



National Unit Specification: general information

UNIT Thermal Cutting Processes (SCQF level 6)

CODE F5FB 12

SUMMARY

This Unit can be taken as part of a National Qualification Group Award in Engineering but can also be taken as a free-standing Unit.

The Unit will allow candidates to gain knowledge of the principles of the oxy-fuel, arc/air, manual metal arc, oxy/arc, plasma and laser processes and to apply these principles and applications to industrial requirements. Candidates will collect this information from a variety of sources including manufacturers' handbooks, and data sheets and the use of Information Technology will also be encouraged.

Candidates will learn about the gases, equipment, operating variables and consumables of each process and the relationship of each of these to the selection of a process with regard to the quality of cut.

The Unit is suitable for candidates who are studying the subject for the first time as well as those who wish to enhance their knowledge of thermal cutting processes.

OUTCOMES

- 1 Describe the principles of thermal cutting processes, and identify the factors that affect the quality of the thermal cut.
- 2 Identify the equipment and consumables required for the thermal cutting processes.
- 3 Identify the factors which affect the selection of a thermal cutting process for a given application.

Administrative Information

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National Unit Specification: general information (cont)

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RECOMMENDED ENTRY

While entry is at the discretion of the centre, it would be beneficial if candidates had some knowledge of fabrication and welding.

CREDIT VALUE

1 credit at Higher (6 SCQF credit points at SCQF level 6*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

There are opportunities to develop the Core Skills of *Communication* and *Information Technology* at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

National Unit Specification: statement of standards

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Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME 1

Describe the principles of thermal cutting processes, and identify the factors that affect the quality of the thermal cut.

Performance Criteria

- (a) Explanation of the principles of thermal cutting processes is correct.
- (b) Explanation of the principles of thermal gouging processes is correct.
- (c) Identification of factors that effect the quality of the cut face is correct.
- (d) Identification of hazards associated with thermal cutting and gouging processes is correct.

OUTCOME 2

Identify the equipment and consumables required for the thermal cutting processes.

Performance Criteria

- (a) Identification of the equipment required for thermal cutting processes is correct.
- (b) The necessary consumables required for thermal cutting processes are listed correctly.

OUTCOME 3

Identify the factors which affect the selection of a thermal cutting process for a given application.

Performance Criteria

- (a) Identification of the factors which affect the selection of a thermal cutting process and consumables are correct.
- (b) Identification of the factors which affect the selection of a gouging process and consumables are correct.

National Unit Specification: statement of standards

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EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that the candidates have achieved all of the Outcomes and Performance Criteria.

Evidence for this Unit will be assessed by written and/or recorded oral evidence at a single assessment event under supervised conditions lasting no more than two hours and must include:

- ◆ explanation of the principles of any **three** thermal cutting and **one** gouging process
- ◆ identification of any **four** factors effecting the quality of a cut face for any **two** processes
- ◆ identification of any **three** hazards associated thermal cutting and gouging processes
- ◆ identification of the equipment and consumables required for any **two** thermal cutting processes and **one** gouging process
- ◆ selection and justification of a thermal cutting process for a given application

The Assessment Support Pack (ASP) for this Unit provides samples of details of the questions which exemplify the national standard. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard.

National Unit Specification: support notes

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This part of the Unit Specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

The Unit is in the National Qualification Group Award (NQGA) in *Fabrication and Welding Engineering* but can also be taken on a free-standing basis.

Candidates will be required to access the information listed below which could be collected by the student from information data sheets, manufacturers handbooks, they could be accessed either by paper copies or the internet.

Gases in oxy-fuel: oxygen, acetylene, and propane.

Gases in plasma: argon, argon/hydrogen, nitrogen, and oxygen, air.

Equipment: manual systems, mechanised systems.

Gases: fuel, pressures, selection.

Electrical: electrode types, electrode diameters, and current.

Operating variables: nozzle type, cutting speed, electrode to work distance.

Costs: capital, operating.

Production: speed of cutting, operator skills.

Quality: materials cut (ferrous, non-ferrous), width of kerfs, need for finishing.

Consumables: gases, non-consumable electrodes, nozzle type, carbon electrodes.

Gas equipment: nozzles, hoses, regulators, and connections.

Electrical equipment: power sources, cable connections, carbon holders, and electrodes.

They should also be made aware about the health and safety implications of using explosive and toxic gases, electrical power, fire and fume.

The candidates should undertake the Unit within a classroom situation but have access to the workshop where individual processes can be demonstrated.

It is important that decision making regarding process selection is included and that a degree of practice on this topic is incorporated into the teaching.

National Unit Specification: support notes (cont)

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GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

To raise the candidate's awareness of the Unit it would be a benefit if it were presented in tandem with the Unit *Thermal Cutting Skills*. Candidates would experience the vocational skill along with the appropriate theoretical knowledge.

Candidates should see workshop demonstrations of each process, either in a real life situation or by the use of Audio Visual equipment to allow them to assimilate the theory with the practice.

They should also be allowed to inspect a range of cuts in different materials to allow them to make informed decisions on the relevance of a process to a particular material.

The main content of the Unit should be taught in the classroom with candidates having access to the internet to enable them to research the processes.

This Unit should be delivered by a combination of teaching and learning approaches which could include:

- ◆ Lecturing
- ◆ Case studies
- ◆ Practical activities
- ◆ Group discussions
- ◆ Tutorials
- ◆ Directed study
- ◆ Investigation including the use of ICT
- ◆ Site visits
- ◆ Audio visual

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Candidates will learn to access and evaluate complex information from a range of sources, and could be introduced to effective on line search strategies to read the most current resources on issues relevant to thermal cutting processes. They should be advised on the effective and responsible use of equipment and software applications, and learn methods for keeping all data gathered secure and well organised.

Although skills in communication are not formally assessed, candidates should be expected to produce analytical written work which is factually and technically accurate, and presented to a standard acceptable in the vocational area. Current industry materials could provide models of appropriate style, structure, format and graphic communication. Group discussion of case studies during formative work be useful to support analytical approaches to issues affecting thermal cutting processes and would provide opportunities enhance oral communication skills and interpersonal techniques in a work related context.

National Unit Specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by information and communications technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Candidates could be assessed using an integrated assessment of Outcomes 1 and 2 which could take the form of a series of written questions combining completion and short answer responses.

The completion questions could be taken from pieces of text used in the teaching notes for each of the PCs, ie the principles of the process, the remainder of the assessment will be made up of short answer questions based on the remainder of the two PCs.

In question 3 the assessment could take the form of a case study requiring the candidate to select a process and give reasons for the selection, this could be carried out for one cutting and one gouging process.

CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* (www.sqa.org.uk).