



## National Unit specification: general information

**Unit title:** Land-based Engineering: An Introduction: Thermal Joining and Cutting Processes (SCQF level 5)

**Unit code:** H1MP 11

**Superclass:** SK

**Publication date:** August 2012

**Source:** Scottish Qualifications Authority

**Version:** 02

## Summary

The purpose of this Unit is to provide candidates with basic skills in welding, cutting and soldering. Candidates will produce a range of simple welded joints, oxy-fuel gas cuts and soldered joints and will work under supervision to relevant industrial standards using safe working practices. The Unit is suitable for candidates who wish to progress to apprentice training as engineering technicians working on land-based vehicles and equipment.

This is an optional Unit in the National Certificate in Land-based Engineering: An Introduction at SCQF level 4. It is also available as a freestanding Unit.

## Outcomes

- 1 Use oxy-fuel gas equipment to weld, cut and heat low carbon steel.
- 2 Produce welds in low carbon steel using Manual Metal Arc (MMA) welding equipment.
- 3 Produce welds in low carbon steel using Metal Inert Gas (MIG) welding equipment.
- 4 Produce soldered joints.

## Recommended entry

Entry is at the discretion of the centre.

## Credit points and level

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.*

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

**Unit title:** Land-based Engineering: An Introduction: Thermal Joining and Cutting Processes (SCQF level 5)

### **Core Skills**

Achievement of this Unit gives automatic certification of the following Core Skills component:

Complete Core Skill                      None

Core Skill component                      Critical Thinking at SCQF level 5

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

## **National Unit specification: statement of standards**

**Unit title:** Land-based Engineering: An Introduction: Thermal Joining and Cutting 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**

Use oxy-fuel gas equipment to weld, cut and heat low carbon steel.

#### **Performance Criteria**

- (a) Confirm oxy-fuel equipment is safe and serviceable prior to use.
- (b) Set up parameters and variables correctly.
- (c) Prepare materials.
- (d) Produce a butt weld joint.
- (e) Produce a braze weld T fillet joint.
- (f) Produce an oxy-fuel gas cut.
- (g) Use oxy-fuel gas to heat and bend metal.
- (h) Close down equipment and store safely after use.
- (i) Adopt safe working practices at all times.

### **Outcome 2**

Produce welds in low carbon steel using Manual Metal Arc (MMA) welding equipment.

#### **Performance Criteria**

- (a) Confirm MMA equipment is safe and serviceable prior to use.
- (b) Set up parameters and variables correctly.
- (c) Prepare materials.
- (d) Produce a butt weld joint.
- (e) Produce a T fillet joint.
- (f) Close down equipment and store safely after use.
- (g) Adopt safe working practices at all times.

## National Unit specification: statement of standards (cont)

**Unit title:** Land-based Engineering: An Introduction: Thermal Joining and Cutting Processes (SCQF level 5)

### Outcome 3

Produce welds in low carbon steel using Metal Inert Gas (MIG) welding equipment.

#### Performance Criteria

- (a) Confirm MIG equipment is safe and serviceable prior to use.
- (b) Set up parameters and variables correctly.
- (c) Prepare materials.
- (d) Produce a butt weld joint.
- (e) Produce a T fillet joint.
- (f) Close down equipment and store safely after use.
- (g) Adopt safe working practices at all times.

### Outcome 4

Produce soldered joints.

#### Performance Criteria

- (a) Confirm soldering equipment is safe and serviceable prior to use.
- (b) Set up parameters and variables correctly.
- (c) Prepare materials.
- (d) Produce a soldered lap joint.
- (e) Produce a sweated solder joint using copper pipe.
- (f) Close down equipment and store safely after use.
- (g) Adopt safe working practices at all times.

#### Evidence Requirements for this Unit

All practical activities must be carried out under supervision and in accordance with current health and safety legislation and guidance, codes of practice and manufacturers' recommendations. Personal protective equipment (PPE) must be used wherever necessary. A safety induction must be undertaken on workshop practices and the safe use of equipment.

Evidence is required to demonstrate that the candidates have achieved all of the Outcomes and Performance Criteria. Evidence can be produced holistically or Outcome by Outcome.

Performance evidence should be produced in supervised conditions.

**Note:** This Unit does not cover the repair of safety critical components.

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

**Unit title:** Land-based Engineering: An Introduction: Thermal Joining and Cutting Processes (SCQF level 5)

### **Outcomes 1–4**

In addition to making the welds described below, performance evidence is required for each Outcome to demonstrate that candidates can work safely at all times and use PPE and welding fume extraction equipment. Candidates must confirm that each type of equipment is safe and serviceable prior to use, set up the parameters and variables correctly for each process, prepare the materials, close down equipment and store it safely after use.

#### **Outcome 1 — Oxy fuel welded joints**

Performance evidence to demonstrate:

- ◆ Gas cutting of materials in thickness up to 12mm
- ◆ Joints in one material up to 1.6mm thick and a minimum of 100mm long
- ◆ one horizontal butt joint in low carbon steel up to 1.6mm thick and a minimum of 100mm long
- ◆ one brazed horizontal T fillet joint up to 1.6mm thick and a minimum of 100mm long

#### **Outcome 2 — MMA welded Joints**

Performance evidence to include one horizontal butt joint and one horizontal T fillet joint. The joints must be formed in low carbon steel using the manual metal arc process, have a maximum thickness of 8mm and be a minimum of 100mm long.

#### **Outcome 3 — MIG welded Joints**

Performance evidence to include one horizontal butt joint and one horizontal T fillet joint. The joints must be formed in low carbon steel using the metal inert gas process, have a maximum thickness of 8mm and be a minimum of 100mm long.

#### **Outcome 4 — soldered joint**

Performance evidence to include one soldered horizontal lap joint no more than 1.6 mm thick and no less than 50mm long. Produce a sweated joint on a 12mm copper pipe.

## National Unit specification: support notes

**Unit title:** Land-based Engineering: An Introduction: Thermal Joining and Cutting 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

This is an optional Unit in the National Certificate in Land-based Engineering: An Introduction at SCQF level 4. It is also available as a freestanding Unit.

This Unit is aligned to the following Lantra Sector Skills Council's National Occupational Standards (NOS):

- ◆ Unit LEO 1 Recognise and reduce hazards in the land-based engineering work area
- ◆ Unit LEO 9 Core land-based Engineering — thermal joining processes
- ◆ Unit CU5A Establish and maintain working relationships with others

This Unit is designed to provide the candidate with basic skills in welding and cutting for the Land-based Engineering Industry.

On completion of this Unit the candidate will be aware of the statutory safety regulations applicable to oxy-fuel cutting and heating, welding with oxy-acetylene, MMA and MIG equipment and soldering. The candidate will know the factors that affect and control welds, soldered joints and cuts in low carbon steel.

All practical activities must be carried out according to current health and safety guidelines.

Health and Safety should be emphasised and assessed in all its aspects, eg personal protective equipment (PPE), fumes and gases, the correct use of welding fume extraction equipment.

It is desirable for candidates to be able to identify materials and their suitability for thermal joining processes and be able to prepare materials and joints for thermal joining and oxy-fuel gas cutting and heating.

Candidates should be given time to develop their welding, soldering, cutting and heating skills.

The candidate should be able to select gas cylinders; regulators; hose colour; screw thread type, nozzle size and type. Methods of assembling, cracking/purging and leak-testing gas cylinders. Gas pressures and flame setting for oxy-fuel welding and cutting. MMA and MIG equipment should be used under supervised conditions.

## **National Unit specification: support notes (cont)**

**Unit title:** Land-based Engineering: An Introduction: Thermal Joining and Cutting Processes (SCQF level 5)

Candidates will be introduced to current legislation, regulations and safe working procedures and practices before starting practical activities in workshop situations. A safe system of work must be established in line with current guidelines. The storage and handling of materials and methods of disposal of waste materials produced during the Unit must comply with current legislation and good practice.

### **Guidance on learning and teaching approaches for this Unit**

A safety induction must be undertaken on the workshop practices and the safe use of welding equipment, preparation equipment, finishing equipment and welding shop extraction and ventilation equipment. The Unit induction will be required to inform candidates of the requirements of the Unit and the assessment procedure and requirements. Candidates should be supplied with safety support materials to reinforce the induction.

As this is a practical workshop based Unit, demonstrations will be required. This may be demonstrations to the entire group and as the Unit and candidates progress at different rates the demonstrations will be more individual to support the needs of each of the candidates.

Health, safety and environmental issues associated with this Unit could be integrated with Unit F5FK 10 *Accident Prevention and Emergency Procedures* (SCQF level 4).

Candidates will be encouraged to work in an efficient manner throughout the Unit. Consideration should be given to the efficient use of materials and consumables and the avoidance of unnecessary waste.

Fluxes and solders for thermal processes should be used efficiently and consideration given to toxicity and the harmful effects to the candidate and the environment when using and disposing of unwanted flux and solder residue.

When using transformer type or inverter type electric welders, candidates should be made aware of the energy consumption. The cost of energy use should be considered for the types and the candidate made aware of energy consumption costs.

The environmental effects of welding could be highlighted to the candidate in line with Unit *Land-based Engineering and Sustainability* (SCQF level 5).

## National Unit specification: support notes (cont)

**Unit title:** Land-based Engineering: An Introduction: Thermal Joining and Cutting Processes (SCQF level 5)

### Guidance on approaches to assessment for this Unit

The assessment of this Unit could be approached in an integrated way with documentation covering all Outcomes developed as an integrated whole. It is suggested a single workbook covering all Outcomes for the candidate to record welding soldering and cutting activities should be used.

Evidence of safe working practice/s could be recorded on a safety checklist.

All practical activities must be carried out according to current health and safety guidelines. Performance evidence supplemented with an assessor observation checklist(s) should be produced to demonstrate that a candidate has achieved all Outcomes and Performance Criteria.

### 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 Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. 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)*.

### Opportunities for developing Core Skills

In this Unit candidates will:

- ◆ Weld, cut and solder in a workshop situation with others
- ◆ Produce a range of accurate simple welded joints, Oxy-Fuel gas cuts and soldered joints.
- ◆ Work according to industrial standards.
- ◆ Develop safe working practices in welding, cutting and heating processes.

This means that as candidates are doing this Unit they will be developing aspects of the Core Skills of *Problem Solving*, *Working with Others* and *Numeracy*.

Whilst completing this Unit, candidates may develop aspects of the following Core Skills where specific learning and teaching approaches are adopted:

*Problem Solving* may be developed when candidates assess the safe condition of process equipment, set up equipment, produce a range of thermal joints and cuts and weld fault identification and fault rectification. It may also be developed when candidates are involved with practical thermal process tasks, task organisation and resource allocation, assessing weld/joint quality.



## **National Unit specification: support notes (cont)**

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*Working with Others* may be developed when candidates work in teams/pairs in equipment checking and materials preparation and when candidates interact with their lecturers, support staff and other candidates, for example; while sharing welding workshop areas welding equipment and consumables.

*Numeracy* may be developed where candidates measure materials for welded joints and cutting dimensions.

This Unit has the Critical Thinking component of Problem Solving embedded in it. This means that when candidates achieve the Unit, their Core Skills profile will also be updated to show they have achieved Critical Thinking at SCQF level 5.

### **Disabled candidates and/or those with additional support needs**

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website [www.sqa.org.uk/assessmentarrangements](http://www.sqa.org.uk/assessmentarrangements)

## History of changes to Unit

Version	Description of change	Date
02	Core Skills Component Critical Thinking at SCQF level 5 embedded.	06/08/2012

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