SEMME3051 – HY1K 04
Cutting and shaping materials using portable thermal cutting equipment

Overview

This standard identifies the competences you need for cutting and shaping plate (3mm thickness and above), rolled sections, pipe and tube for marine fabrications, using portable thermal cutting equipment, in accordance with approved procedures. The equipment to be used will include hand-held oxy-fuel 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 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 the work will include guided cuts, vertical cuts, overhead cuts, external curved contours, round and square holes and demolition work, as 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, to seek 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 resolve yourself, or are outside your responsibilities, to the relevant authority. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you produce.

Your underpinning knowledge will provide a good understanding of your work and will provide an informed approach to applying thermal cutting procedures in a marine environment. 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, directives 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

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 marine fabrication environment, both on land and on board vessels (including 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 (PPE) to be worn when working with fabrications and thermal cutting equipment (including leather aprons and gloves, eye/ear protection and safety helmets)

K3 the correct methods of moving or lifting plate materials and components

K4 the hazards associated with thermal cutting (including naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot metal, elevated working, 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, permit-to-work procedures and emergency shutdown 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 carry out currency/issue checks of the specifications you are working with

K9 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing

K10 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

K11 the various types of thermal cutting equipment available and typical applications

K12 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

K13 the gases used in thermal cutting; gas identification and colour codes; their particular characteristics and safety procedures

K14 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)

K15 preparations prior to cutting (including checking connections for leaks, setting gas pressures, setting up the material/workpiece and checking the cleanliness of materials used)
K16 the holding methods that are used to aid thermal cutting and the equipment that can be used
K17 setting of operating conditions (including flame control and the effects of mixtures and pressures associated with thermal cutting)
K18 the correct procedure for lighting and extinguishing the flame and the importance of following the procedure
K19 procedures to be followed for cutting specific materials and why these procedures must always be adhered to
K20 material thermal cutting characteristics and material preparation requirements
K21 the terminology used in thermal cutting, in relation to the operations being performed
K22 the problems that can occur with thermal cutting and how they can be avoided (including causes of distortion during thermal cutting and methods of controlling distortion)
K23 the effects of oil, grease, scale or dirt on the cutting process
K24 the causes of cutting defects, how to recognise them and methods of correction and prevention
K25 quality requirements of the type of work being undertaken
K26 the calibration/care and control procedures for tools and equipment
K27 the procedure for the safe disposal of waste materials
K28 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. a flashback arrestor is fitted to the 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 (where applicable)

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. straight cuts (track guided)
   - 3.3. vertical cuts
   - 3.4. overhead cuts
   - 3.5. regular shapes
   - 3.6. irregular shapes
   - 3.7. angled cuts
   - 3.8. radial cuts
   - 3.9. rough cutting (demolition)
   - 3.10. chamfers
   - 3.11. gouging/flushing
   - 3.12. bevelled edge – weld preparations

4. Produce thermal cuts in **three** of the following forms of material (metal of 3mm and above) and **two** different thicknesses:

4.1. plate
4.2. rolled sections
4.3. pipe/tube
4.4. structures

5. Produce cut profiles for **one** type of material from the following:
   5.1.1. mild steel
   5.1.2. high tensile steel
   5.1.3. other specific metal

6. Produce thermally-cut components which meet **all** of the following standards:
   6.1.1. dimensional accuracy is within the tolerances specified on the drawing/specification, or within +/- 3mm
   6.1.2. angled/radial cuts are within specification requirements (perpendicular/angularity/elliptical/parabolic)
   6.1.3. cuts are clean and smooth, with minimal drag lines

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