start them
- P3 obtain the appropriate tools and equipment for the cutting operations, and check that they are in a safe and usable condition
- P4 set up the thermal cutting equipment for the operations to be performed
- P5 where appropriate, mark out the components for the required operations, using appropriate tools and techniques
- P6 operate the thermal cutting equipment to produce items/cut shapes to the dimensions and profiles specified
- P7 measure and check that all dimensional and geometrical aspects of the component are to the specification
- P8 deal promptly and effectively with problems within your control, and seek help and guidance from the relevant people if you have problems that you cannot resolve
- P9 shut down the equipment to a safe condition on conclusion of the machining activities
- P10 leave the work area in a safe and tidy condition on completion of the thermal cutting activities

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Knowledge and understanding

You need to know and understand:

- K1 the specific safety precautions to be taken when working with thermal cutting equipment in a fabrication environment (including general workshop safety; protecting other workers by siting protective screens; fire and explosion prevention; safety in enclosed/confined spaces; fume control)
- K2 the personal protective clothing and equipment (PPE) to be worn when working with thermal cutting equipment (such as leather aprons and gloves, eye/ear protection)
- K3 the correct methods of moving or lifting plate and section materials
- K4 the hazards associated with carrying out thermal cutting activities (including trailing hoses, naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot metal, enclosed spaces), and how they can be minimised
- K5 safe working practices and procedures for using thermal equipment, in line with British Compressed Gas Association (BCGA) codes of practice (to include setting up procedures, and emergency shutdown procedures)
- K6 the procedure for obtaining the required drawings, job instructions and other related specifications
- K7 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
- K8 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
- K9 basic principles of thermal cutting, the various types of thermal cutting equipment available, and typical applications
- K10 the accessories that can be used with hand-held thermal cutting equipment to aid cutting operations (such as cutting guides, trammels, templates); arrangements for attaching cutting aids to the equipment
- K11 the gases used in thermal cutting; gas identification and colour codes; their particular characteristics and safety procedures
- K12 how to set up the thermal cutting equipment (including connection of hoses, regulators and flashback arrestors, selection of cutting torch and nozzle size in relationship to material thickness and operations performed)
- K13 preparations prior to cutting (including checking connections for leaks, setting gas pressures, setting up the material/workpiece, and checking the cleanliness of materials used)
- K14 the holding methods that are used to aid thermal cutting, and the equipment that can be used
- K15 setting of operating conditions (including flame control, and the effects of mixtures and pressures associated with thermal cutting)
- K16 the correct procedure for lighting and extinguishing the flame (to include

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- lighting the cutting torch and adjusting gas controls to produce a neutral flame; methods of starting the cut and controlling the cutting speed, direction and angle of cut; the procedure for extinguishing the flame and the importance of following the procedure)
- K17 procedures to be followed for cutting specific materials, and why these procedures must always be adhered to
 - K18 the problems that can occur with thermal cutting (including causes of distortion during thermal cutting and methods of controlling distortion), and how they can be avoided
 - K19 the effects of oil, grease, scale or dirt on the cutting process
 - K20 the causes of cutting defects, how to recognise them, and methods of correction and prevention
 - K21 when to act on your own initiative and when to seek help and advice from others
 - K22 the importance of leaving the work area and equipment in a safe and clean condition on completion of the thermal cutting activities (such as safely storing gas cylinders and cutting equipment, removing and disposing of waste)

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Additional Information

Scope/range related to performance criteria

- You must be able to:*
1. Confirm that the equipment is safe and fit for purpose, by carrying out **all** of the following checks:
 - 1.1 adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment (PPE) and other relevant safety regulations
 - 1.2 the equipment selected is suitable for the operations to be performed
 - 1.3 regulators, hoses and valves are securely connected and free from leaks and damage
 - 1.4 the correct gas nozzle is fitted to the cutting torch
 - 1.5 a flashback arrestor is fitted to the gas equipment
 - 1.6 appropriate gas pressures are set
 - 1.7 the correct procedure is used for lighting, adjusting and extinguishing the cutting flame
 - 1.8 hoses are safely routed and protected at all times
 - 1.9 gas cylinders are handled and stored safely and correctly

 2. Use the following thermal cutting method:
 - 2.1 hand-held oxy-fuel gas cutting equipmentPlus **one** more from the following:
 - 2.2 hand-held plasma gas cutting equipment
 - 2.3 simple, portable, track-driven cutting equipment (electrical or mechanical)
 - 2.4 fixed bench gas cutting equipment

 3. Perform thermal cutting operations, to include **all** of the following:
 - 3.1 down-hand straight cuts (freehand)
 - 3.2 cutting regular shapes
 - 3.3 making radial cutsPlus **three** more from the following:
 - 3.4 making straight cuts (track guided)
 - 3.5 cutting irregular shapes
 - 3.6 gouging/flushing
 - 3.7 making vertical cuts
 - 3.8 making angled cuts
 - 3.9 bevelled edge – weld preparations
 - 3.10 making overhead cuts
 - 3.11 cutting chamfers

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3.12 cutting out holes

4. Produce thermal cuts in the following form of material (metal of 3mm and above):
 - 4.1 platePlus **one** more from the following:
 - 4.2 rolled sections
 - 4.3 pipe/tube
 - 4.4 structures

5. Produce cut profiles for **one** type of material from the following:
 - 5.1 mild steel
 - 5.2 high tensile/special steel
 - 5.3 stainless steel
 - 5.4 other appropriate metal

6. Produce thermally-cut components which meet **all** of the following:
 - 6.1 dimensional accuracy is within the tolerances specified on the drawing/specification, or within +/- 3mm
 - 6.2 angled/radial cuts are within specification requirements
 - 6.3 cuts are clean, smooth and free from flutes

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