



National Unit Specification: general information

UNIT Land-based Engineering: Small Construction Plant (SCQF level 6)

CODE F91M 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 knowledge and understanding of a range of small construction plant equipment. During the delivery of the Unit candidates will develop a knowledge of the construction and working principles of components of small plant used in the plant equipment industry with special reference to the plant hire sector. They will also develop the knowledge and skills to perform fault finding techniques, repair and test components from the equipment. Candidates will develop practical skills and safe working practices whilst removing, replacing and servicing small plant components.

This Unit is suitable for candidates training to be service engineering technicians.

OUTCOMES

- 1 Describe the purpose, layout and working principles of small construction plant machines.
- 2 Inspect and report on the condition of used small construction plant machines.
- 3 Dismantle, assess, repair, re-assemble, and test small construction plant machines.

Administrative Information

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National Unit Specification: general information (cont)

UNIT Land-based Engineering: Small Construction Plant (SCQF level 6)

RECOMMENDED ENTRY

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

- ◆ *Land-based Engineering: Engine Technology* at SCQF level 6
- ◆ *Land-based Engineering: Piston Engine Repair Skills* at SCQF level 6
- ◆ *Land-based Engineering: Workshop Processes* at SCQF level 6
- ◆ Communication at SCQF level 5
- ◆ Numeracy at SCQF level 5

CREDIT VALUE

1 credit at SCQF 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:

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

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

National Unit Specification: statement of standards

UNIT Land-based Engineering: Small Construction Plant (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

Describe the purpose, layout and working principles of small construction plant machines.

Performance Criteria

- (a) Identify and describe the purpose of small construction plant machines.
- (b) Describe correctly the working principles and function of hand held electrical and Internal Combustion Engine (ICE) powered plant.
- (c) Describe correctly the working principles and function of ICE powered pedestrian controlled plant.
- (d) Describe correctly the working principles and function of water pumps, small concrete mixers, concrete laying tools and winches.
- (e) Describe correctly the working principles and function of dump trucks.
- (f) Describe correctly the working principles and function of generators.
- (g) Describe correctly the working principles and function of compressors and air tools.

OUTCOME 2

Inspect and report on the condition of used small construction plant machines.

Performance Criteria

- (a) Plant is safely started, run, tested and stopped in accordance with the manufacturer's recommendations.
- (b) Identify correctly the condition of plant sub-assembly components, including drives or prime movers.
- (c) Report accurately on the serviceability of small plant.
- (d) Identify correctly any damage associated with incorrect operation.
- (e) Identify correctly out of season maintenance tasks and decommissioning procedures.

OUTCOME 3

Dismantle, assess, repair, re-assemble, and test small construction plant machines

Performance Criteria

- (a) Carry out the dismantling, inspection and repair of small construction plant in accordance with manufacturer's recommendations.
- (b) Select and use appropriate tools in accordance with industry convention.
- (c) Carry out final safety checks on serviced/repared plant in accordance with manufacturer's recommendations.
- (d) Carry out decommissioning of surplus/unused plant in accordance with manufacturer's recommendations.

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.

Range of Small Plant to be selected for Outcomes of this Unit

	Hand Held Elect	Hand Held ICE	ICE Pedestrian	Water Pumps	Dump Trucks	Concrete Mixers	Concrete Laying	Generators	Compressors and Air Tools	Winches
Outcome 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Outcome Two Inspect <u>two</u> machines for this Outcome	No	Option for Inspection in Outcome 2	Option for Inspection in Outcome 2	Option for Inspection in Outcome 2	Option for Inspection in Outcome 2	Option for Inspection in Outcome 2	Option for Inspection in Outcome 2	No	Option for Inspection in Outcome 2	Option for Inspection in Outcome 2
Outcome Three Repair <u>four</u> machines for this Outcome	No	Option for Repair in Outcome 3 if the machine was not previously chosen for inspection in Outcome 2	Option for Repair in Outcome 3 if the machine was not previously chosen for inspection in Outcome 2	Option for Repair in Outcome 3 if the machine was not previously chosen for inspection in Outcome 2	Option for Repair in Outcome 3 if the machine was not previously chosen for inspection in Outcome 2	Option for Repair in Outcome 3 if the machine was not previously chosen for inspection in Outcome 2	Option for Repair in Outcome 3 if the machine was not previously chosen for inspection in Outcome 2	No	Option for Repair in Outcome 3 if the machine was not previously chosen for inspection in Outcome 2	Option for Repair in Outcome 3 if the machine was not previously chosen for inspection in Outcome 2

Outcome 1

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. The assessment should holistically cover the commonly available small construction plant machines. Total assessment time for Outcome 1 must not exceed 1 hour.

With regard to Outcome 1

- ◆ candidates must describe correctly the purpose of eight small construction plant machines
- ◆ candidates must describe correctly the working principles and function of one electrical and one ICE powered items of hand held plant
- ◆ candidates must describe correctly the working principles and function of one ICE powered item of pedestrian controlled plant

National Unit Specification: statement of standards (cont)

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- ◆ candidates must describe correctly the working principles and function of a dump truck
- ◆ candidates must describe correctly the working principles and function of one type of water pump
- ◆ candidates must describe correctly the working principles and function of a small concrete mixer and one concrete laying power tool
- ◆ candidates must describe correctly the working principles and function of a small mains voltage generator
- ◆ candidates must describe correctly the working principles and function of a compressor
- ◆ candidates must describe correctly the working principles and function of an air tool
- ◆ candidates must describe correctly the working principles and function of a power winch

Outcome 2

Outcome 2 must be assessed by a series of assessments designed to generate evidence of candidates' abilities to find faults in four different types of small construction plant machines.

Candidates must undertake assessment on their own which should be conducted under supervised conditions. Candidate evidence must be in the form of performance and written and/or recorded oral evidence. An observation checklist must be used to record the evidence of candidates having satisfied all the Performance Criteria in the Outcome.

Mains voltage generators and electrically powered items of hand held plant should not be used for this Outcome

With regard to Outcome 2

- ◆ candidates must run and test two small construction plant machines in accordance with the manufacturers' recommendations
- ◆ candidates must report accurately on the serviceability of each sub-assembly, including the prime mover, drive for two small construction plant machines
- ◆ candidates must identify correctly potential sources of damage associated with incorrect operation on two items of small construction plant
- ◆ candidates must identify basic maintenance tasks for two small construction plant machines in accordance with the manufacturers' recommendations
- ◆ candidates must identify out of season maintenance tasks and decommissioning procedures for two small construction plant machines in accordance with the manufacturers' recommendations
- ◆ assessment must be conducted under supervised conditions

Outcome 3

Outcome 3 must be assessed by a series of assessments designed to generate evidence of candidates' abilities to dismantle, inspect, repair, rectify and/or adjust four different types of machines not previously inspected in Outcome 2. Candidate evidence must be in the form of performance and written and/or recorded oral evidence. An observation checklist must be used to record the evidence of candidates having satisfied all the Performance Criteria in the Outcome. Mains voltage generators and electrically powered items of hand held plant should not be used for this Outcome.

National Unit Specification: statement of standards (cont)

UNIT Land-based Engineering: Small Construction Plant (SCQF level 6)

With regard to Outcome 3

- candidates must dismantle, inspect, repair and/or adjust, re-assemble and test four small construction plant machines from the above list not chosen in outcome two in accordance with manufacturers' recommendations
- candidates must complete a final safety check on serviced/repaired plant in accordance with manufacturers' recommendations
- candidates must select and use tools appropriately
- candidates must produce an accurate job card describing the serviceability of the four mechanisms of the small construction plant machines
- observation checklist to be produced by the centre as evidence of the candidate's ability to follow instructions, use correct tools, observe relevant/set safety requirements for the given tasks and carry out service and test procedures correctly and within realistic time scales

National Unit Specification: support notes

UNIT Land-based Engineering: Small Construction Plant (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 small construction plant. **Mains voltage generators and electrically powered items of hand held plant should not be used in Outcomes 2 and 3**

The aim of this Unit is to develop the candidate's knowledge, understanding and skills of small construction plant machines from the following groups:

- electrical and ICE powered items of hand held plant
- ICE powered items of pedestrian controlled plant
- small dump trucks
- water pumps
- concrete mixers
- concrete laying tools
- mains voltage generators (knowledge only)
- compressors and air tools
- ◆ winches

The candidate could be given the opportunity to examine in a practical location small construction plant including, identification of the main components, layout, principles of operation of the systems and components. Factors affecting areas of potential wear, failure, settings, adjustments, and the effect of incorrect operational settings/adjustments. The candidates complete the removal, inspection and replacement procedures for components from small construction plant.

Used plant components should be inspected and compared to manufacturers' specifications and new components. Due regard for cost of new replacement parts should be impressed on the candidates in line with industry practice.

HEALTH SAFETY AND ENVIRONMENTAL ISSUES

As Outcomes 2 and 3 require candidates to practically service and repair equipment either onsite or in a workshop situation, it is strongly recommended that candidates be 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 practical activities. The storage and handling of materials and methods for 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

UNIT Land-based Engineering: Small Construction Plant (SCQF level 6)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

In Outcome 1 candidates should learn the purpose of the complete range of small construction plant. They should know electrical and ICE powered items of hand held plant, ICE powered items of pedestrian controlled plant, dump trucks, water pumps, concrete mixers, concrete laying tools, mains voltage generators, compressors and air tools relevant to the local industry. Candidates must know the layout of components, drives to sub-assemblies, working principles and operational adjustments.

In Outcome 2 candidates should demonstrate an understanding of start, run in operational mode and stopping the plant, if possible operating in real work conditions. They should inspect and report on the condition of two complete items of small plant excluding, mains voltage generators and electrically powered items of hand held plant. The candidate should complete the reports on items of plant designated by the lecturer, which demonstrates the candidate's ability to successfully inspect used equipment with faults and allow them to provide a written or oral reports.

In Outcome 3 candidates should participate in the completion of tasks designated by the lecturer where the candidate's ability to successfully dismantle, assess need for repair, rectify and then reassemble the components of a used item of small construction plant. Repair of working plant should be undertaken where possible excluding mains voltage generators and electrically powered items of hand held plant. The plant should then be tested and set up in accordance with the manufacturer's recommendations. Manufacturer's time scales should be referenced.

In reporting on the serviceability of each sub-assembly, including the prime mover, drive or transmission, chassis or frame, and the principle unique working components (ie in a 'concrete mixer' the drum and ring gear, safety controls) of small construction plant, candidates identify potential sources of excess wear. Special emphasis should be placed on the sub-assemblies not covered in other Land-based Engineering units or unique interactions between sub-assemblies. Care should be taken to examine soil or material engaging components for wear and malfunction.

Systems include the control systems but exclude steering, braking, fuel, hydraulic, engine, transmission and electrics, which are covered in detail in other Land-based Engineering units.

As Outcomes 2 and 3 require candidates to practically service and repair small plant either onsite or in a workshop situation, it is strongly recommended that 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 practical activities. The methods for 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 although assessment of health, safety and environmental issues associated with this Unit should be cross matched and assessed in the Land-based Engineering Health Safety and the Environment Unit.

National Unit Specification: support notes (cont)

UNIT Land-based Engineering: Small Construction Plant (SCQF level 6)

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Elements of the Core Skill *ICT* at SCQF level 5 may be developed in Outcomes 2 and 3 where job card/report writing is specified. As some modern small construction plant equipment has electronic machine control systems which require calibration and/or adjustment to ensure they perform within manufacturer's specifications, further development opportunities exist. Candidates may research and report on the plant types and their constructional features in Outcome 1, servicing requirements and the methods of decommissioning machinery in Outcomes 2 and 3.

Elements of *Communication* at SCQF level 5 may be developed in Outcomes 2 and 3 where report/job card writing is specified. This may further be developed in these Outcomes when candidates investigate, apply techniques and communicate detailed written conclusions regarding overall condition of modern small construction plant equipment and their servicing and routine maintenance. They are required to produce and respond to detailed and complex written communication in Outcome 1, investigate and apply techniques and communicate detailed written conclusions about the servicing, routine maintenance and overall condition of small construction plant equipment.

Elements of *Numeracy* at SCQF level 4 may be developed in Outcome 3 where various aspects of equipment performance are determined during the final testing. Using Graphical Information at SCQF level 5 may be developed in Outcome 3 as candidates are given data and use this to practically set up equipment units they are servicing. Centres have opportunities to develop Numeracy skills and to contextualised reference and support materials provided to the candidate.

Elements of the Core Skill of *Problem Solving* at SCQF level 5 may be developed in Outcomes 2 and 3 particularly the Critical Thinking component. Here candidates are involved in analysing faults and deciding the most economic use of resources to practically complete the repair and servicing of small construction plant equipment. The identification of potential sources of damage associated with incorrect operation of small construction plant is also a vital potential development.

Planning and Organising will be developed in group practical tasks where the allocation of resources is organised to produce a plan for repairs in practical workshop activities when candidates are dismantling, assessing condition of small construction plant, re-assembling, setting up and testing equipment. Reviewing and Evaluating may also be developed in Outcomes 2 and 3 after candidates have completed their group practical tasks, as they could evaluate the effectiveness of the work plan, drawing conclusions and offer alternative solutions to complete the task.

Elements of *Working with Others* Core Skill at SCQF level 5 may be developed in Outcomes 2 and 3 during team working in practical situations where co-operatively with others, sharing service engineering workshop areas, tools and equipment are the norm. This could then be discussed in terms of the nature and scope of team goals, roles and responsibilities. Working Co-operatively with Others and Reviewing the Co-operative Contribution at SCQF level 5 may be developed in Outcomes 2 and 3. Although candidates have to demonstrate practical skills independently, formative group activities will enhance skills in working with others and as they engage in practical work they have to interact with their lecturers, support staff and other candidates. Additionally in developing a repair plan and completing the routine maintenance of small construction plant equipment, candidates could be given constructive feedback to encourage the review and evaluation of their approaches to practical work including their contribution to team working

National Unit Specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

A single, holistic assessment paper of short answer and or restricted response questions may assess Unit knowledge in Outcome 1. Alternately assessment of individual parts of the Outcome could 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 a particularly important role in building candidate knowledge, understanding, skills and confidence of Unit content. Candidates would be required to complete an appropriate written job card/inspection report document 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.

In assessing the condition/serviceability in Outcome 2 or the dismantling, repairing and testing in Outcome 3, special emphasis should be placed on the parts and sub-assemblies not covered in other Land-based Engineering units (ie engines). Each sub-assembly, including drives, frame, and the ***principle unique working components*** (ie on a 'concrete mixer' the frame, drum and ring gear) of small plant, candidates should assess potential sources of excess wear. Soil or material engaging components should be assessed for wear and malfunction and systems including the control and operation systems but excluding steering, braking, fuel, hydraulic, engine, transmission and electrics, which are not unique to the machine and which are covered in detail in other Land-based Engineering units.

An observation checklist must be used to record the evidence of candidates having satisfied all the Performance Criteria in Outcomes 2 and 3.

Health safety and environmental issues

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.

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