National Unit Specification: general information

UNIT Manual Metal Arc Welding Skills (SCQF level 6)

CODE F5F6 12

SUMMARY

This Unit can be delivered as part of a National Qualification Group Award in Engineering but can also be taken as a free standing Unit by candidates who wish to enhance their skills in a fabrication and welding environment.

Because this Unit is suitable for candidates with little or no experience in Manual Metal Arc (MMA) Welding it is also suitable for candidates who are studying the subject for the first time.

Candidates will gain practical skills in the MMA welding process used on Low Carbon Steel (LCS) in the downhand or flat position and provided with the opportunity to recognise the requirements of welding standards and specifications.

Candidates will be made aware of and required to practise the relevant health and safety regulations and requirements relating to the welding process.

OUTCOMES

1 Select equipment and consumables for manual metal arc welding.
2 Set up and weld joints/components.
3 Inspect welded joints.
4 Comply with safety regulations and requirements in manual metal arc welding.

RECOMMENDED ENTRY

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

Administrative Information

Superclass: XE

Publication date: March 2008

Source: Scottish Qualifications Authority

Version: 01

National Unit Specification: general information (cont)

UNIT Manual Metal Arc Welding Skills (Higher)

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 *Problem Solving* and *Working with Others* 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

UNIT Manual Metal Arc Welding Skills (SCQF level 6)

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 manual metal arc welding**.**

Performance Criteria

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

OUTCOME 2

Set up and weld joints/components.

Performance Criteria

(a) Set up Joints for welding correctly.
(b) Weld selected joints correctly.

OUTCOME 3

Inspect welded joints.

Performance Criteria

(a) Inspection of welded joints is correct.
(b) Completion of inspection report is correct.

OUTCOME 4

Comply with safety regulations and requirements in manual metal arc welding.

Performance Criteria

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

National Unit Specification: statement of standards (cont)

UNIT Manual Metal Arc Welding Skills (SCQF level 6)

EVIDENCE REQUIREMENTS FOR THIS UNIT

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

Performance evidence supported by assessor checklists and written and/or recorded oral evidence is required to show that all Outcomes and Performance Criteria have been achieved. Assessment should take place under supervised conditions and should last no more than two hours.

Performance evidence supplemented by assessor observation checklists is required to demonstrate that the candidate has safely carried out the following:

- selected equipment and consumables to produce a single vee butt joint in the downhand position in low carbon steel to current industrial standards
- visually inspected the completed single vee butt weld and completed an inspection report
- complied with all health and safety requirements

National Unit Specification: support notes

UNIT Manual Metal Arc Welding Skills (SCQF level 6)

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

The candidate should be provided with information and written instructions covering the following details:

- Parent metals
- Welding process and polarity
- Welding consumables
- Welding positions
- Material thicknesses
- Joint type (with sketch of weld preparation)
- Weld dimensions required

On completion of this Unit, the candidate will be aware of the statutory safety regulations applicable to arc welding, will know the factors which affect and control the making of a quality weld and will have developed the manual skills to make a selection of quality welds in low carbon steel.

The candidates will have visually inspected their own welds using criteria laid down in relevant International (ISO), European (BS EN) and British (BS) standards and thus have a good basic foundation to enhance skills in other metals and/or other welding positions.

The candidate should achieve the level of competence of someone who can manually weld, using the metal arc process, the majority of work in low carbon steel, providing the joint is in the downhand or flat position and s/he is not welding to an approved welding procedure.

Corresponding to Outcomes

The Unit should be carried out predominantly in a workshop situation. Safety should be heavily emphasised in all its aspects, eg filter glass grades, earthing, fumes and gases, etc.

Safety regulations: UK; Euro-norm. Support sheets could also be used.

The core of the Unit requires between 70% and 75% of the available time.

Demonstration, practice, correction of defects, and where required, more practice is required.

The techniques which are considered by tutors/trainers to be the most appropriate should obviously be used, however step-by-step techniques, eg: tilting a T joint so as to weld in the bottom of a vee before trying to weld in the horizontal-vertical position; packing the front edge of a vee butt weld up in order that the molten slag runs back over the weld made and not forward into the vee before welding it in the downhand (flat) position are all tried techniques in the instruction of basic welding. However the welding technique(s) used in the basic instruction is largely personal choice. A major help in this area is a Code of Practice for training in Arc Welding Skills and offers advice on training courses, including a syllabus sequence, leading to weld assessment. Weld procedure and weld procedures sheets have deliberately been omitted from this Unit. The second run should stop 20mm before the end of the weld and the third run should stop 40mm before the end of the weld. This enables the run blend to be more easily inspected.

The current industrial standard for the visual inspection of fusion welded joints covers inspection (i) before, (ii) during and (iii) after welding and should be followed in the preparation of the inspection checklist. When this Standard becomes obsolete the current industrial standard should be used in its place. Candidates will require supervision and advice on visual inspection.

Destructive testing could also be covered at the centre's discretion.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

The delivery of the Unit could be organised in such a way that practically all activity could be carried out in a workshop. Equipment, safety, parameter selection and techniques require to be covered before any meaningful welding can take place; however these could be enlarged upon as the course progresses giving breaks between 'burning rods' and thus integrating the minimum necessary theory with the practice. (Possibly in one of these breaks the OCV of power source and electrode requirements could be shown).

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

- Practical activities
- Group discussions
- Tutorials
- Directed study
- Site visits
- Audio visual

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Candidates have opportunities to develop skills in *Problem Solving* as they investigate and observe safe use of fabrication workshop equipment and analyse the processes involved in production. Equipment, consumables and techniques have to be considered before candidates decide on approaches to welding which comply with regulations and complete practical activities. Discussion during formative work will allow candidates to examine and analyse all the factors impacting on processes, including best practice in safety procedures. They should be given opportunities to evaluate and discuss finished results.

There may also be practical opportunities to enhance skills in group co-operative working. Candidates could be encouraged to analyse the task and its component elements and discuss and negotiate the nature and scope of team goals, roles and responsibilities involved in manual metal arc welding. They could be asked to demonstrate and explain equipment and methodology elected and to review and evaluate their own abilities in working with others in a workshop environment.

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 sequence of assessment of the completed test pieces shall be:

- visual examination of the test welds

and where found necessary:

- selection of the appropriate destructive test
- implementation of the appropriate test

The assessment of this Unit should be approached in an integrated way with documentation covering all Outcomes developed as an integrated whole.

Welds for each candidate must be retained. In addition inspection checklists must be completed by each candidate for the joint covering, where appropriate, the following areas: (i) before welding; weld preparation, cleanliness, fit-up, consumables, (ii) during welding; inter-run cleaning, (iii) after welding; slag removal, penetration and root examination, weld width and contour, undercut, overlap, weld flaws, stray arcing, tool marks and macro-etch. It would be advantageous if prepared inspection checklists were available to the candidates prior to the commencement of welding.

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)**.