

SEMF333 - SQA Unit Code H1VY 04

Cutting and shaping materials using portable thermal cutting equipment



Overview

This unit identifies the competencies you need for cutting and shaping plate (3mm thickness and above), rolled sections, pipe and tube for fabrications using portable thermal cutting equipment in accordance with approved procedures. The equipment to be used will include hand held gas cutting equipment, plasma cutting equipment and simple portable machines running on tracks. You will be required to assemble and set up the appropriate equipment to be used for the material and thickness to be cut, the type of operation to be carried out and the accuracy required to be achieved. Materials to be cut and shaped may include mild steel, stainless steel, special steels and other appropriate materials and will include guided cuts, vertical cuts, overhead cuts, external curved contours, round and square holes and demolition work as is appropriate. This will call for care in selecting the right equipment and tools so as to avoid damage to the material and tools, and danger to oneself

Your responsibilities will require you to comply with organisational policy and procedures for the cutting operations, seeking out relevant information for the thermal cutting activities undertaken and to report any problems with the equipment, materials, consumables or cutting activities that you cannot personally resolve yourself, or are outside your personal responsibilities, to the relevant authority. 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 thermal-cutting procedures. You will understand the processes, and will know about the equipment and its application, and the materials and consumables, in adequate depth to provide a sound basis for carrying out the activities to the required specification. You will need to understand the safety precautions required when working with the thermal cutting equipment, especially those with regard to fire and potential explosion, and the safeguards necessary for undertaking the activities safely and correctly. You will be expected to demonstrate safe working practices throughout, and will understand the responsibilities 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 confirm that the machine is set up and ready for the machining activities to be carried out
 - P3 manipulate the machine tool controls safely and correctly in line with operational procedures
 - P4 produce components to the required quality and within the specified dimensional accuracy
 - P5 carry out quality sampling checks at suitable intervals
 - P6 deal promptly and effectively with problems within your control and report those that cannot be solved
 - P7 shut down the equipment to a safe condition on conclusion of the machining 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 (general workshop and site safety, appropriate personal protective equipment, fire and explosion prevention, protecting other workers, safety in enclosed/confined spaces; fume control; accident procedure; statutory regulations)
- K2 the personal protective clothing and equipment that needs to be worn when working with fabrications and thermal cutting equipment (leather aprons and gloves, eye protection, safety helmets etc.)
- K3 the correct methods of moving or lifting plate materials and components
- K4 the hazards associated with thermal cutting and how they can be minimised (naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot metal, elevated working, enclosed spaces)
- 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, permit to work procedures and emergency shut down procedures
- K6 how to obtain the necessary drawings and thermal cutting 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 the thermal cutting process (basic principles of thermal cutting and related equipment; the various techniques and their limitation; care of the equipment to ensure that it is safe and ready to use)
- K10 the various types of thermal cutting equipment available and typical applications
- K11 the accessories that can be used with hand held thermal cutting equipment to aid cutting operations (such as guides, trammels, templates) arrangements for attaching cutting aids to the equipment
- K12 the gases used in thermal cutting, gas identification and colour codes, their particular characteristics and safety procedures
- K13 how to set up the thermal cutting equipment (connection of hoses, regulators and flash back arrestors, selection of cutting torch and nozzle size in relationship to material thickness and operations performed)
- K14 preparations prior to cutting (checking connections for leaks, setting gas pressures, setting up the material/workpiece, checking cleanliness of materials used)
- K15 the holding methods that are used to aid thermal cutting and equipment that can be used

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- K16 setting of operating conditions; flame control and the effects of mixtures and pressures associated with thermal cutting.
- K17 the correct procedure for lighting and extinguishing the flame, and the importance of following the procedure
- K18 procedures to be followed for cutting specific materials, and why these procedures must always be adhered to
- K19 material thermal cutting characteristics and material preparation requirements
- K20 the terminology used in thermal cutting in relation to the operations being performed
- K21 the problems that can occur with thermal cutting and how they can be avoided; causes of distortion during thermal cutting and methods of controlling distortion
- K22 the effects of oil, grease, scale or dirt on the cutting process
- K23 the causes of cutting defects, how to recognise them and methods of correction and prevention
- K24 quality requirements of the type of work being undertaken
- K25 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

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 the equipment selected is suitable for the operations to be performed
 - 1.2 regulators, hoses and valves are securely connected and free from leaks and damage
 - 1.3 the correct gas nozzle is fitted to the cutting torch
 - 1.4 that a flash back arrestor is fitted to gas equipment
 - 1.5 appropriate gas pressures are set
 - 1.6 the correct procedure is used for lighting, adjusting and extinguishing the cutting flame
 - 1.7 hoses are safely routed and protected at all times
 - 1.8 gas cylinders are handled and stored safely and correctly
2. use **two** of the following thermal cutting methods:
 - 2.1 hand held Oxy-fuel gas-cutting equipment
 - 2.2 hand held plasma gas-cutting equipment
 - 2.3 simple portable track driven cutting equipment (electrical or mechanical)
3. perform thermal cutting operations to produce **six** of the following features:
 - 3.1 down-hand straight cuts freehand
 - 3.2 square/rectangular shapes
 - 3.3 round holes
 - 3.4 straight cuts track guided
 - 3.5 irregular shapes
 - 3.6 square holes
 - 3.7 vertical cuts
 - 3.8 angled cuts
 - 3.9 rough cutting (demolition)
 - 3.10 overhead cuts
 - 3.11 external curved contours
 - 3.12 bevelled edge - weld preparations
4. produce thermal cuts in **four** of the following forms of material (metal of 3mm and above and two different thickness):
 - 4.1 plate
 - 4.2 rolled sections
 - 4.3 structures
 - 4.4 bar
 - 4.5 pipe/tube
5. produce cut profiles for **one** type of material from the following:
 - 5.1 mild steel
 - 5.2 special steels
 - 5.3 stainless steel

- 5.4 other appropriate metal
- 6. produce thermally cut components which meet **all** of the following quality and accuracy standards:
 - 6.1 dimensional accuracy is within the tolerances specified on the drawing/specification or within +/- 1.5mm
 - 6.2 angled cuts are within specification requirements (perpendicular/angularity)
 - 6.3 cuts are clean and smooth with minimal drag lines

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