



## National Unit Specification: general information

**UNIT** Weld Procedure Specification and Testing (SCQF level 5)

**CODE** F5F4 11

### SUMMARY

This Unit will enable candidates to understand the need for standards and welding procedure specifications on the quality of deposited weldmetal, and the requirements in planning the welding operation and the documentation associated with approving weld procedures.

In addition, the candidate will be aware of the role of the Welding Co-ordinator and Welding Engineer.

The Unit is an Optional Unit in the National Certificate in Engineering Practice: Fabrication and Welding and National Certificate in Engineering: Fabrication and Welding but can also be taken as a free standing unit by candidates who wish to enhance their skills in a fabrication and welding environment.

### OUTCOMES

- 1 Interpret standards/specifications used for weld procedure specification.
- 2 Interpret welding standards/specifications used for welder qualification.
- 3 Interpret standards/specifications for assessing weldability.

### RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ Welding processes (Intermediate 2)
- ◆ Basic Engineering materials

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#### Administrative Information

**Superclass:** XE

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## **National Unit Specification: general information (cont)**

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### **CREDIT VALUE**

1 credit at SCQF level 5 (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 Numeracy and Information Technology 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      Weld Procedure Specification and Testing (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**

Interpret standards/specifications used for weld procedure specification.

##### **Performance Criteria**

- (a) The standards/specifications listed for procedure specifications are correct.
- (b) The requirements listed for a weld procedure specification are correct.
- (c) Testing requirements for weld procedure approval are correctly stated.

#### **OUTCOME 2**

Interpret welding standards/specifications used for welder qualification.

##### **Performance Criteria**

- (a) The lists of standards/specifications used for welder qualifications are correct.
- (b) The stated requirements for welder qualification approval are correct.
- (c) The stated testing requirements for welder approval are correct.

## **National Unit Specification: statement of standards (cont)**

### **UNIT        Weld Procedure Specification and Testing (SCQF level 5)**

#### **OUTCOME 3**

Interpret standards/specifications for assessing weldability.

#### **Performance Criteria**

- (a) The factors listed in assessing the weldability of steels are correct.
- (b) The carbon equivalent of the material to be welded is calculated accurately.
- (c) The information used to assess the need for pre-heat is correct.

#### **EVIDENCE REQUIREMENTS FOR THIS UNIT**

The evidence required should reflect the stated outcomes and performance criteria.

The candidate will provide evidence using a written assessment consisting of short answer and multiple choice questions.

Evidence will be supported by the candidate:

- ◆ interpreting the requirements of standards/specifications used for weld procedure
- ◆ interpreting the requirements for welder qualification testing
- ◆ assessing the weldability of a specified steel

The assessment should be closed book and take place under controlled and supervised conditions.

## **National Unit Specification: support notes**

### **UNIT      Weld Procedure Specification and Testing (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 covers three main areas:

- ◆ weld procedure qualification
- ◆ welder approval qualification
- ◆ assessing the weldability of steels.

Current ISO, BS EN and BS standards should be considered as the main teaching and learning materials although it may be helpful to include other standards or codes such as ASME.

Weld procedure construction and the requirements of qualification welding conditions, parent material groups and filler material groups welding process heat treatment requirements and essential variables.

The necessary weld testing requirements for butt welds and fillet welds both destructive and non-destructive testing.

Range of approval for a particular weld test to ensure the requirements for a particular purpose or application are satisfied.

A similar approach should be adopted to welder approval qualification the requirements of the qualification — test piece position, material thickness, welding process and welding positions. Parent material and filler material groups, where a new test is required.

The requirement to consider the effects of the following factors on the weldability of a steel:

- ◆ susceptibility to cracking during or after welding
- ◆ the use of heat treatment to reduce the effects of the thermal cycle on the weldment

The following factors to be used in assessing weldability:

- ◆ heat input, diffusible hydrogen, combined thickness and the carbon equivalent of the material composition
- ◆ the use of this information in determining if a pre heat treatment is required
- ◆ the temperature and the methods of how pre heat temperatures can be measured

## **National Unit Specification: support notes**

### **UNIT      Weld Procedure Specification and Testing (SCQF level 5)**

#### **GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT**

The main teaching support materials should make use of current standards and codes. Extracts of standards and the definitions of terms should be used. In addition, candidate support materials should make reference to current standards.

The variables/parameters for the welding processes are also necessary to assist the candidate in understanding welding procedures welder qualification and weldability. Pro forma documentation should be used. However, simplified weld procedure documentation in the early stages will be beneficial

The use of case study type exercises to provide candidates with the experience of using standards and specifications to draw up weld procedures, determine ranges of approval and testing requirements for weld procedures and welder qualifications.

A practical exercise, where a proposed weld procedure is drawn up, a weld procedure test carried out and witnessed by the group of candidates, would be beneficial in understanding the approval process.

Exercises in determining if a pre-heat temperature is required taking into consideration the following:

- ◆ welding processes
- ◆ heat inputs
- ◆ material thickness
- ◆ joint configuration
- ◆ hydrogen scales

It is important that candidates have a good understanding of materials and material behaviour, during heating cycles and when subjected to stress.

#### **OPPORTUNITIES FOR CORE SKILL DEVELOPMENT**

Candidates have to understand and apply current standards and codes affecting practical welding procedures. The ability to interpret and apply written and graphic information relevant to standards and specifications is essential in the drawing up and determining ranges of approval and testing requirements for weld procedures and welder qualifications. Knowledge and understanding of the variables and parameters required for the welding processes is necessary. Integration of assessment with other practical units will support development of skills across the award, with an emphasis on Numeracy as a tool to be used and applied efficiently in working contexts.

Access to on line facilities may be useful to support further research on current international standards and codes of practice. This would develop skills in the use of technology and could update and supplement underpinning professional knowledge.

## National Unit Specification: support notes

### UNIT Weld Procedure Specification and Testing (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)*.

A holistic approach should be adopted for assessing this Unit. The candidate would benefit from an end test that allowed understanding of the subject using an industrial application requiring a meaningful solution. The use of pro-forma standards and specifications is recommended.

The questions should be structured in a manner that guides the candidate through the assessment process. It is advisable that formative assessment be carried out prior to summative assessment.

There should be an opportunity for assessment on demand where appropriate.

It is advisable that multi-choice sample questions are available to candidates.

Recommended assessment procedures:

- ◆ assessment instruments should be short answer and multiple choice questions
- ◆ multiple choice questions should consist of one correct answer from four options
- ◆ multiple choice assessment should last 45 minutes and consist of 40–50 questions
- ◆ short answer assessment paper of 12 questions with the candidate answering any 10

Total assessment should take no longer than two hours.

#### 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](http://www.sqa.org.uk)).