National Unit Specification: general information

UNIT Thermal Joining Skills (SCQF level 5)

CODE F5F2 11

SUMMARY

This Unit can be delivered as part of a NQ Group Award but can also be taken as a free-standing Unit by candidates who wish to enhance their skills in a fabrication environment. The Unit is also suitable for those who are studying the subject for the first time.

The candidate will develop practical skills in the Oxy Fuel gas and Manual Metal Arc welding process used on Low Carbon Steel (LCS) in the downhand or flat and horizontal-vertical positions. Candidates will use these skills to produce a range of joints and they will also be required to work within the relevant industrial standards.

Candidates will be made aware of and practise the relevant health and safety regulations and requirements relating to the welding processes and especially the use of explosive gases.

OUTCOMES

1 Select equipment and consumables for thermal joining processes.
2 Check and set up equipment prior to thermal joining.
3 Produce a range of joints using thermal joining processes.
4 Comply with the safety regulations and requirements in stated welding processes.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, it would be beneficial if candidates had experience of some industrial practice.

Administrative Information

Superclass: XF

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National Unit Specification: general information (cont)

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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 *Numeracy* 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

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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

Select equipment and consumables for thermal joining processes.

Performance Criteria

(a) Equipment selection is correct.
(b) Consumable selection is correct.

OUTCOME 2

Check and set up equipment prior to thermal joining.

Performance Criteria

(a) Identification and selection of consumables for a given process is correct.
(b) Setting of process parameters and variables is correct in terms of the given process.
(c) Preparation and setting up of joints in position is correct.

OUTCOME 3

Produce a range of joints using thermal joining processes.

Performance Criteria

(a) Production of oxy-acetylene and metal arc fusion welded joints in low carbon steel within the range of materials thickness is correct.
(b) Equipment is closed down and stored safely and correctly on completion of use.

OUTCOME 4

Comply with the safety regulations and requirements in stated welding processes.

Performance Criteria

(a) Use Personal Protective Equipment (PPE) relevant to oxy-acetylene and manual metal arc welding correctly.
(b) Observation of safe working practices is correct.
(c) The use of specialised safety equipment for oxy-acetylene and manual metal arc welding is correct.

National Unit Specification: statement of standards (cont)

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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.

Performance evidence is required to show that all Outcomes and Performance Criteria have been achieved and should be generated under supervised conditions at one or more assessment occasions during the delivery of the Unit.

Performance evidence supplemented by assessor observation checklists is required to demonstrate that the candidate has safely, within a total time not exceeding two hours, carried out the following welds:

- A lap joint in Low Carbon Steel (LCS) using the oxy-acetylene welding process in the horizontal-vertical position. The joint should be a minimum of 150mm long and have a maximum thickness of 3mm.
- A Tee Fillet joint in LCS using the manual metal arc welding process in the horizontal-vertical position. The joint should be a minimum of 150mm long and have a maximum thickness of 6mm.

National Unit Specification: support notes

UNIT Thermal Joining Skills (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) *Fabrication and Welding Engineering* but can also be taken on a free-standing basis.

This Unit should be taught in a safe, suitably equipped workshop environment during which the candidate is made aware of the basic skills of the common thermal joining processes for steels. Integral to this will be the requirement of how to use the equipment safely.

Welding processes

Oxy-acetylene leftward welding, manual metal arc welding (MMA).

Joints

All joints configurations should be taught and candidates allowed time to develop their skills.

Consumables

Oxy-acetylene welding, MMA welding.

Process parameters and variables

Selection of cylinders; regulators; hose by colour and screw thread, nozzles by size. Methods of assembling; 'cracking' open cylinders and checking for gas leaks. Gas pressures and setting flame. Current settings for MMA welding, electrode selection for MMA welding.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The delivery of the Unit could be organised in such a way that the content of Outcome 1 is completed first. Outcomes 2 and 3 follow in a logical sequence with the emphasis being on practical welding activity. If required, written and / or pictorial questions could be incorporated into the support sheets and preparatory practical exercises in the 'hands-on' sections to provide cognitive assessment.

An adequate range of posters, wall charts, and manufacturers' catalogues showing the checking and setting up of equipment, tabulation of parameters, consumables required and jointing faults would be highly beneficial. Additionally a 'model set' of joints would be an incentive to the candidates of the standard to be achieved.

National Unit Specification: support notes (cont)

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It is recommended that the Outcomes be taught sequentially.

Support sheets giving details of the processes, equipment required; assembly of equipment where required, and techniques used with the relevant safety precautions, are essential eg: protective clothing, eye protection, fume ventilation, screens, equipment storage, cable routing, tidy working area, equipment complying with current British and Euro-Norm Standards; eg the correct shade of filter (glass) for the processes used in this Unit. The use of videos and films, particularly for techniques, would be advantageous. Candidates should be encouraged to research for themselves further information on the processes and related consumables etc.

- Outcome 1 is essentially 'hands-on' and could best be carried out in a workshop situation. Although it is the prelude to Outcomes 2, 3 and 4 it is of prime importance, since the safe production of good thermal joints depends largely on the pre-jointing preparation. Procedures for checking and setting parameters in the equipment should be taught, as should procedures for closing down, storage, and finishing with equipment; also finishing with equipment; the checking of joints for alignment and, where appropriate, cleanliness. Knowledge of the type(s) of consumables, and possible defects, is required.

- Demonstrations by the tutor / trainer of processes, procedures and techniques should be ongoing. The candidates will probably require constant help and advice in this Outcome with the range of processes they encounter. Materials appropriate to local industry could be introduced if necessary.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

All elements of the Core Skill of *Problem Solving*, including critical thinking, planning, organising, reviewing and evaluating, can be developed in work related contexts as candidates undertake the Unit. As they apply theory to a practical task decisions are made on methods and approaches relevant to their materials and candidates have plan time management. Health and safety requirements must be considered and complied with throughout practical working. Group discussion to support on going reflective evaluation of efficiency and achievement may be particularly useful.

The ability to calculate and work to data presented numerically and graphically will underpin competencies developed. Candidates focus on practical analysis and calculation in setting up and using different types of welding equipment to ensure joints of the specified thickness and length. Applying knowledge and understanding to practical activities will be critical to accuracy. Exercises to encourage the development of skills under guided supervision are undertaken as part of formative work across the award, with an emphasis on *Numeracy* as a tool to be used and applied efficiently and critically in working contexts. The provision of appropriate reference materials in numeric and graphic format could support the process.

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)*.

Centres may use assessments which are considered by the tutor / trainer to be the most appropriate. The assessment of this Unit could be carried out in an integrated way with worksheets covering Outcomes 1-4 developed. An account should be taken of economic time and acceptable levels of waste or rework and competence should be demonstrated by the candidate. Examples of assessment which could be used are as follows:

Outcome 1

Two observation checklists, one for each Performance Criterion.

Outcomes 2, 3 and 4

Observation checklists for both joints, plus the completed joints should be retained, are necessary to ensure that the required level of competence is reached.

The completed joints should be free from scale, slag and spatter and there should be no excessive chipping marks evident.

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)**.