National Unit Specification: general information

UNIT Land-based Engineering: Agricultural Machinery — Cultivation and Plant Establishment (SCQF level 6)

CODE F91E 12

SUMMARY

This Unit may form part of a National Qualification Group Award or may be offered on a free standing basis.

This Unit is designed to provide candidates with basic knowledge and understanding of agricultural machinery used for soil preparation, crop establishment and crop care. During delivery of the Unit candidates will learn the operating principles and function of these machines, how to remove and replace components, how to set up machines for field operation and how to calibrate machines.

This Unit is suitable for candidates training to be maintenance, mechanical or multi-disciplinary engineering craft persons or technicians but may also be delivered to candidates who are being introduced to agricultural machinery and equipment for the first time.

OUTCOMES

1 Describe the types of machines used for cultivation and crop establishment, their construction, operating principles and function.
2 Remove, assess, repair and replace components.
3 Calibrate machines.

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:

- Experience in the operation of tractors and tractor controls
- Numeracy at SCQF level 4

Administrative Information

Superclass: SK

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National Unit Specification: general information (cont)

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CREDIT VALUE

1 credit at level 6 (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 is no automatic certification of Core Skills in this Unit.

The Unit provides opportunities for the candidate to develop aspects of the following Core Skills:

Problem Solving	(SCQF level 5)
Working with others	(SCQF level 4)
Communication	(SCQF level 5)
Numeracy	(SCQF level 4)
ICT	(SCQF level 5)

These opportunities are highlighted in the Support Notes of this Unit Specification.

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

Describe the types of machines used for cultivation and crop establishment, their construction, operating principles and function.

Performance Criteria

(a) Describe the purpose, construction and principles of operation of the machines used for cultivation and crop establishment.
(b) State the operational field adjustments in accordance with manufacturer's recommendations.

OUTCOME 2

Remove, assess, repair and replace components.

Performance Criteria

(a) Correctly remove and replace components.
(b) Dismantle, assess, repair and reinstate machinery to manufacturer's specification.
(c) Identify correctly the causes of excessive wear on soil engaging components.
(d) Correctly set up and verify the operation of cultivation and plant establishment machinery following repair.

OUTCOME 3

Calibrate machines.

Performance Criteria

(a) Correctly demonstrate the methods used to adjust the application rates and how to calibrate machines and equipment.
(b) Correctly describe the factors which can affect the application rate of these machines.

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT

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

Written and/or recorded oral, product and performance evidence supplemented with an assessor observation checklist(s) should be produced to demonstrate that a candidate has achieved all Outcomes and Performance Criteria.

Machine groups are to be selected from the following:

Group A: Select 2 machines from this group:

- Ploughs
- Powered cultivators
- Non-powered cultivators

Group B: Select 3 machines from this group:

- Seed drills
- Fertiliser spreaders
- Potato establishment equipment including de-stoners and planters
- Sprayers
- Precision seeders
- Slurry and manure spreaders and equipment
- Irrigation equipment

Outcome 1 must be assessed by a single assessment designed to ensure that candidates can generate sufficient evidence to satisfy the Outcome and Performance Criteria. Candidate evidence must be in the form of written and/or recorded oral evidence. Assessment must be conducted under supervised, closed-book conditions in which candidates are not allowed to bring their own notes, handouts, textbooks or other materials into the assessment. Total assessment time for Outcome 1 must not exceed 1 hour.

With regard to Outcome 1 candidates should describe the function and working principles of all the machines selected in groups A and B.

- candidates must describe correctly the function of the 2 machines chosen from Group A
- candidates must describe correctly the function of the 3 machines chosen from Group B
- candidates must describe correctly the working principles of the 2 machines chosen from Group A
- candidates must describe correctly the working principles of the 2 machines chosen from Group B
- candidates must identify 5 key components of the 2 machines chosen from Group A
- candidates must identify 5 key components of the 3 machines chosen from Group B
- candidates must describe correctly the field adjustments and settings of the 2 machines chosen from Group A
- candidates must describe correctly the field adjustments and settings of the 3 machines chosen from Group B

National Unit Specification: statement of standards (cont)

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Outcome 2 must be assessed in the following way:

Candidate evidence must be in the form of product and performance evidence. Candidates must undertake assessment on their own. Assessment must be conducted under supervised conditions. An observation checklist must be used to record evidence of candidates having achieved all the Performance Criteria in the Outcome.

In Outcome 2 candidates will be able to remove, inspect, replace and reinstate to a reconditioned standard, five machines to be selected; **two machines from group A** and **three machines from group B**

With regard to Outcome 2 candidates must be able to:

1 remove and replace components
2 inspect and assess the condition of components and assemblies
3 dismantle, repair and reinstate machinery to manufacturers' specification
4 identify the causes of excessive wear on soil engaging components
5 set up and verify the correct operation of cultivation and plant establishment machinery

Outcome 3

Candidate evidence must be in the form of product and performance evidence. Candidates must undertake assessment on their own. Assessment must be conducted under supervised conditions. An observation checklist must be used to record evidence of whether candidates have satisfied all the Performance Criteria in the Outcome or not.

Candidates will correctly adjust and calibrate **three machines from group B** ie: Seed drill, Fertiliser spreader, Potato planter, Sprayer, Precision seeder, Slurry or manure spreader, Irrigator; and understand the factors that may affect the calibration and machine settings.

With regard to Outcome 3 candidates must be able to:

- demonstrate the methods used to adjust the application rates and how to calibrate machines and equipment selected from the list of machines and to verify the application rate selected is correct
- correctly describe the factors which can affect the application rate of these machines

National Unit Specification: support notes

UNIT Land-based Engineering: Agricultural Machinery — Cultivation and Plant Establishment (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

This unit forms part of the National Qualification Group Award in Land-Based Engineering at SCQF level 6, but may also be offered on a free standing basis. It can operate in conjunction with the SVQ level 3 in Land-Based Engineering Operations, providing candidates with the knowledge and understanding required to service and repair crop harvesters appropriate to their area.

The aim of this Unit is to allow candidates to develop knowledge, understanding and skills in the function, repair, maintenance, operation and adjustment of a range of soil preparation and crop establishment machinery.

Sub-assemblies to be selected from the groups include:

- **Soil preparation:** Ploughs, powered cultivators and non-powered cultivators.
- **Crop establishment machinery**: Seed drills, Fertiliser spreaders, Potato establishment equipment including de-stoners and planters, Sprayers, Precision seeders, Slurry and manure spreaders and equipment, Irrigation equipment.

On successful completion of the Unit candidates will be able to identify wearing and damaged components; remove, repair or replace components; adjust, set up and calibrate machines and also describe some of the factors which can affect the application rate of these machines for example seed or fertiliser type and quality.

Correct use of tools and observation of safe working practices should be encouraged at all times. The potential hazards associated with high pressure fluids, harmful substances used in crop establishment machinery, dust, heat and the correct disposal of fluids should also be highlighted.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

HEALTH, SAFETY AND THE ENVIRONMENT

As Outcomes 2 and 3 require the candidate to practically service and repair equipment either on-site or in a workshop situation, it is strongly recommended that the candidates are inducted into current legislation, regulations and safe working procedures and practices, before starting practical work.

A safe system of work should be established in line with the Health, Safety and the Environment unit guidelines while taking cognisance of the candidate's previous experience and abilities prior to the commencement of the practical activities. The storage and handling of materials and methods of disposal of waste materials produced during the servicing of land-based equipment should comply with current legislation and good practice. Health, safety and Environmental issues associated with this unit ***should be taught together with the subject topics and not separately*** in the Land-Based Engineering: Health, Safety and the Environment Unit.

National Unit Specification: support notes (cont)

UNIT Land-based Engineering: Agricultural Machinery — Cultivation and Plant Establishment (SCQF level 6)

It is recommended that the Unit is delivered in the same sequence the Outcomes are presented in the National Unit Specification: statement of standards section of the Unit. The Unit may be delivered largely by a combination of lectures and practical work.

Good wall charts and videos/DVDs on machines and components may also provide useful sources of learning. Where appropriate and if practical, field work operation should be included as either a demonstration or practical activity for the candidate.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Problem Solving

The Critical Thinking component of *Problem Solving* at SCQF level 5 may be developed in Outcomes 2 & 3 while candidates are involved in practical work removing, assessing, repairing and replacing components, and also in the setting up and calibrating of appropriate machines.

The Planning and Organisation component of *Problem Solving* at SCQF level 5 may be developed in Outcomes 2 and 3 while candidates are involved with practical tasks, as they may need to organise how the required resources will be allocated.

The Reviewing and Evaluating component will be addressed during report writing at the conclusion of practical activities undertaken in Outcomes 2 and 3.

Working with others

The Working Co-operatively with Others Core Skill component at SCQF level 4 may be developed in Outcomes 2 and 3 while candidates carry out the repair and calibration of agricultural machinery.

The Reviewing Co-operative Contribution Core Skill component at SCQF level 4 may be developed in Outcomes 2 and 3 while candidates engage in practical work as they have to interact with their lecturers, support staff and other candidates, for example; while sharing engineering workshop areas, tools and equipment or in developing a plan and completion of the repair and calibration of agricultural machinery.

Communication

The Written Communication Core Skill component at SCQF level 5 may be developed in Outcomes 1, 2 and 3 while candidates engage in practical work as they have to submit written reports on the setting up, repair and calibration of agricultural machinery.

The Oral Communication Core Skill component at SCQF level 5 may be developed in Outcomes 1, 2 and 3 while candidates engage in practical work as they have to interact with their lecturers, support staff and other candidates, for example; while sharing engineering workshop areas, tools and equipment or in developing a plan and completion of the adjustment, repair and calibration of agricultural machinery.

Numeracy

The Using Number Core Skill component at SCQF level 4 may be addressed in Outcomes 1, 2 and 3 through calculation involved in the measurement during adjustment, repair and calibration of agricultural machinery.

The Using Graphical Information Core Skill component at SCQF level 4 may be addressed in Outcome 3 using charts and graphical presentation for calibration procedures.

ICT

The Accessing Information Core Skill component at SCQF level 5 may be developed in Outcomes 2 and 3 through the retrieval of manufacturers' data.

The Processing Information Core Skill component at SCQF level 5 may be developed in Outcomes 2 and 3 through the presentation of assessments and reports.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Assessment of health, safety and environmental issues within this unit could be cross matched and assessed in the associated Land-Based Engineering Health, Safety and the Environment unit.

A single, holistic assessment paper of short answer, multiple choice or restricted response may assess Unit knowledge in Outcome 1. Alternately assessment of individual parts of the Outcome may be carried out at appropriate points during Unit delivery. Candidate evidence must be in the form of performance and written and/or recorded oral evidence.

Formative assessment exercises involving candidates in workshop inspections and repair skills acquisition will play an important role in building candidate knowledge, understanding, skills and confidence of unit content. Candidates would be expected to complete an appropriate written job card/inspection report associated with Outcomes 2 and 3. An observation checklist must be used to record the evidence of candidates having satisfied all the Performance Criteria in Outcomes 2 and 3.

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).*

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**