

Unit 24: Land-based Workshop Practices

Delivery guidance

'Unit 24: Land-based Workshop Practices' is designed to develop learners' skills and knowledge in and around the workshop. It is essential that learners are well equipped in order to be able to carry out repairs and ensure that machines are in good running order. This unit will aid the development of learners understanding facilities, as well as recognition of tools needed to carry out repairs and maintenance in the workshop.

Completing this unit will enable learners to be equipped with the skills and knowledge necessary in order to progress to employment in the sector or onto further study via an apprenticeship, e.g. land-based engineering, or via a higher education course such as agriculture.

Approaching the unit

Unit 24: Land-based Workshop Practices' covers a range of skills required for learners to be able to work in a workshop setting. The unit relies heavily on practical skills development and has an emphasis on preparing learners for employment. Learners wishing to pursue a career in an engineering-based or a workshop setting will use the skills and knowledge gained from this unit. Access to a workshop equipped with a range of tools and equipment, as well as welding and cutting materials, forms a fundamental part of this unit.

Learners will develop their skills through practical task completion and these will be supported by taught sessions as well as having access to real-life work experience. Learners should be encouraged to take advantage of any work placements available to support their learning and add value to the content of this unit.

It would be beneficial for learners to have access to a virtual learning environment (VLE) for information relevant to the topics studied in this unit. Resources such as worksheets, web links to external manufacturers, videos and extension tasks should be made readily available to learners to allow them the opportunity to develop their knowledge outside of the classroom or workshop environment.

The opportunity to undertake a series of visits would enhance the delivery of this unit. Local businesses such as a machinery manufacturer, fabricator or even an engineering setting would give learners an insight into the possible future employment opportunities available, as well as providing a more in-depth understanding of the unit content.

Delivering the learning aims

Learning aim A

Learning aim A focuses on the environment and resources needed to be able to work effectively and carry out repair and maintenance tasks in a workshop. It also looks at the common types of materials likely to be found within a workshop setting and those that learners may be working with in future. Legislation and safe working practices are also covered in this learning aim. It will allow for development of knowledge from other units, for example, *Unit 23: Land-based Machinery Operations* and apply this in a workshop context.

Learning aim B

Learning aim B explores the use of workshop tools and equipment with an emphasis on the safe and correct usage. This ensures that learners are familiar with both powered tools, non-powered tools and welding and cutting equipment. These include a selection of handheld tools such as a hammer and chisel, as well as powered tools such as a grinder or drill.

A range of welding procedures is also covered, including electrical and gas, and this includes the techniques applied while welding and the storage of gas. It also deals with the safety aspect of the use of tools and covers safety switches and personal protective equipment (PPE).

Learning aim C

Learning aim C is a more practical-based learning aim and will enable learners to practise carrying out workshop maintenance and repair tasks. These will include servicing machines and the use of the machine manual and any online support from manufacturers, as well as some computer diagnostic methods.

The repair tasks will allow learners to develop skills in selecting the necessary tools and equipment for the job, such as hammers, wrenches and spanners, as well as grinders and drills. Learners will also be actively involved in organising and checking their work to ensure that it is all completed to a high standard and complies with all the necessary health and safety legislation. This will also include an awareness and understanding of good environmental and sustainable practice in relation to the disposal of waste oil, grease and paper.



Assessment model (in internally assessed units)

Learning aim	Key content areas	Recommended assessment approach
A Investigate the requirements for a land-based workshop used for the maintenance and repair of machinery and equipment	A1 Workshop environment and materials A2 Workshop tools and equipment – fixed and portable A3 Laws/Legislation and codes of practice	A report or presentation on resource and legislative requirements for a land-based workshop used for maintenance and repair
B Use workshop tools and equipment to complete a preparation task	B1 Safe and correct use of tools B2 Correct tool maintenance and storage	A portfolio of evidence, to include: <ul style="list-style-type: none"> • correct use of tools and equipment in preparation for carrying out maintenance and repair of machinery, including cleaning and storage, for given tasks • use of workshop tools and equipment to maintain and repair machinery, meeting maintenance schedules, according to operator manual guidelines and required standards
C Carry out workshop maintenance and repair of land-based machinery to meet maintenance schedules	C1 Use of operator manuals for machinery to be repaired and maintained C2 Selection and use of appropriate tools and equipment C3 Organising and checking work	

Assessment guidance

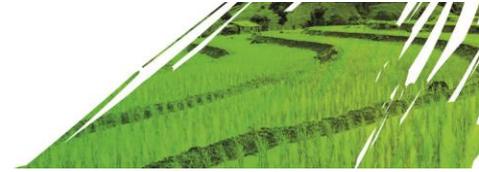
For learning aim A, the assessment evidence is to be presented in either a report or suitable presentation. This will cover the resources needed for a land-based workshop and include detail on how the environment of a workshop should be designed to have better lighting, access, utilities (such as a sink or air compressor) and operator comfort. The assessment will also need to cover how the workbenches and workstations are set out, as well as storage for materials and location of tools and equipment.

Tutors should provide guidance on the design and layout of a workshop setting in order to best assist learners with their work. Independent research and taking notes will also help with this assessment. The report should be structured in such a way that it encompasses the underpinning theory and covers the unit content for this learning aim.

For learning aims B and C, the assessment evidence is to be collated through the production of a portfolio of evidence. It is likely that most centres will deliver learning aims B and C alongside each other. Learning aim B concentrates on the correct use of tools in the preparation for carrying out a maintenance task, while learning aim C covers the use of the tools to carry out a repair task. Learning aim C also assesses the learners' understanding of meeting maintenance schedules and use of manufacturers' operator guidelines. Evidence for both of these learning aims could be in the form of a job record, designed by the centre, which is

completed for each task. A range of these will need to be completed for a comprehensive portfolio and tutors will need to ensure that learners can successfully complete a wide range of these tasks. This will allow for the inclusion of simple and complex tasks to be undertaken.

The portfolio of evidence can be further supported by including the relevant pages of a manufacturer's operating manual or by including annotated diagrams and pictorial evidence to increase the range of evidence presented. It may also be possible for centres to include video evidence of learners carrying out maintenance and repair tasks.



Getting started

This provides you with a starting place for one way of delivering the unit, based around the recommended assessment approach in the specification.

Unit 24: Land-based Workshop Practices

Introduction

This unit will develop learners' skills and knowledge in understanding the requirements of a land-based workshop before learning how to use the resource for undertaking maintenance and repair tasks. There are theoretical and practical aspects to this unit and involvement from local businesses and employers by way of:

- visits to local manufacturers, workshops and fabrication plants
- development of skills through relevant work placements
- guest speakers
- relevant tutor knowledge to enhance and contribute to the delivery of the unit
- reading material such as journals and magazines, which give industry updates and technical input
- mentoring and support.

Learning aim A – Investigate the requirements for a land-based workshop used for the maintenance and repair of machinery and equipment

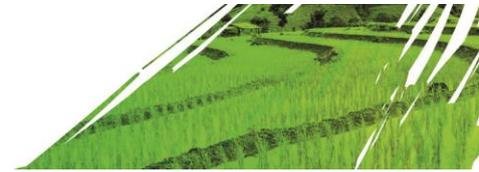
Introducing the unit. Learning aim A should take place at the start of delivery of the unit and can be done in a practical manner, possibly linking to an induction of the workshop area where the remainder of the unit will be taught. An assessment of learners' prior knowledge or experience can be conducted at the same time to establish the levels of experience that they may already have.

- For learning aim A1, learners could draw to scale a bird's eye view of the current facilities at the centre, marking on their plan any:
 - access routes and emergency exits
 - washing facilities, first-aid facilities, toilets
 - locations of fixed and portable tools and equipment
 - storage for tools, materials and equipment
 - waste disposal facilities.

They can then compare their plans with the person next to them, suggesting any improvements, before feeding back to the class.

- Learners could also carry out experiments with different materials to gain an understanding of their use in maintenance and repair. This may involve looking at the different properties of the materials. For example, through supervised activities, learners could look at how malleable materials are by hitting them with different forces.
- Learners could also apply different treatments to materials, such as looking at the effects of anti-rusting agents and metallic paint, in order to help them to understand how materials corrode. Tutors could facilitate a discussion to also explain how lubricants are used for drilling and cutting, and for gearboxes, chains and drive systems. Explain how this knowledge is important when maintaining and repairing different types of machinery and equipment.
- Tutors could bring a selection of materials into the workshop (e.g. steel, cast iron, aluminium and metallic/non-metallic) and ask learners to identify each one, and then suggest a use for them in a land-based setting.

- For learning aim A2, learners could form into pairs to create a list or spider diagram of the equipment and tools required for a land-based workshop. This can include three categories: fixed, portable and welding (and associated cutting) equipment.
- Learners could work in small groups with the tutor dividing up a list of the portable and fixed tools among each group. Learners could then create a safe working guide for the piece of equipment they have been given, which can be shared with the rest of the group.
- Tutors could demonstrate the safe and correct way of using the tools in the workshop. This could be delivered as part of an induction programme into the workshop and could then be followed by a knowledge quiz to assess how much information has been retained.
- Tutors could give learners access to a virtual welder in order to improve the confidence of those learners who may have less experience. Different settings can be used and tutors can ensure tracking of learner progress on different tasks to allow for some preparation before they attempt welding.
- For learning aim A3, learners could identify where possible hazards and risks are within the workshop environment, e.g. slips and trips that may occur within the setting. Learners can then annotate these hazards on their plans. To develop this further, they could include any remedial action that can be undertaken to reduce the risks identified.
- Learners could create a factsheet on each of the legislation and codes of practice they will need to comply with in a land-based workshop setting.
- As part of a practical session, learners could complete a detailed risk assessment for a range of tasks they will be covering in the unit.
- Tutors could give learners a range of powered and non-powered tools and ask them to create a checklist. This must be completed prior to the use of these tools to check that all equipment is safe and fit for use. This could form part of a safety check.
- Tutors would need to induct learners in relation to each piece of equipment that they will be using, and guidance is needed from tutors to ensure that all learners have had instruction on the use of these tools.
- Learners can complete an exercise in identifying a range of tools they will be using. This can then be developed to include what range of jobs these tools are likely to be used for.
- Learners could produce a protocol for the removal and disposal of waste products out of the workshop, e.g. oil, grease and paper, and give consideration to an environmentally and sustainable method of disposal.
- Summative assessment of this learning aim is recommended to be through a report or presentation. This could include diagrams, lists of equipment, common materials likely to be found in a workshop, as well as detail on the relevant legislation. As a guide, approximately 10 hours of teaching time could be allocated to this learning aim. There will be an expectation that learners will need at least 5 hours of independent study and assignment preparation time.



Learning aim B – Use workshop tools and equipment to complete a preparation task

This learning aim concentrates on the use of tools and equipment in a workshop setting to complete set tasks. Learners will need access to a range of operator manuals and a range of tools and equipment.

For learning aims B1 and B2, learners are to focus on the safe, correct use of tools and the correct maintenance and storage of these tools. They should be encouraged to locate the correct manufacturer's manual when preparing a given task and to note details of this in their record of work.

- Tutors should give instruction on the use and placing of safety guards on the range of tools learners will be expected to use. This should include on/off switches, isolation switches and circuit breakers.
- Learners could form into pairs when using a range of tools and equipment and could use peer tutoring to foster and develop skills between peers. They can then assess each other on how well the tools have been used for the given tasks, and provide feedback so that they can improve in later practical sessions.
- Tutors should give learners explicit instruction and guidance on the use of welding and cutting equipment. This can be done through tutor-led practical demonstrations and placing learners into small groups. This will ensure that the safety aspect of this equipment has been covered.
- Learners could annotate a drawing of a person wearing appropriate personal protective equipment (PPE) and then give reasons as to why this protective equipment is needed, as well as outlining the dangers of not wearing PPE.
- Tutors could show a range of safety videos; these can be from *YouTube* or other similar resource, highlighting the need for correct use of equipment within a workshop setting. Learners could take notes from these videos and this could promote a useful discussion within the group.
- Learners could produce a list of 'do's and don'ts' that can be displayed in the workshop. These lists could outline the correct way to clean and store tools after their use.
- Tutors could invite a health and safety representative to come into the centre to deliver a session on workshop safety. This could be used to further develop the delivery of health and safety given by the tutor.
- Learners could create and deliver a presentation on the correct methods of maintaining tools, which will promote their use and develop the learners' understanding of the topic. This could then be delivered to a group of peers and incorporated into their portfolio as evidence.
- Learners could produce a chart for use in the workshop that shows the frequency and different intervals that tools and equipment have for maintenance and calibration (e.g. torque wrenches and compressors).
- Learners could create a quiz to test their peers on the problems caused by incorrect storage of tools and equipment, taking into account factors such as temperature, humidity, damp and rust.
- Summative assessment for this learning aim is recommended through the production of a portfolio of evidence. This may contain tool list, detailed work or job cards (outlining the work undertaken in the workshop) and pictorial evidence of tool storage. As a guide, around 25 hours of teaching time and a further 7.5 hours of self-study and assignment preparation time should be allocated to this learning aim.

Learning aim C – Carry out workshop maintenance and repair of land-based machinery to meet maintenance schedules

This learning aim is very much a practical-based learning aim and it is likely to be delivered alongside learning aim B.

- For learning aim C1, learners could be asked to look at a service interval chart for a given machine and interpret what the requirements are, e.g. the frequency of servicing, number of hours/miles.
- Learners could put together a calendar of service requirements for a range of machinery at the centre. They could also collate information relating to:
 - model number
 - date of registration
 - year of manufacture.
- Tutors could give learners access to a range of resources, e.g. manufacturer's manuals and online manuals, as well as online support and diagnostic tools to develop learners' knowledge in identifying solutions.
- Learners could also take part in activities that require them to review a range of scenarios in order to identify (through the use of the resources listed above) a solution. This will allow them to develop their knowledge regarding how to use the resources as well as their problem-solving skills.
- Learners could be given some basic details about a machine and are tasked with finding out more specific details, e.g. year of manufacture, model number and registration date. They can then share the knowledge with others in the group.
- Learners could annotate a picture diagram similar to those found in manufacturer's manuals and interpret the information displayed. They must then describe how this is relevant to repair and maintenance tasks to the rest of the class.
- For learning aim C2, learners could complete an exercise where they are to select the appropriate tools for certain jobs such as the use of a ring spanner, adjustable spanner or open-ended spanner. They could then verbally provide reasons for their selection, justifying their choices to their peers and/or tutor.
- Learners could undertake the servicing of machines in a practical session. Some tutor guidance and supervision may be needed for those who are less confident. Learners could carry out the service, then update the servicing records and identify when the next service is needed. This evidence can then be recorded by the learners towards the completion of their practical portfolio for their summative assessment.
- Tutors could set up several scenarios, and allocate one to learners in small groups. They can be asked to check if these are safe to be used, e.g. the placing of an axle stand, bottle jack or hoist. Learners could provide reasons to support their answers, and this could further develop their understanding of health and safety.
- Learners could be given the opportunity to phone a supplier for the purpose of either asking for technical support or ordering a necessary part. This would mirror real-life experience, which the learners may well come across as part of employment.
- Learners could be given a selection of materials for joining purposes and they then have to select the best material for the job, e.g. steel for welding, rubber for gluing and mild steel for riveting. Learners can then justify their choices to the tutor.
- For learning aim C3, to assist with the organisation of their work, learners could form into pairs to produce a checklist of the order of operations for a repair or maintenance task, i.e. selection, layout, access, storage and waste collection and disposal. This will take into



consideration the most logical way of completing the task.

- Learners could create and deliver a presentation on the importance of organising and checking work. This can be presented to a workshop manager and form part of the assessment for the unit.
- Following the completion of a task, learners could peer assess others' work. This could be done whereby learners give each other written feedback that can then be verified by the tutor.
- Learners could complete an inventory for the workshop that they are using. This could then be updated on a regular basis and any items low on stock could be given to a tutor or workshop manager to reorder.
- Summative assessment for this learning aim is recommended through the production of a portfolio of evidence. This will likely contain annotated diagrams, details of maintenance and repair tasks carried out, evidence of tool selection and pictorial evidence from operator manuals linked to repair or maintenance tasks carried out. As a guide, around 25 hours of teaching time and a further 7.5 hours of self-study and assignment preparation time should be allocated to this learning aim.

Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

This unit links to:

- Unit 1: Plant and Soil Science
- Unit 4: Developing a Land-based Enterprise
- Unit 23: Land-based Machinery Operations
- Unit 12: International Sheep Production

Resources

In addition to the resources listed below, publishers are likely to produce Pearson- endorsed textbooks that support this unit of the BTEC Internationals in Agriculture/Horticulture/Land-based subjects. Check the Pearson website (<http://qualifications.pearson.com/endorsed-resources>) for more information as titles achieve endorsement

Textbooks

Bell B, *Farm Machinery* (5th Edition), Old Pond Publishing, Sheffield, 2005 ISBN 9781903366684 – This book gives learners an insight into a wide range of land- based machinery

Culpin C, *Farm Machinery* (10th Edition), Hesperides Publishing, Hong Kong, 2008 ISBN 9781443703017 – This book is an ideal starter point for those involved in working with, and maintaining, land-based machinery

Whipp J and Brooks R, *Transmission, Chassis and Related Systems* (3rd Edition), Thomson Learning, 2001 ISBN 9781861528063 – This is a useful book relating to chassis and transmission systems, covering a wide range of those found in land- based workshops

Journals

Farm Machinery Journal (Sundial Magazines) – Agricultural machinery – a detailed and in-depth look at modern technological developments in agricultural machinery

Websites

'The Institution of Agricultural Engineers (IAgrE)' – a professional members' organisation ideal for anyone working within a land-based workshop or engineering setting

'HowStuffWorks.com' – a website with interactive videos on the integral workings of a large range of machines and machine parts

'Health and Safety Executive (HSE)' – a website dedicated to the Health and Safety Executive organisation with the latest publications and guidelines for keeping safe

Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling learners to access them through the school/college intranet.