



National Unit specification: general information

Unit title: Land-based Engineering: An Introduction: Sheet Metal Workshop Skills (SCQF level 4)

Unit code: H1MV 10

Superclass: SK

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Version: 02

Summary

The purpose of this Unit is to provide an introduction to sheet metal workshop skills. It is a practical Unit designed to provide the candidate with introductory skills used in a land-based workshop environment. Candidates will prepare and manufacture sheet metal in a workshop and will learn how to use tools and work safely according to industry standards. This Unit is suitable for candidates who wish to enter apprentice training to be engineering technicians working on land-based vehicles and equipment or in other engineering disciplines.

This is a mandatory Unit in the National Certificate in Land-based Engineering: An Introduction at SCQF level 4. It may also be taken as a freestanding Unit.

Outcomes

- 1 Prepare to manufacture a sheet metal artefact to a given specification.
- 2 Prepare materials to a given specification for manufacture of a sheet metal artefact.
- 3 Manufacture a sheet metal artefact to a given specification using the workshop and tools safely.

Recommended entry

Entry is at the discretion of the centre.

General information (cont)

Unit title: Land-based Engineering: An Introduction: Sheet Metal Workshop Skills (SCQF level 4)

Credit points and level

0.5 National Unit credits at SCQF Level 4 (3 SCQF credit points at SCQF level 4*)

**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

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 4

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: Sheet Metal Workshop Skills (SCQF level 4)

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.

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.

Outcome 1

Prepare to manufacture a sheet metal artefact to a given specification.

Performance Criteria

- (a) Identify hand tools used in land-based engineering workshops and describe their use.
- (b) Select suitable hand tools to manufacture an artefact.
- (c) Prepare the hand tools for use, using safe working practices.
- (d) Identify non-thermal fastening and joining.
- (e) Describe where non thermal fastening and joining methods may be used.

Outcome 2

Prepare materials to a given specification for manufacture of a sheet metal artefact.

Performance Criteria

- (a) Prepare the surfaces of the materials for marking out.
- (b) Select and use tools for marking out.
- (c) Mark out the materials to a given specification.

Outcome 3

Manufacture a sheet metal artefact to a given specification using the workshop and tools safely.

Performance Criteria

- (a) Produce the components for a sheet metal artefact to a given specification.
- (b) Assemble the components into a finished artefact using non-thermal joining techniques and complying with the specification.
- (c) Observe safe working practices at all times.

National Unit specification: statement of standards (cont)

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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 using a single assessment for all three Outcomes, or Outcome by Outcome.

Written and/or oral and performance evidence must be produced in supervised conditions.

Outcome 1

Performance, written and/or recorded oral evidence gathered under supervised conditions.

Candidates must:

- ◆ Identify and explain the correct use of a range of common hand tools used in a land-based engineering workshop. The correct use of tools should include safe working practices. The range of tools will include three file types, hacksaw, marking out equipment, drills including drill bit sharpening, and chisels including chisel sharpening.
- ◆ Select a minimum of three suitable tools to manufacture the artefact in Outcome 3 and prepare them for use, following safe working practices.
- ◆ Identify and describe the use of three threaded (to include thread forms) and four non-threaded methods of fastening or locating components.
- ◆ Identify and describe the correct use of three adhesives used to fasten or locate components.

National Unit specification: statement of standards (cont)

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Outcomes 2 and 3

Performance and product evidence gathered under supervised conditions. Candidates will be provided with a specification.

Candidates must:

- ◆ Prepare the surfaces of materials to ensure they are deburred then select appropriate datum face(s)/edge(s) to meet the given specification and where necessary apply marking out ink.
- ◆ Use a minimum of three aids from the following list to mark out components:
 - rule
 - scribe
 - engineers square
 - protractor
 - dividers
 - centre punch
- ◆ Manufacture components and assemble them into a sheet metal artefact, which should be joined using three different non-thermal joining methods to a tolerance of 2mm.
- ◆ Produce the finished artefact in accordance with the given specification.
- ◆ Demonstrate safe working practices at all times.

National Unit specification: support notes

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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 20 hours.

Guidance on the content and context for this Unit

This is a mandatory Unit in the National Certificate in Land-based Engineering: An Introduction at SCQF level 4. It may also be offered as a free standing Unit.

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

- ◆ LEO 1 Recognise and reduce hazards in the land-based engineering work area
- ◆ LEO 5 Core land-based engineering principles — Tools and equipment
- ◆ LEO 6 Core land-based engineering principles — Material preparation, shaping and assembling
- ◆ LEO 7 Core land-based engineering principles — Calculations
- ◆ LEO 8 Core land-based engineering principles — Servicing and maintenance

This Unit is designed to provide the candidate with introductory skills used in workshop processes commonly carried out in a land-based workshop environment.

Tutors may include a wide range of short practical tasks and activities to equip candidates with the knowledge and skills necessary to complete the manufacture of the artefact. During the process of practical work the candidate should become accustomed to engineering technology and will be able to demonstrate a basic knowledge of engineering terminology and an understanding of the terminology in everyday use. Candidates will learn safe and effective working practices and be able to carry out quality checks on their own work.

In Outcome 1 candidates should be introduced to the main hand tools used in the land-based engineering workshop with the emphasis placed on identification, use and safe working practices/procedures. The sharpening of drill bits and chisels should be included as these could be used in the manufacture of the artefact in Outcome 3. Candidates should be introduced to the main non-thermal joining processes used in the land-based workshop they should be able to identify and correctly describe how threaded types of fixings are used. These could include machine screws, self-tapping screws, cap screws, countersunk and button head screws, etc. The candidate should be able to identify common thread forms and have an understanding of the industrial applications, advantages and disadvantages of the thread forms found on bolts and where various types of nuts would be used. The types of non-threaded fixings that the candidate could be introduced to are the commonly used rivets types (solid and pop), keys, pins, circlips and captive fasteners.

In addition candidates will be able to describe the safe use of adhesives and sealants to bond metal and plastic components in the workshop and in the field. To stimulate candidate interest further, some of the fixing methods introduced should be used to assemble the artefact required for successful completion of Outcomes 3.

National Unit specification: support notes (cont)

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In Outcome 3 candidates should be introduced to the correct methods required to interpret information such as dimensions and tolerance as specified in engineering drawings. This information should be used to mark out the required components. Candidates will be introduced to the use of datum edges and to the importance of working within tolerance. The candidates should be encouraged to check the quality of their work and to rectify any errors.

The components marked out in Outcome 2 should form part of the artefact that is manufactured in Outcome 3, this could be for example a sheet metal tool box having side joints assembled using one non thermal joining method, a handle attached on the lid with brackets held in place using another method and a candidate name plate could be glued on. The non-thermal processes used could be some of those identified in Outcome 1. To complete the manufacture of the artefact in Outcome 3 a paint or other protective finish should be included in the specification and applied by the candidate.

Guidance on learning and teaching approaches for this Unit

In delivering Outcome 1 emphasis should be placed on identification, use and safe working practices.

Lengthy written tests are not required for tool/non-thermal joining technique identification, use or for identifying and describing the correct application of tool/non-thermal joining techniques. Restricted response questions that are mainly of a visual nature should be used.

For example the tool(s) and fastening(s) required in Outcome 1 could be displayed and the candidates asked to identify them, describe their use and associated safe working practices.

As Outcome 3 requires candidates to manufacture an artefact in a workshop situation, candidates must be inducted into current legislation, regulations and safe working procedures and practices before starting practical tasks. It is important that safe systems of working are established in the workshop and candidates are given a thorough grounding in their responsibilities with regard to safe working practices, the hazards of working with tools and equipment and the methods for disposal of waste materials produced during the manufacture process. Delivery of the Unit content should be principally by tutor demonstration followed by candidates practicing the skills and safe working procedures demonstrated.

Industrial site visits, especially for candidates with little or no employment experience in the land-based sector, can be helpful in providing candidates with useful insights into commonly used manufacturing processes, health and safety requirements and environmental considerations commonly employed by the land-based engineers in the field and in repair workshops.

National Unit specification: support notes (cont)

Unit title: Land-based Engineering: An Introduction: Sheet Metal Workshop Skills (SCQF level 4)

Guidance on approaches to assessment for this Unit

Lengthy written tests are not required for tool identification, tool use or for identifying and describing the correct application of non-thermal joining techniques. Restricted response oral or written questions should be used with appropriate visual aids. Alternatively the tool(s) and fastening(s), etc could be displayed and the candidates asked to write or state their use. Evidence of safe working practice/s should be recorded on a safety checklist.

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

Problem Solving may be developed in Outcome 3 while candidates plan the operations and organise the processes involved with the manufacture and final assembly of the artefact. The Reviewing *and* Evaluating component will be developed whilst candidates compare their component marking out exercise and manufacturing skills with the stated specification and tolerances in Outcome 3.

Working with Others may be developed in Outcome 3 while candidates engage in practical work whilst they interact with tutors, support staff and other candidates.

Numeracy may be developed in Outcome 3 through calculation when candidates measure and mark out component parts for manufacture and assembly.

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 4.

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

History of changes to Unit

Version	Description of change	Date
02	Core Skills Component Critical Thinking at SCQF level 4 embedded.	06/08/2012

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