Unit 27: Undertaking Specialised Land-based Workshop Practices

Unit code: J/600/9635

QCF Level 3: BTEC National

Credit value: 10

Guided Learning Hours: 60

Aim and purpose

This unit aims to introduce learners to the specialised land-based workshop skills and knowledge and how these can be applied in practice. It is designed for learners in centre-based settings looking to progress into the sector or onto further/higher education.

Unit introduction

With ever-increasing costs involved when purchasing, maintaining and using land-based machinery and equipment there is an increasing need to provide a high standard of maintenance and repair to ensure tasks are carried out on time, to agreed costs and in accordance with current legislative requirements and to meet environmental constraints.

This unit focuses on developing learner knowledge of and ability to understand the need to use specialist tools and processes to allow maintenance, repair and fabrication tasks to be carried out safely, accurately and efficiently. Practical workshop activities will consolidate skills, safe workshop procedures and tools and process selection to allow learners to understand work expectations.

Experience in workshop operations will enable learners to identify the need for specialist tools and processes, together with the importance of tool maintenance, transport and storage. Throughout the unit learners will be encouraged to assess safe and legal working procedures and operate tools and equipment safely and efficiently with regard to current legislative requirements.

Learning outcomes

On completion of this unit a learner should:

1 Be able to identify and select specialised tools, equipment and processes

2 Be able to use specialised tools and equipment in a safe and competent manner

3 Be able to carry out specialised maintenance and repair tasks

4 Understand the need for correct care and storage of specialised tools, equipment and materials.

Unit content

1 Be able to identify and select specialised tools, equipment and processes

Tools and measuring equipment: taps and dies; reamers; honing tools; micrometers; vernier gauges; bore gauges

Powered tools: air tools; electric tools; battery packs and chargers; valve grinders; bore deglazers

Testing equipment: compression testers, pressure testers, exhaust gas analysers, electrical test meters, multimeters

Equipment: manual metal arc (MMA); manual inert gas (MIG); tungsten inert gas (TIG); metal active gas (MAG) welding equipment; plasma cutting; band and cut off saws; eg presses, rolls, folders, lathes, surface grinders, milling machines

Processes: eg paint spraying, electrostatic painting, galvanising, electroplating, powder coating

2 Be able to use specialised tools and equipment in a safe and competent manner

Safe working practices: health and safety issues; Health and Safety at Work Act; risk assessments; Provision and Use of work Equipment Regulations 1998 (PUWER); Control of Substances Hazardous to Health Regulations 1999 (COSHH); Lifting Operations and Lifting Equipment Regulations 1998 (LOLER); personal protective equipment (PPE); fume extraction; appropriate waste disposal; safe lifting and handling

Tool and equipment use: correct selection; fit for purpose; safe use; use of manufacturers' instructions and data; correct method of use; replacement components; calibration; testing

3 Be able to carry out specialised maintenance and repair tasks

Specialised tasks: power unit and transmission overhaul; fabrication and joining procedures; re-finishing; maintenance schedules; work records; testing procedures

4 Understand the need for correct care and storage of specialised tools, equipment and materials

Correct care and storage: storage systems; transport of equipment; cleaning; lubrication; protection in storage; sharpening; replacement wearing parts; periodic calibration; storage temperature and humidity; material storage; waste matter storage and disposal; safe chemical handling and storage

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	**To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:**	**To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:**
P1 identify and select appropriate specialist tools, joining, cutting equipment, fasteners and finishes for given situations [CT]	**M1** install specialist tools and equipment safely	**D1** evaluate processes involved in the installation and setting up of tools and joining and cutting equipment required to complete specialised maintenance and repair tasks.
P2 describe the function of specialist tools, joining, cutting equipment, fasteners and finishes		
P3 safely use selected specialist tools, joining, cutting equipment, test equipment, fasteners and finishes for given situations [SM, EP]	**M2** compare the use of selected specialist tools, equipment and processes for given situations	
P4 safely set up and install replacement components in selected specialist tools, joining and cutting equipment		
P5 using manufacturers' guidance safely carry out specialised maintenance and repair tasks on given land-based equipment [TW]	**M3** discuss the need for specialist tools and equipment to carry out a range of identified tasks and processes	
P6 identify the need for specialised maintenance and repair tasks on given land-based equipment		
P7 explain the care and storage for selected specialist tools, equipment and materials [IE]	**M4** discuss the importance of correct care and maintenance of specialist tools and equipment.	
P8 discuss the importance of correct care and storage of selected specialist tools, equipment and materials.		

PLTS: This summary references where applicable in the pass criteria, in the square brackets, the elements of the personal, learning and thinking skills. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical and written assessments, visits to suitable industrial maintenance workshops and will link to work related experience placements.

Before undertaking instruction and skills practise for this unit, it is expected that learners will have already developed a significant amount of basic workshop skills and are proficient at completing routine maintenance and repair tasks. This unit is designed to build on those experiences and introduce a higher level of technical equipment, tools and processes that are becoming the norm in land-based workshop practices.

Where possible tutors should integrate the assessment criteria into delivery strategies to motivate and enthuse learners and enable tasks to be undertaken as 'non simulated' and encourage learners to work to a high standard at all times.

It is important that, due to the high level of potential hazards and risks when working in a maintenance workshop environment, learners are supervised closely, encouraged to follow safe working practices at all times and assess hazard and risks prior to undertaking any practical tasks.

Learning outcome 1 looks at the more advanced hand tools, measuring equipment and joining processes. Learners will develop an understanding of what tools and equipment are available to carry out engine and overhaul procedures and component fabrication to a high degree of accuracy and tolerance.

Learning outcome 2 requires learners to develop skills in, and understanding of, specialist tool and equipment selection and use. Learners will develop an understanding of the need for initial installation, calibration and set up procedures before using existing or new equipment and processes.

In learning outcome 3 learners will develop their existing skills to enable them to carry out specialised tasks on land-based equipment to manufacturers' recommended procedures, measurements and tolerances. Learners will be encouraged to select appropriate specialist tools, equipment and processes to enable tasks to be carried out safely, accurately and efficiently. Where more than one type of equipment or process is acceptable, learners will be able to evaluate alternatives and justify their choices.

Learning outcome 4 looks at the importance of specialist tool and equipment maintenance and care. Learners will identify the need for specialist tool re-adjustment for accuracy, replacement of worn components and user safety. Learners will also develop an understanding for tool and equipment storage, security and safe transport to ensure tools and equipment are available and useable for future tasks. Learners should also understand the consequences of incorrect care and maintenance.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives **an indication of the volume of learning it would take the average learner** to achieve the learning outcomes. It is **indicative and is one way of achieving the credit value**.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction and overview of the unit.
Assignment 1 Specialist Tool Selection and Function (P1, P2, M1, D1) Tutor introduces assignment brief.
Discuss specialist tool range, identify examples related to tasks.
Discuss specialist measuring equipment, identify and relate to tasks.
Discuss specialist processes (joining and finishing) and relate to tasks.
Assignment 2 Specialist Tools and Equipment Use (P3, P4, M2) Tutor introduces assignment brief.
Carry out a variety of specialist tool and process tasks to familiarise learners with equipment.
Visits to industrial premises to observe specialist engine re-building, transmission unit overhaul.
Visits to industrial premises to observe specialist fabrication and manufacturing processes.
Assignment 3 Specialist Repair Tasks and Processes (P5, P6, M3) Tutor introduces assignment brief.
Carry out specialist maintenance, overhaul and repair processes using specialist tools, equipment and processes.
Review assignments 1 and 2.
Assignment 4 Care and Storage of Tools (P7, P8, M4) Tutor introduces assignment brief.
Discuss tool and equipment maintenance and storage requirements.
Carry out tool and equipment maintenance and storage procedures.
Review assignments 3 and 4.
Unit review.

Assessment

For P1 and P2, learners must select and describe items of specialist tools, joining and cutting equipment, fasteners and finishes for given situations. Situations must include repair, fabrication, maintenance joining and fastening processes. Evidence could be taken from practically presented examples or illustrations. If orally assessed, the tutor must record evidence in a suitable format to justify achievement.

For P3 and P4, learners need to demonstrate the safe use of a range of specialist tools and equipment and install replacement components. Not all the tools and equipment listed for learning outcome 1 need to be demonstrated but at least two specialist measuring tools, two joining techniques and two fastening processes should be covered.

For P5 and P6, learners are required to carry out a range of specialist maintenance, repair, fabrication and repair tasks and identify the need for these tasks. One task from each area outlined above should give a fair representation of specialised task requirements. The tutor should negotiate with learners suitable tasks to cover the criteria and agree the processes to be used. Evidence for P3, P4, P5 and P6 could be practical observation and a portfolio recording details of all tasks carried out, processes used and job card production. Photographic evidence may be used to enhance portfolio content.

For P7 and P8, learners are required to provide information on the maintenance and care of a range of specialist tools and equipment. This may be evidenced orally but evidence must be recorded by the tutor in an appropriate format.

For M1, learners are expected to install specialist tools and equipment safely, including setting up and calibration where necessary. Evidence will be direct observation of procedures recorded in an appropriate format. The range of equipment will include measuring tools, joining and cutting equipment.

For M2 and M3, learners will provide information on the comparison of specialist tools and equipment to carry out a range of identified tasks and processes. Needs should be identified from schedules of work outlined in manufacturers' workshop manuals or from planning sheets when fabricating or joining components. A presentation or oral evidence during practical activities could be included as part of the portfolio evidence for P3.

For M4, learners will discuss the importance of correct care and maintenance of specialist tools and equipment. Written evidence explaining the importance of correct care and maintenance could be added to evidence already included in the portfolio.

For D1, learners must evaluate the processes involved with setting up tools and equipment for maintenance and repair tasks. Evidence could be in the form of a presentation or workshop report.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, M1, D1	Specialist Tool Selection and Function.	A newly established land-based maintenance and repair workshop is to be equipped with a range of specialist tools and equipment to enable specialist maintenance and repair processes to be undertaken. A range of required equipment needs to be identified and its purpose explained.	Practical observation and assessment. Workshop report.
P3, P4, M2	Specialist Tools and Equipment Use	Establish tools and equipment are fit for purpose, safe and accurate. Test tools and equipment use in simulated circumstances and prepare as required. Evaluate installation and set-up processes.	Practical observations. Verbal discussions. Written evaluations.
P5, P6, M3	Specialist Repair Tasks and Processes	Carry out specialised maintenance, repair and fabrication tasks using specialist tools and processes.	Portfolio of evidence covering practical tasks. Written evidence supporting the selection and need for specialist tools and processes. Written comparisons of tools and processes available to carry out tasks.

Criteria covered	Assignment title	Scenario	Assessment method
P7, P8, M4	Care and Storage of Tools	Identify pre-storage maintenance and component replacement for selected specialist tools and equipment. Suggest safe transport and storage solutions to ensure security and condition.	Written report on maintenance requirements for an identified range of specialist tools and equipment.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC land-based sector suite. This unit has particular links with:

Level 2	Level 3
Introduction to Land-based Workshop Practice	Undertaking Land-based Workshop Practice

Essential resources

A safe, well-equipped maintenance workshop facility is required including suitable storage facilities for specialist tools and equipment, enabling a range of work processes to be carried out on land-based machines and equipment.

A range of specialist tools, fabrication and joining process equipment commonly used on land-based equipment will be needed.

Learners will need access to a selection of land-based power units and machines requiring specialised maintenance and repair.

Employer engagement and vocational contexts

Centres should be encouraged to develop links with contractors, dealers and farmers to allow on-site visits for observe of specialised maintenance and repair procedures. Learners should be encouraged to maintain links with suitable businesses to allow for work experience and practise in specialised tasks that may not arise in their learning environment.

Learners will need access to manufacturers' websites and workshop repair manuals to research task procedures and processes.

Indicative reading for learners

Textbooks

Bell B – *Farm Workshop, 2nd Edition* (Farming Press, 1992) ISBN 0852362374

Farmers Weekly – *Farm Workshop and Maintenance* (HarperCollins Publishers 1984) ISBN 0246120193

Pearce A – *Farm Welding, 2nd Edition* (Old Pond Publishing Press, 2006) ISBN1905523300

Pearce A – *Farm and Workshop Welding* (Old Pond Publishing Press, 2007) ISBN 1905523300

Journals

Profi International

Farmers Weekly

Farm Ideas

Websites

www.hsegov.uk	Health and Safety Executive
www.twi.co.uk	The Welding Institute

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	explaining care and storage of tools and equipment
Creative thinkers	identifying and selecting appropriate tools and processes
Team workers	using manufacturers' guidance information
Self-managers	using tools and equipment safely
Effective participators	carrying out practical tasks

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	enquiring about work experience opportunities
Creative thinkers	deciding on appropriate work processes
Team workers	organising site visits

Functional Skills – Level 2

Skill	When learners are ...
ICT – Use ICT systems	
Select, interact with and use ICT systems independently for a complex task to meet a variety of needs	researching manufacturers' recommendations for maintenance and repair procedures researching specialist tool suppliers and tools specifications
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	
Manage information storage to enable efficient retrieval	producing a portfolio of practical work
Follow and understand the need for safety and security practices	
Troubleshoot	
ICT – Find and select information	
Select and use a variety of sources of information independently for a complex task	following manufacturers' recommended maintenance and repair procedures
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: • text and tables • images • numbers • records	recording engine and component wear tolerances
Bring together information to suit content and purpose	
Present information in ways that are fit for purpose and audience	
Evaluate the selection and use of ICT tools and facilities used to present information	
Select and use ICT to communicate and exchange information safely, responsibly and effectively including storage of messages and contact lists	

Skill	When learners are ...
Mathematics	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	
Identify the situation or problem and the mathematical methods needed to tackle it	using measuring equipment to determine component wear
Select and apply a range of skills to find solutions	determining if component wear is within manufacturers' acceptable tolerances
Use appropriate checking procedures and evaluate their effectiveness at each stage	
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	
Draw conclusions and provide mathematical justifications	
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	producing written evidence to support portfolio documentation, identifying practical work tasks and procedures.