Arrangements for:

National Certificate in Land-based Engineering at SCQF level 6

Group Award Code: G9RV 46

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Acknowledgement

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

History of changes

It is anticipated that changes will take place during the life of the qualification, and this section will record these changes. This document is the latest version and incorporates the changes summarised below.

Version number	Description	Date
03	**Revision of Unit**: D36H 11 Work Experience *has been revised by* HF88 45 Work Placement *and will finish on* 31/07/2017	22/07/2016
02	H23W 75 Literacy *has been added as an alternative to* F3GB 11 Communication	12/06/2014

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1 Introduction

This is the Arrangements Document for the National Certificate Group Award in Land-based Engineering at SCQF level 6 which was validated in April 2010. This document includes background information on the development of the Group Award, its aims, guidance on access, details of the Group Award structure and guidance on delivery.

The review of the NCGA in Land-based Engineering has been necessitated by technological developments in the industry and the evolution of the Vocational Qualifications in Land-based Operations (LEO). In revising the award it ensures alignment with the revised National Occupational Standards. The revised qualification has been developed under the design principles for **National Certificate Group Awards.**

2 Rationale for the revision of the Group Award

2.1 The Need for the Revision

The land-based service industry is fast moving, challenging and one of the most advanced and progressive engineering sectors in the UK, using innovation and technology to meet the demands of the enduring and progressive agricultural sector.

The larger tractors of today have an engine capable of producing 150hp upwards with sophisticated transmission and hydraulic systems and will be packed with more computer-power, electronics and sophisticated control systems than many of the early manned space flights. As the size of machines and tractors has grown, with greater technological advancement, requiring a more skilled service workforce to keep the equipment working at full efficiency, this new technology requires a new breed of technicians who are highly trained, appropriately educated and adaptable. A recognisable, respected and modern qualification is therefore required to meet and respond to these needs.

Since the introduction of the Group Award in the 1990s many of the National Certificate modules have became obsolete and required revision, hence a review of the original NC modules has been completed as part of the development of the National Certificate. Significantly as the Sector Skills Council (LANTRA) has revised the National Occupational Standards in line with changing industry requirements, it is essential the NC Group Award be updated to complement the industry standards and changes in practices.

The emphasis in the new SVQ level 3 in Land-based Engineering Operations (LEO) is the industry requirement for the modern technician to have a broad base of knowledge and skills with a clear progression path for future land-based engineers. It will also provide a possible route of progression into higher education to diploma or degree level.

This Group Award at SCQF level 6 offers candidates options for Agricultural, Ground Care, Construction Plant, and Forestry Engineers to specialise in their chosen field.

2.2 Management of the Development Process

A Qualification Design Team (QDT) was set up to oversee the development and has primarily involved staff from Further Education colleges supported by SQA and a lead consultant.

2.3 Market research

Market research to support the development of the National Certificate has been undertaken using the following approaches:

- Desk based research
- Consultation with Employers
- Consultation with Further Education and Training Providers
- Consultation with Sector Skills Council Representatives

Each of these approaches is summarised the following sections:

Type of Research	Nature and Findings of the Research
Desk Based Research	Analysis of numbers and size of Tractors and Machines in use in Scottish Agriculture over a six year period as shown in the Scottish Government 2009 Economic Report
	Demographic changes in the workforce indicated by Futureskills Scotland and LANTRA show the necessity to ensure replacements for the retiring/ageing workforce are educated and trained to meet these needs.
	LANTRA report the need for training in Core Skills: literacy, communication, numeracy and ICT
	Recognition by the IAgrE (Institution of Agricultural Engineers) as suitable for registration as Engineering Technician grade
Consultation with Further Education Colleges	A consultation with the four Scottish Land-based Colleges.
	Ensure the new award dovetails with the VQ qualifications and Modern Apprenticeship in Land-based Engineering which have recently been revised.
	Specialist Units unique to individual engineering areas for Agriculture, Construction Plant, Forestry and Ground Care. Support the inclusion of Communication, Numeracy, ICT, Problem Solving, Working with Others

	Give a higher profile within an award to Health, Safety and Environmental considerations
	Recognise the complexity of tractors and equipment means the service support required to service and repair sophisticated systems.
Consultation with Prospective Employers	Twelve employers identified by Scottish Land-based Colleges were contacted
	Group Award structure and content, including Core Skills, meets the needs the of the industry
	Aligns to National Occupational Standards
	Progression routes to S/NVQ level 3 in Land-based Operations (LEO)
Consultation with Sector Skills Council Representatives	Aligns to National Occupational Standards
	Progression routes to S/NVQ level 3 in Land-based Operations (LEO
	The Core Skills meet the needs the of the industry
	NCGA provides potential a pre-employment education and training opportunity for candidates who hope to enter the industry
	Lantra feels the structure is appropriate.

3 Aims of the Group Award(s)

The aims of the NCGA are to provide land-based service engineers with engineering knowledge and skills enabling them to work in the land-based engineering industry in one of its many sectors.

3.1 General aims of the Group Award(s)

The National Certificate aims to provide the knowledge and skills which candidates require to become competent in the Land-based Service Engineering industries. These include to:

1 Develop candidates' technical abilities to technician engineer level
2 Respond to future technical advances in the industry
3 Prepare candidates including adults for employment in the various Land-based engineering specialist sectors. Scotland's skills gaps in rural areas show a paradox in that those with the least skills are the least likely to train and are a social, as well as an economic issue.
4 Provide a base for SVQ level III underpinning knowledge in Land-based Engineering Operations (LEO) — see appendix 4.
5 Provide a base for the Modern Apprenticeship following industrial experience

6 Develop broad based knowledge, skills and technical abilities which give candidates flexibility to adapt to various related industries for enhanced future employment prospects
7 Allow candidates to progress to a degree in a Land-based engineering or related subject discipline especially in general engineering.
8 Allow candidates to develop knowledge, understanding and skills in Communication, Numeracy, Information and Communication Technology, Problem Solving and Working with Others, the Core Skills that underpin and support their studies in Land-based Engineering

3.2 Specific aims of the Group Award(s)

1 To enhance candidate employment prospects through development of Core Skills
2 Support candidates' careers and continuing professional development eg manufacturers' courses
3 Enable progression within the SCQF (Scottish Credit and Qualifications Framework)
4 Develop learning and transferable skills which are particularly prevalent in the industry. Education and training makes the difference — the employment and wage benefits associated with qualifications reflect the knowledge gained and its value in the labour market

3.3 Target groups

The National Certificate in Land-based Engineering at SCQF level 6 may be studied by school leavers, those holding a relevant qualification at SCQF level 5 or adult returnees. Those in employment who are seeking a qualification which will educate and train them to become engineering technicians perhaps in association with the SVQ in Land-based Engineering Operations and especially in tandem with a Modern Apprenticeship. Individual units within the level 6 award can be offered on a free-standing basis to meet specific industrial educational or training requirements in, for example, Hydraulic Systems or Welding.

3.4 Employment opportunities

The National Certificate in Land-based Engineering is a broad based qualification, allowing candidates the opportunity to work as a technician in the service repair areas of agriculture, ground care, forestry or construction plant. The qualification provides a great deal of the underpinning knowledge, understanding and formative skills for those candidates who are entering the industry as SVQ apprentice engineering technicians. These opportunities for Land-based engineering technicians occur regularly in both dealerships, private business, related industries and the public sector.

3.5 Professional recognition

Recognition by the IAgrE (Institution of Agricultural Engineers) the professional body for Agricultural Engineers as suitable for registration as Engineering Technician (as per SVQ level 3 Land-based Engineering Operations).

4 Access to Group Award

4.1 Access requirements

Access to the National Certificate in Land-based Engineering should be based on a broad approach to candidate selection but, at the same time, should ensure that candidates chosen have the potential and ability to complete an award successfully. The following are recommendations and should not be seen as a definitive or prescriptive list of entry requirements as access to the award is designed to be flexible. Their purpose is simply to give guidance on the selection of candidates.

3 passes at Standard Grade at Grade 3 or above in English and Mathematics and one of the following:

- Physics Standard Grade at General level
- Physics at Intermediate 1 or 2
- Technological Studies Standard Grade at General level
- Technological Studies at Intermediate 1 or 2
- Skills for Work Engineering at Intermediate 1 or 2
- SPA in Engineering at Intermediate 2

Or
Successful completion of an introductory programme of relevant non-advanced SQA NC Units at SCQF level 5.

At the discretion of the presenting centre for applicants with a different experiential background who could benefit from taking the course or Units within the course, eg adult returnees, overseas students with relevant work experience.

4.2 Core Skills Entry Profile

The recommended Core Skills entry profile for the National Certificate in Land-based Engineering is as follows**:**

- Communication SCQF level 4
- Numeracy SCQF level 4
- Information & Communication Technology SCQF level 4
- Problem Solving SCQF level 4
- Working with Others SCQF level 3

4.3 Alternative Access Arrangements

The presenting centre may operate alternative access arrangements in cases where the candidate is convinced that they already have the required competencies in a given area. These arrangements are as follows:

- Assessment on demand
- Credit transfer
- Accreditation of prior learning
- Relevant work experience for mature candidates

Individual presenting centres will require to outline their systems for each of these as a part of any approval procedure.

5 Group Award structure

To successfully achieve the National Certificate in Land-based Engineering at SCQF level 6 a candidate must complete 12 units or 72 SCQF credit points to successfully achieve the award. Eight of the credits are in the Mandatory Section and four credits from the Optional Section.

5.1 Framework

NCGA Land-based Engineering Structure at SCQF level 6

Mandatory Section (8 Credits)

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Communication Or Literacy	F3GB 11 H23W 75	6 6	5 5	1 1
Mathematics: Craft 1	F3HV 11	6	5	1
Land-based Engineering: Engine Technology	F918 12	6	6	1
Land-based Engineering: Piston Engine Repair Skills	F919 12	6	6	1
Land-based Engineering: Electrics — Introduction	F91A 12	6	6	1
Land-based Engineering: Workshop Processes	F91C 12	6	6	1
Land-based Engineering: Hydraulics	F91X 12	6	6	1
Land-based Engineering: Mechanical Transmission Systems	F91R 12	6	6	1

Optional Section (4 credits required from this section)

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Agricultural				
Land-based Engineering: Agricultural Machinery — Cultivation and Plant Establishment	F91E 12	6	6	1
Land-based Engineering: Crop Harvesting Machines	F91F 12	6	6	1
Forestry				
Land-based Engineering: Timber Harvesting Heads	F91G 12	6	6	1
Land-based Engineering: Forestry Machinery Maintenance	F91H 12	6	6	1
Ground care				
Land-based Engineering: General Ground Care Machinery	F91J 12	6	6	1
Land-based Engineering: Ground	F91K 12	6	6	1

Care Machinery Grass Maintenance				
Construction				
Land-based Engineering: Heavy Construction Plant	F91L 12	6	6	1
Land-based Engineering: Small Construction Plant	F91M 12	6	6	1
Land-based Engineering: Welding 1	F91N 12	6	6	1
Land-based Engineering: Welding 2	F91P 12	6	6	1
Land-based Engineering: Powershift, Hydrostatic and Stepless Transmission Systems	F91T 12	6	6	1
Land-based Engineering: Electronic Control and Monitoring Systems	F91V 12	6	6	1
Land-based Engineering: Brakes, Steering and Traction	F91W 12	6	6	1
Work Placement	HF88 45*	6	5	1
Engineering: Using Information Technology	F5D6 11	6	5	1
Land-based Engineering: Health, Safety and the Environment	F91D 12	6	6	1

5.2 Mapping information

The units have been aligned to the Sector Skills Council's (LANTRA) National Occupational Standards (approved October 2009) which define the competencies required to carry out functions used in land-based engineering.
See appendix 4 for details of NOS in Land-based Engineering/NCGA in Land-based Engineering matching exercise.

5.3 Articulation, professional recognition and credit transfer

Recognition by the IAgrE (Institution of Agricultural Engineers) the professional body for Agricultural Engineers as suitable for registration as Engineering Technician (as per SVQ level 3 Land-based Engineering Operations).

Progression pathways

The NCGA aligns to the National Occupational Standards and provides a progression path for land-based engineers to progress to an SVQ level 3 in Land-based Engineering Operations (LEO) and a Modern Apprenticeship. The award offers options for Agricultural, Ground Care, Construction Plant, and Forestry Engineers to specialise in their chosen field. Employers in the Land-based Service Engineering Sector have come to regard this award as a pre-entry requirement for candidates to an accelerated VQ for new entrants to the industry.

Candidates may progress where appropriate to higher education programmes for example to a degree level course at Harper Adams University which will accept the NCGA in Land-based Engineering (the VQ 3 equivalent) as an entry requirement to their Foundation Degree following a successful interview.

It may also provide a possible route of progression into other higher education diplomas or degree level courses especially in general engineering. Candidates are advised to liaise directly with the HE establishment prior to each year's intake of candidates as entry is considered on an individual basis.

Credit Transfer Arrangements

Allowing for the changes in technology and working practices, credit transfer opportunities between the old award and individual NC modules and the new NCGA Units will be very limited.

5.4 Core Skills

Opportunities for Core Skills development

The award includes mandatory **Units in Communication**, **Numeracy and Information and Communication Technology** which are contextualised to ensure Core Skill competence tailored to vocational needs of the industry. Centres will build on entry skills diagnostic profiling for the on-going development across the award of relevant aspects of all Core Skills.

Communication at SCQF level 5 may be developed in all Units as candidates will be required to produce and respond to detailed and complex written and oral communications. Effective interpretation and communication of complex technical information in written and oral forms will be demonstrated by using examples of industry documentation to indicate acceptable formats, structure and terminology. As they investigate the different aspects of Land-based Engineering and report on how to apply servicing techniques they will communicate complex written conclusions about the servicing, routine maintenance and overall condition of land-based vehicles.

Numeracy is fundamental to Land-based Engineering and candidates learn skills in the practical exercises where calculation, application and presentation of complex data in graphic and numerical form are in constant use. Opportunities to develop understanding and skills within the principles and concepts of the Land-based Engineering context are further enhanced by involvement in the realistic practical engineering environment. Candidates will develop Use of Graphical Information in a variety of subjects eg engine valve and fuel pump timing data, complete an engine timing diagram and then, using the correct methods, practically check the accuracy of the diagram using the engine they are servicing.

Information and Communication Technology is an essential tool for reference and research in Land-based Engineering to ensure currency of knowledge. Candidates will complete reports on the different aspects of service and repair of engines, transmission, hydraulic, electronic and other systems associated with Land-based Engineering equipment. Access to a range of simulation packages and professional software may further strengthen skills. Online tutorial support with e-learning and e-assessment opportunities are increasingly available.

The **Problem Solving** elements — critical thinking, planning, organising, reviewing and evaluating — underpin the competencies developed in Land-based Engineering.

The **Critical Thinking** component will be developed where candidates plan practical activities in how to complete the service and routine maintenance tasks of land-based vehicles and equipment. The **Planning and Organising** component is developed while candidates are involved with group practical tasks, as they could be tasked with organising resources allocation and to producing a plan for servicing and routine maintenance of land-based vehicle and equipment using the most cost effective methods. The **Reviewing and Evaluating** component is developed in Units where candidates have completed the group practical tasks and they review the effectiveness of the plan developed, drawing conclusions and making suggestions of more effective ways of completing the allocated tasks.

The Working with Others Core Skill is developed while candidates complete group tasks during the servicing and routine maintenance of land-based vehicles and equipment. Candidates co-operating with each other while engaging in practical work and interacting with their lecturers, support staff in sharing engineering workshop areas, tools and equipment will achieve part of the objective. They will develop plans and promote good team relationships during the completion of the servicing and routine maintenance tasks on land-based equipment. Task based practical work will provide opportunities for reviewing co-operative working and the skills associated with this which will ensure they can identify, manage and resolve potential difficulties in the work place.

Work Experience

Although not a Core Skill, Work Experience Intermediate 2 is seen as an essential component of the award as it allows candidates to develop their interpersonal, investigative and organisational skills through experience of work.

Achievement of the Unit at Intermediate 2 gives automatic certification of **Working with Others** at SCQF level 5 and **Problem Solving** SCQF level 5.

See Appendix 2.

6 Approaches to delivery and assessment

6.1 Content and context

The Units, which form part of the National Qualification Group Award in Land-based Engineering, cover the principles and practice required to maintain and repair land-based engineering vehicles and machinery.

Reference is made to the construction, function, operation, repair and reinstatement of systems and their components. Methods used to check and identify areas of potential failure or wear, implications of incorrect settings and fault diagnosis in systems are an important part of many Units. Safe working practices as laid down in the health and safety codes of practice which include lifting and handling are encompassed in all Units.

The Group Award aligns to the National Occupational Standards providing progression pathways to SVQ level 3 in Land-based Engineering Operations (LEO), Modern Apprenticeships and, where appropriate, higher education programmes. Candidates may progress to a degree level course at Harper Adams University, as they will accept the NCGA in Land-based Engineering (the VQ 3 equivalent) as an entry requirement to their Foundation Degree following a successful interview.

It may also provide a possible route of progression into other higher education diplomas or degree level courses especially in general engineering. Candidates are advised to liaise directly with the HE establishment prior to each year's intake of candidates as entry is considered on an individual basis.

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6.2 Delivery and assessment

The aim of the award is to allow candidates to develop knowledge, understanding and technical skills associated with vehicles, equipment and their systems used in the land-based sector. They will develop the knowledge of industry standards, current legislation, safety regulations and current thinking on current environmental issues including the correct disposal of waste materials.

Candidates should be introduced to the main constructional and operational features and sequence of operation of a range of engines used in the land-based sector. To stimulate candidates' interest further they should appreciate advantages and disadvantages of different types of systems used in the sector. In gaining practical experience candidates will be

encouraged to use manufacturers' service information and data sheets and to record the service/maintenance completed on the recommended service record sheets. In workshop practical situations candidates should be aware of current safety, environmental legislation, regulations and inducted into safe working procedures/practices before starting and during practical work. It is important that safe systems of working are established in the workshop/site environment. Candidates should be 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 servicing of land-based machinery.

It is recommended that knowledge for the Units be presented with the emphasis placed on the terminology, constructional features and principles of operation for the range of equipment types and associated ancillary systems. The Units may be delivered by a combination of lectures, investigations, lecturer demonstration and associated practical activities. Industrial visits and work experience, especially for candidates with limited experience in the land-based sector will be helpful in providing them with useful insights into onsite practices, procedures, health and safety requirements and environmental considerations for the service and repair of land-based vehicles and equipment.

Avoidance of duplication across Units

Units or outcomes from individual Units should be integrated where possible to save time and avoid duplication especially of assessment. For example, in *Heavy Construction Plant*, Outcome 2 when reporting on the plant serviceability, it is the principal unique working components (ie in a 'backhoe loader' the boom, backacter and bucket), which candidates should concentrate on in identifying potential sources of excess wear. Care should be taken to examine soil or material engaging components for wear and malfunction. Special emphasis should be placed on these sub-assemblies rather than repeating work covered in other Land-based Engineering units such as *Piston Engine Repair Skills* or *Mechanical Transmission Systems*. Systems should include the control systems but exclude steering, braking, fuel, hydraulic, engine, transmission and electrical systems if they are covered in detail in other Land-based Engineering units.

Assessment

Assessment of knowledge may comprise a series of assessment papers consisting of multiple choice, short answer, structured and essay questions. Partly completed diagrams may be used as part of the assessment. Some assessments may be suitable for on-line delivery. Assessment of practical activities should comprise of exercises designed to ensure that although they may work in small groups of 2/3, the individual candidates can gather sufficient evidence to satisfy the Outcomes and Performance Criteria. Task instruction sheets, manufacturers' product literature and record forms should be made available to candidates. In most instances it is recommended the assessor should record achievement on a checklist designed for the assessment.

Assessment Support Packs will be available for all mandatory Units.

If possible, a holistic approach to Unit assessment should be adopted where a single assessment instrument for a whole Unit is used. If this is not possible the assessment strategy adopted should be for the minimum numbers of assessment instruments where required consistent with maintaining agreed national standards.

Assessment Support Packs for Mandatory Units

Product code	Product Title	Will be available on SQA secure website
F3GB 11	Communication	✓
F3HV 11	Mathematics: Craft 1	✓
F918 12	Land-based Engineering: Engine Technology	✓
F919 12	Land-based Engineering: Piston Engine Repair Skills	✓
F91A 12	Land-based Engineering: Electrics: Introduction	✓
F91C 12	Land-based Engineering: Workshop Processes	✓
F91X 12	Land-based Engineering: Hydraulics	✓
F91R 12	Land-based Engineering: Mechanical Transmission Systems	✓

Formative Assessment

Formative assessment should be used throughout the delivery of NQ units to reinforce learning, build candidates' confidence and prepare them for summative assessment.

E-Assessment

E-assessment may be appropriate for some assessments in this Group Award. 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 wishing 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.

Health Safety and Environmental considerations

As many units and outcomes require candidates to practically service and repair equipment 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 Environment Unit guidelines while taking cognisance of candidates' 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 in the subject units and not separately in the *Land-based Engineering: Health, Safety and the Environment* Unit. This Unit is designed to be incorporated and integrated with the content of other Units within the Land-based Engineering Award. It is envisaged that it will be mainly taught in tandem with other appropriate Land-based Engineering units as required rather than as a completely separate standalone unit. Evidence will be gathered over the period of delivery of the relevant units with assessments conducted under supervised conditions at that time.

Assessment of health, safety and environmental issues associated with the Units should be cross matched and assessed in the Land-based Engineering, Health Safety and the Environment Unit.

It is suggested that assessment evidence be gathered by performance evidence generated under supervised conditions throughout the other Units within the *Land-based Engineering* Award supported by assessor checklists covering the Outcome and all PCs. It is envisaged that evidence will be generated from the following *Land-based Engineering* Units by performance evidence with assessments conducted under supervised conditions as indicated in the table overleaf.

Land-based Engineering: Health, Safety and the Environment Unit cross match to other Land-based Engineering units

LBE units H&S topic	1/2	3	4	5	6	7/8	9/ 10	11/ 12	13/ 14	15/ 16	17	18	19	20
H&S at Work Act 1974														X
Management of Health and Safety at Work Regulations 1999														X
Workplace (Health, Safety and Welfare) Regulations 1992,		X	X											
Health and Safety (Safety Signs and Signals) regulations 1996,		X	X							X			X	
Control of Substances Hazardous to Health Regulations 2002 (as amended 2004)	X		X	X		X	X	X	X				X	
Lifting Operations and Lifting Equipment Regs1998	X			X	X	X	X	X	X	X	X		X	
Control of Noise at Work Regulations 2005	X		X							X				
Manual Handling Operations Regulations 1992	X				X	X	X	X	X		X		X	
Electricity at Work Regulations 1989,		X										X		
Fire (Scotland) Act 2005	X							X		X				X
Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995,														X
Health and Safety (First Aid) Regulations 1981													X	X
Provision and Use of Work Equipment Regulations 1998			X					X		X				
Personal Protective Equipment Regulations 1992			X						X	X				

Key

Mandatory Section

1 Land-based Engineering: Engine Technology (F918 12)
2 Land-based Engineering: Piston Engine Repair Skills (F919 12)
3 Land-based Engineering: Electrics: Introduction (F91A 12)
4 Land-based Engineering: Workshop Processes (F91C 12)
5 Land-based Engineering: Hydraulics (F91X 12)
6 Land-based Engineering: Mechanical Transmission Systems (F91R 12)

Optional Section

Agriculture

7 Land-based Engineering: Agricultural Machinery — Cultivation and Plant Establishment (F91E 12)
8 Land-based Engineering: Crop Harvesting Machines (F91F 12)

Forestry

9 Land-based Engineering: Timber Harvesting Heads (F91H 12)
10 Land-based Engineering: Forestry Machinery Maintenance (F91H 12)

Ground care

11 Land-based Engineering: General Ground Care Machinery (F91J 12)
12 Land-based Engineering: Ground Care Machinery Grass Maintenance Machinery (F91K 12)

Construction

13 Land-based Engineering: Heavy Construction Plant (F91L 12)
14 Land-based Engineering: Small Construction Plant (F91M 12)

Optional Section Others

15 Land-based Engineering: Welding 1 (F91N 12)
16 Land-based Engineering: Welding 2 (F91P 12)
17 Land-based Engineering: Powershift, Hydrostatic and Stepless Transmission Systems (F91T 12)
18 Land-based Engineering: Electronic Control and Monitoring Systems (F91V 12)
19 Land-based Engineering: Brakes, Steering and Traction (F91W 12)
20 Land-based Engineering: Health, Safety and Environment (F91D 12)

Suggested Delivery Schedule

In the Mandatory Section the Units *Engine Technology* and *Piston Engine Repair Skills* may be delivered together towards the commencement of the award to develop the candidates' interest.

The specialist machinery Units for candidates who follow the **Agricultural Engineering** alternative, should start with *Cultivation and Plant Establishment* and follow with *Crop Harvesting Machines*. Similarly candidates following the **Forestry** selection could undertake *Forestry Machinery Maintenance* followed by *Timber Harvesting Heads*. Candidates on **Ground Care** could commence with *General Ground Care Machinery* and then complete *Grass Maintenance Machinery*. Those candidates who opt for **Construction Plant** could start with *Small Construction Plant* and proceed to *Heavy Construction Plant*.

It is recommended that *Workshop Processes* should be delivered prior to *Welding 1* which should be presented before *Welding 2*. The Units *Mechanical Transmission, Electronic Control and Monitoring Systems, Brakes, Steering and Traction and Hydraulics* should be delivered prior to *Powershift, Hydrostatic and Stepless Transmission Systems*.

As previously stated, Health, Safety and the Environment Unit delivery must be integrated and delivered and assessed with the other Units.

NCGA Land-based Engineering at level 6 (Agricultural Option)
Suggested Timetable for Full-Time delivery

First Semester						
	Communication F3GB 11	**Land-based Engineering: Engine Technology**	**Land-based Engineering: Piston Engine Repair Skills**	**Land-based Engineering: Workshop Processes**	*Land-based Engineering: Agricultural Machinery — Cultivation and Plant Establishment*	*Land-based Engineering: Brakes, Steering and Traction*
Second Semester						
	Mathematics: Craft 1 F3HV 11	**Land-based Engineering: Hydraulics**	**Land-based Engineering: Mechanical Transmission Systems**	**Land-based Engineering: Electrics: Introduction**	*Land-based Engineering: Crop Harvesting Machines*	*Land-based Engineering: Health, Safety and the Environment*

Mandatory units in Bold — *Optional units in Italic*

7 General information for centres

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**.

Internal and external verification

All instruments of assessment used within this/these Group Award(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external verification can be found in *SQA's Guide to Assessment* **(www.sqa.org.uk)**.

8 General information for candidates

The National Certificate in Land-based Engineering at SCQF level 6 has been designed and developed to provide education and training for those seeking employment as engineering technicians in Agriculture, Construction Plant, Forestry and Ground Care Engineering.

As a land-based engineering technician you will work to solve problems using a combination of scientific, technical and engineering knowledge. You will work on a wide range of specialist vehicles and machines used in farming, forestry, horticultural businesses, groundcare and sports facilities, including golf courses and parks. Work in this sector normally has a

standard full-time week, but this can vary depending on seasonal demands and deadlines. The working environment can vary between working indoors in a workshop to outdoors on field work, visiting farms and other sites. The work with agricultural, forestry and horticultural equipment can be hazardous and engineers are required to wear protective clothing and at times high-visibility vests and hard hats.

As a land-based engineer you will need:

- good practical and IT skills
- to be creative and inventive
- to have good problem-solving skills
- the ability to record and analyse data
- an understanding of customer care
- an understanding of health and safety legislation
- an interest in the agricultural, horticultural, forestry or construction sectors
- training to keep equipment in good working order through planned maintenance, as well as carrying out any diagnostic and repair work when required

The NCGA award in Land-based Engineering allows you to develop the wide range of skills and knowledge required to repair and maintain complex machines and tractors. It focuses on engineering activities in the workshop where you will learn about: hydraulics, engine technological and electrical systems, diagnostic fault finding, and aspects of workshop practice. Above all it will provide you with a broad base of land-based engineering knowledge which you will call on as a engineer.

As a land-based service technician this work will involve you in:

- running diagnostic tests on complex machinery and equipment
- recording and analysing data
- carrying out repairs
- servicing and maintaining a wide range of plant and machinery
- adjusting and setting equipment to allow correct operation
- replacing parts and fabricating new components if necessary
- using techniques such as welding to make repairs — you will refer to and use technical information in repair manuals
- using a wide range of hand and specialist tools, including diagnostic equipment and laptop computers.

Award Content

The National Certificate in Land-based Engineering comprises two sections: mandatory and optional. The mandatory section contains Units in communication and numeracy. Irrespective of which field of land-based engineering you wish to go into, it is important that you can read and understand technical information, speak to others effectively, while working and present technical information in written form in a correct and concise manner, free from spelling and grammatical mistakes. All fields of engineering involve some calculations and the use of mathematics and it is important that you are competent in numeracy and mathematics if you are

going to work as a technician. The six technology units in the mandatory section are essential to all branches of land-based engineering.

The optional section of the National Certificate contains units which allow you to choose between either two Agriculture, or two Construction Plant, or two Forestry, or two Ground Care specialisms The other options in the award allow you the flexibility to choose another two from a range of Units to complete your NCGA in land-based Engineering.

The choice of Units you make may depend on the following factors:

- subjects to satisfy a future employer's needs and specialisms
- having a career or personal interest in a certain subjects

Teaching

While studying for the award, the teaching and learning approaches adopted by the lecturers in your centre could include the following: lecturing, group classroom work, practical engineering work, including diagnostic repair and testing, computer simulation, investigations (including the use of the Internet) and project work. Industrial visits and work experience may also be included in your course to allow you to see 'real life' land-based engineering situations.

Assessment

SQA has designed the award to ensure that the assessments meet national standards and every attempt has been made to optimise assessment so that sufficient time is available for you to learn both the practical and theory to become a good technician. Individual NQ Unit assessments will normally consist of practical exercises, written tests, assignments, computer simulations and project work. Your lecturer should tell you at the start of the Unit what form the Unit assessment will take.

Progression pathways

The NCGA provides a progression path for land-based engineers to progress to an SVQ level 3 in Land-based Engineering Operations (LEO) and a Modern Apprenticeship. The award offers options for Agricultural, Ground Care, Construction Plant, and Forestry Engineers to specialise in their chosen field. Employers in the Land-based Service Engineering Sector have come to regard this award as a pre-entry requirement for candidates to an accelerated VQ for new entrants to the industry.

It will also provide a possible route of progression into higher education and to further your studies at diploma or degree level. Harper Adams University will accept the NCGA in Land-based Engineering or the VQ 3 equivalent on to their Foundation Degree following a successful interview. The NCGA may also provide possible routes of progression into other higher education diploma or degree level courses, especially general engineering.

9 Glossary of terms

SCQF: This stands for the Scottish Credit and Qualification Framework, which is a new way of speaking about qualifications and how they inter-relate. We use SCQF terminology throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at www.scqf.org.uk

SCQF credit points: One SCQF credit point equates to 10 hours of learning. NQ Units at SCQF levels 2–6 are worth 6 SCQF credit points, NQ Units at level 7 are worth 8 SCQF points.

SCQF levels: The SCQF covers 12 levels of learning. National Qualification Group Awards are available at SCQF levels 2-6 and will normally be made up of National Units which are available from SCQF levels 2–7.

Dedicated Unit to cover Core Skills: This is a non-subject Unit that is written to cover one or more particular Core Skills.

Embedded Core Skills: This is where the development of a Core Skill is incorporated into the Unit and where the Unit assessment also covers the requirements of Core Skill assessment at a particular level.

Signposted Core Skills: This refers to the opportunities to develop a particular Core Skill at a specified level that lie out with automatic certification.

Qualification Design Team: The QDT works in conjunction with a Qualification Manager/Development Manager to steer the development of the National Certificate/National Progression Award from its inception/revision through to validation. The group is made up of key stakeholders representing the interests of centres, employers, universities and other relevant organisations.

Consortium-devised National Certificates/National Progression Awards are those developments or revisions undertaken by a group of centres in partnership with SQA.

10 Appendices

Appendix 1: NOS — NCGA cross matching exercise
Appendix 2: Core Skills matrix

Appendix 1: NOS — NCGA cross matching exercise

SQA NOS MATRIX Appendix

MANDATORY SECTION

MANDATORY SECTION eight credits | **OPTIONAL SECTION at least four credits**

AGRICULTURAL | **FORESTRY** | **GROUND CARE** | **CONSTRUCTION**

Page	Unit No	National Occupational Standards April 2009	SQA Unit	Comm-unication	Maths: Craft 1	Info Tech	H S & Environ	LBE Engine Tech	LBE Piston Repair Skills	LBE Electrics Introduct	LBE Workshop Process	LBE Agric Mach Cult & P Establish	LBE Crop Harvest Machines	LBE Forestry Machine Mainten	LBE Timber Harvest Heads	LBE General Ground Care Machine	LBE Grass Maint Machinery	LBE Small Const Plant	LBE Large Const Plant	Welding 1	Welding 2	Transmissi ons Mech	Hydraulics	Transmiss ions Complex	Brakes Steering Tyres Traction	
		Credit Value	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**		
		SCQF Level	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6		
3	Unit LEO 1	Recognise and reduce hazards in the Land Based Engineering work area		P		P	Y																			
9	Unit LEO 2	Organisational procedures in Land Based Engineering																								
11	Unit LEO 3	Customer care in Land Based Engineering																								
13	Unit LEO 4	Core Land Based Engineering principles – Mechanical principles			P	P		P			P											P		P	P	
15	Unit LEO 5	Core Land Based Engineering principles – Tools and equipment							P		Y									P	P					
17	Unit LEO 6	Core Land Based Engineering principles – Material preparation, shaping and assembling									Y									P	P					
21	Unit LEO 7	Core Land Based Engineeringprinciples – Calculations			Y	P																				
23	Unit LEO 8	Core Land Based Engineering principles – Servicing and maintenance				P			P			P	P	P	P	P	P	P	P			P	P		P	P
25	Unit LEO 9	Core Land Based Engineering – Thermal joining processes																		Y	Y					
29	Unit LEO 10	Core Land Based Engineering – Cooling and lubrication						Y	Y																	
31	Unit LEO 11	Service and Repair Engines on LB equipment				P		Y	Y																	
35	Unit LEO 12	Service and Repair Clutches, fluid flywheels and torque convertors on LB Equipment																				Y		P		
37	Unit LEO 13	Service and Repair Mechanical transmission on LB Equipment																				Y				
39	Unit LEO 14	Service and Repair Braking systems on land-based equipment																							Y	
41	Unit LEO 15	Service and Repair Wheeled and tracked steering systems on land-based equipment																							Y	
43	Unit LEO 16	Service and Repair Tyres and tracks on land-based equipment																	P						Y	
45	Unit LEO 17	Service and Repair Cutting and mowing equipment											Y	Y	Y		Y									
47	Unit LEO 18	Service and Repair Harvesting and processing equipment				P							Y	Y	Y	P	P									
49	Unit LEO 19	Service and Repair Soil preparation, cultivation and plant establishment equipment										Y				Y										
51	Unit LEO 20	Service and Repair Transport, handling and storage equipment											P			P										
53	Unit LEO 21	Service and Repair Suspension systems on land-based equipment																								
55	Unit LEO 22	Service and Repair Electrical systems on land-based equipment								Y																
59	Unit LEO 23	Service and Repair electronic control and monitoring systems on land-based equipment				P							P		P		P								Y	
61	Unit LEO 24	Service and Repair Hydraulic systems and components on land-based equipment																					Y		P	P
63	Unit LEO 25	Service and Repair Pneumatic systems and components on land-based equipment																					Y			P
65	Unit LEO 26	Service and Repair Powershift, hydrostatic, CVT transmissions on land-based equipment				P																		Y		
67	Unit LEO 27	Refrigerant handling																								
69	Unit LEO 28	Service and Repair land-based air-conditioning/refrigeration equipment																								
73	Unit LEO 29	Monitor the handover and installation of land-based equipment	P		P			P	P		P	P	P	P	P	P	P	P								
75	Unit LEO 30	Inspect and test land-based equipment	P		P			P	P		P	P	P	P	P	P	P	P								
79	Unit CU 5	Develop personal performance and maintain working relationships																								P
81	Unit CU 5A	Establish and maintain working relationships with others																								P

Key

Not Covered in SQA NCGA	Not Required in NoS	Y = Fully Covered in SQA NCGA	P = Partially Covered in NCGA

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Appendix 2: Core Skills Matrix

COREskills	SCQF LEVEL	Land-based Engineering Units																						
	Communication	Mathematic: Craft 1	ICT	LBE Engine Technology	LBE Piston Engine repair	LBE Electrics	LBE Workshop	LBE Health, Safety & Env Mechanical	LBE Hydraulics	Agric Mach Crop Est	Agric Crop Harv Mach	Timber Harv Heads	Forestry Mach Maint	General Ground Care	Grass Maint Mach	Const Plant Heavy	Const Plant Small	Welding 1	Welding 2	LBE Advanced transmission	LBE Electronic control and monitoring	LBE Brakes, Steering and Traction	LBE Mechanical transmission	Work Experience Int 2
	MANDATORY SECTION									**SPECIALIST SECTION**								**OPTIONAL SECTION**						
Problem Solving																								
Critical Thinking	N/A	5S	5S	5S	6S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	6S	5S	5S	5S	**5C**
Planning and Organising	N/A	N/A	N/A	5S	6S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	6S	5S	5S	5S	**5C**
Reviewing and Evaluating	N/A	N/A	N/A	5S	6S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	6S	5S	5S	5S	**5C**
Working with Others																								
Working Co-operatively with Others	N/A	N/A	N/A	5S	4S	4S	4S	5S	4S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	4S	5S	5S	4S	**5C**
Reviewing Co-operative Contribution	N/A	N/A	N/A	5S	4S	4S	4S	5S	4S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	4S	5S	5S	4S	**5C**

	Communication	Mathematics: Craft 1	Engineering: Using Information	LBE Engine Technology	LBE Piston Engine repair	LBE Electrics	LBE Workshop	LBE Health, Safety & Env	LBE Hydraulics	Agric Mach Crop Est	Agric Crop Harv Mach	Timber Harv Heads	Forestry Mach Maint	General Ground Care	Grass Maint Mach	Const Plant Heavy	Const Plant Small	Welding 1	Welding 2	LBE	LBE Electronic control and monitoring	LBE Brakes, Steering and Traction	LBE Mechanical transmission	Work Experience Int 2
Communication																								
Written Communication	5C	N/A	N/A	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	4S
Oral Communication	5C	N/A	N/A	5S	5S	4S	5S	4S	4S	4S	4S	5S	5S	4S	4S	4S	4S	4S	4S	4S	4S	4S	4S	4S
Numeracy																								
Using Number	N/A	5C	N/A	4S	5S	4S	5S	4S	4S	4S	4S	5S	5S	4S	4S	4S	4S	5S	5S	5S	5S	4S	4S	4S
Using Graphical Information	N/A	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	4S
ICT																								
Accessing Information	N/A	5C	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	4S	4S
Providing/Creating Information	5S	5C	5S	5S	5S	5S	4S	5S	4S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	5S	4S	4S

SCQF level with S indicating core skill is Signposted within the unit — C indicating achievement allows Certification and N/A Not Applicable