National Unit Specification: general information

UNIT Welding Processes (SCQF level 5)

CODE F5F3 11

SUMMARY

This Unit is intended to be used in Engineering Group Awards but can also be taken as a free-standing Unit by candidates who wish to enhance their skills in a fabrication and welding environment. It is also suitable for those who are studying the subject for the first time.

The Unit will enable candidates to understand the principles of welding processes and their applications, equipment required for the processes to function, consumables used and process welding parameters.

The processes covered in this Unit are: oxy-acetylene, manual metal arc, tungsten inert gas welding, metal inert gas welding, metal active gas welding, flux cored wire metal arc welding with active gas, plasma arc and resistance welding.

OUTCOMES

1 Know the principles and applications of welding processes.
2 Identify equipment required for welding processes.
3 Select process consumables.
4 Explain the factors affecting the quality of deposited weldmetal.

RECOMMENDED ENTRY

Entry is at the discretion of the centre.

Administrative Information

Superclass: XE

Publication date: March 2008

Source: Scottish Qualifications Authority

Version: 01

National Unit Specification: general information (cont)

UNIT Welding Processes (SCQF level 5)

CREDIT VALUE

1 credit at Intermediate 2 (6 SCQF credit points at SCQF level 5*).

**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 *Problem Solving* and *Communication* at SCQF level 5 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

National Unit Specification: statement of standards

UNIT Welding Processes (SCQF level 5)

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

Know the principles and applications of welding processes.

Performance Criteria

(a) The source of energy for a given welding process is described correctly.
(b) The description of how weld and parent materials are protected from atmospheric contamination is correct.
(c) The explanation of how filler material is added to the weldpool is correct.
(d) An application for a given welding process is correctly stated.

OUTCOME 2

Identify equipment required for welding processes.

Performance Criteria

(a) Identification of equipment and components required for a welding process is correct.
(b) The function of components of a welding process is correctly stated.

OUTCOME 3

Select welding process consumables.

Performance Criteria

(a) The consumables required for a given welding process are correctly listed.
(b) Consumables selected for a given application are correct.
(c) The identification of a source of information for welding consumables is correctly stated.

OUTCOME 4

Explain the factors affecting the quality of deposited weldmetal.

Performance Criteria

(a) The identification of welding process parameters/variables is correct.
(b) The identification of variables controlled by the welder is correct.
(c) The identification of the factors affecting weld quality is correct.

National Unit Specification: statement of standards (cont)

UNIT Welding Processes (SCQF level 5)

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 in the form of closed-book written and/or recorded oral evidence produced under controlled and supervised conditions lasting no more than two hours in total.

The evidence must be produced on one assessment occasion towards the conclusion of the Unit where the candidate will:

- select welding processes for given applications
- state the principles of the given welding processes
- select the consumables and variable settings from appropriate sources for the given processes
- state the factors affecting weld quality

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

UNIT Welding Processes (SCQF level 5)

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 it can also be taken on a free-standing basis.

Welding processes are often classified by how energy is used for joining weldable materials eg thermo chemical, oxy-acetylene, gas shielded electric arc, manual metal arc, tungsten inert gas, metal inert gas, metal active gas, flux cored wire metal arc welding with active gas and plasma arc.

Direct Resistance — resistance welding processes: spot stitch, seam, butt, projection and flash butt.

Also required is/are:

- The methods used to protect the welding area from atmospheric contamination for the welding processes listed. Reducing nature of flame, gas shielding and mechanical exclusion.
- The mechanism for adding filler to the weldpool where filler is required.
- Equipment required for the process to operate gas supplies and associated regulators, flow-meters, hoses and safety components.
- Power sources required for arc and resistance processes; the reasons for the use of equipment with particular output characteristics (volt/ampere curve constant current/drooping, constant voltage/flat) power sources that will provide ac, dc and ac/dc currents and how current/voltage and heat input is controlled.
- Consumables required for each of the listed welding processes. How welding processes are selected and sources of information used — manufacturers' catalogue and internet sites.
- The effects of consumables selected on the quality of the deposited weldmetal for example rutile and basic covered electrodes.
- Welding parameters/variables associated with each of the welding processes listed and how they affect the quality of the weld deposit and the shape of the weld reinforcement, fusion penetration etc.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Although this is essentially a classroom based Unit the time made available to deliver this Unit should have a portion of time set aside to provide an opportunity for each candidate to experience first hand each of the welding processes in a workshop environment to reinforce the theoretical learning required.

Each of the welding processes listed should be made available for candidates to use and be aware of the operation, equipment and consumables used, the control settings required for each of the welding processes and the effects they can have on the completed weld.

National Unit Specification: support notes (cont)

UNIT Welding Processes (SCQF level 5)

Candidates should be given the opportunity to research the internet on the processes to enhance their knowledge.

Organisations such as The Welding Institute (WWW.TWI.co.uk) provide learning materials such as Video/CD/DVD that can be used to support the theoretical learning of the principles, capabilities and applications of welding processes.

Suppliers also can provide learning or demonstration materials that can support the learning processes. BOC, Air Products, ESAB Murex Linclon Electric are only a few suppliers where information can be obtained to put together meaningful learning experiences.

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
- Guest speakers

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Candidates have to apply their knowledge and understanding of the principles and applications of welding processes and consider a range of factors affecting such processes. Equipment and consumables required have to be selected, and quality factors identified. Practical formative work should provide experience of each of the welding processes in a workshop environment to reinforce theoretical learning and further enhance problem solving techniques. Candidates could be encouraged to discuss, review and evaluate solutions supported by demonstration and explanation with an emphasis on safety.

Access to and evaluation of current web based information and technical literature could support underpinning knowledge. Candidates should produce and present written and oral evidence which is technically accurate and correctly expressed.

National Unit Specification: support notes (cont)

UNIT Welding Processes (SCQF level 5)

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).*

The assessment for this Unit should be concerned with determining the knowledge and skills gained by a candidate who will be likely to use welding processes on a day to day basis. Assessment should be constructed to support this theme.

An application for a welding process can be provided and questions designed to determine the principles and applications of welding processes. Opportunities should be available for assessment on demand. Candidates should have access to manufactures data sheets and weld procedure specifications.

It is advisable that multi choice sample questions are available to candidates. Centres are best advised that multi choice assessments are difficult and time consuming to construct and are best NOT to be in the public domain. It is recommended that multiple choice questions will consist of one correct answer from four options.

A recommended approach to assessment of this Unit would be a multi choice assessment paper lasting approximately 45 minutes and consisting of forty to fifty questions across all learning Outcomes with a short answer assessment paper of 15 to 20 questions across all learning Outcomes with the candidate answering all questions from a minimum of THREE Welding processes at any one assessment.

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)**.