

Unit 26: Undertaking Land-based Workshop Practice

Unit code:	M/600/9631
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

This unit aims to introduce learners to 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

The practical application of workshop skills plays a vital part in land-based business operations used in a safe and efficient manner, these skills contribute greatly to the wellbeing of successful organisations and individuals. Workshop activities include both repair and servicing work, and also the fabrication of new and re-fabrication of worn out or damaged components. The ability to return a broken machine to optimum working condition with minimum of down time and costs is a highly sought after skill by employers in the land-based industries.

The scale and complexity of jobs undertaken in land-based workshops will depend on their size, level of tools and equipment available, the skill level of employees, and the type of work the organisation is involved in. However, there are basic principles that underpin any workshop activity. Foremost of these is the health, safety and wellbeing of employees, employers, visitors to and customers of the organisation.

Building on basic principles, this unit aims to heighten learners awareness of the application of safe working practices and the benefits of compliance with current and relevant legislation. The application and use of hand tools and joining and cutting equipment will be developed as routine and non-routine repair and maintenance tasks are undertaken. The properties of materials used in land-based equipment will be introduced enabling correct selection, especially where welding and cutting operations are to be performed, enabling learners to complete economic and effective repairs.

Learners will be expected to locate and use a range of information sources including standards organisations, operator and workshop manuals, maintenance and adjustment schedules and to understand the importance of working to specifications where stated. Generally, workshop tidiness and the need to maintain a clean and uncluttered working environment will be embedded as supervised practical work is undertaken in either simulated or commercial workshop conditions.

Learning outcomes

On completion of this unit a learner should:

- 1 Know the importance of health and safety and safe working practices within a workshop environment
- 2 Be able to use hand tools, joining and cutting equipment commonly found in land-based maintenance workshops
- 3 Understand selection and use of materials suitable for purpose
- 4 Be able to maintain, replace or repair worn or broken components in a land-based situation.

Unit content

1 Know the importance of health and safety and safe working practices within a workshop environment

Legal requirements related to workshop situations: current relevant legislation eg Health and Safety at Work Act 1974 (HASAW), Control of Substance Hazardous to Health (COSHH) Regulations 1988, Provision and Use of Work Equipment Regulations (PUWER) 1998, Management Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 1995; implications for workshop operations (compliance); risk assessment; personal protective equipment (PPE); organisational and individual responsibilities and rights; personal cleaning and hygiene facilities; first aid facilities; hazards eg fire, faulty equipment, unsafe storage, unguarded machinery, poisons, unsafe lifting, blocked emergency exits; reporting procedures; work area cleanliness

2 Be able to use hand tools, joining and cutting equipment commonly found in land-based maintenance workshops

Selection, identification and safe use of common powered and non-powered hand tools: non-powered eg hammers, hacksaws, files, spanners, wrenches, measuring devices, screwdrivers, scribes; powered eg drills, grinders, polishers, cutters; appropriate maintenance of tools; correct use of hand tools; safe methods of use; tool storage; tool transportation; health and safety

Selection, identification and safe use of joining equipment: welding plant eg manual metal arc (MMA), metal inert gas (MIG), metal active gas (MAG), spot, oxy-acetylene; other thermal joining eg brazing, silver soldering, soldering; non-thermal joining eg threads, rivets, adhesives; appropriate maintenance of equipment; correct use of equipment; safe methods of use; equipment storage (where relevant); health and safety

3 Understand selection and use of materials suitable for purpose

Use of various materials: metallic eg ferrous, non-ferrous, alloys; non-metallic eg thermo-setting, thermo-plastic, rubber, wood; selection, identification and correct use of materials; properties of materials; characteristics of materials

4 Be able to maintain, replace or repair worn or broken components in a land-based situation

Repair situation: worn or broken components eg weighing equipment, cattle crush, plough; meeting job instructions; component specification; fitness for purpose (tools, equipment); correct waste disposal; quality control; testing procedure; inspection; reporting unsolved repair jobs

Techniques: eg drilling, sawing, tightening, measuring, polishing, welding, joining, gluing; lubrication requirements eg grease, oil, 'anti rust' agents; service and maintenance schedules; manufacturers' handbooks; health and safety; cleaning materials; finish; efficiency; agreed timeframes

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 potential hazards in a land –based maintenance workshop [IE, RL, SM, EP]	M1 analyse the results of a hazard spotting exercise	D1 compile an organisational risk assessment document for a repair activity in an identified workshop
P2 state the range of legislation and/or codes of practice that apply to given workshop operations [IE, RL, SM, EP]		
P3 state reasons for the need to follow legislation and safe working practices in the workshop environment [CT, RL, SM]		
P4 identify a range of hand tools and joining and cutting equipment used in land-based maintenance workshops and state their purpose [IE, TW, RL, SM, EP]	M2 report on a range of practical activities undertaken using industry standard/ organisational documentation	
P5 safely use a given range of hand tools and joining and cutting equipment [TW, SM, EP]		
P6 demonstrate safe and correct maintenance procedures for a given range of hand tools and joining and cutting equipment [TW, SM, EP]		

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:
P7 identify a range of materials commonly used for the repair of land-based equipment [IT, CT, SM, EP]	M3 illustrate the range of materials used for the construction of a land-based machinery. Compare the use of selected materials for given repair situations [CT, RL, SM]	D2 evaluate the effectiveness of equipment used, materials selected and repairs carried out to land-based machinery.
P8 justify the selection of material(s) to meet given repair objectives [CT, RL, TW]		
P9 compare the use of selected materials for given repair situations [CT, RL, SM]		
P10 inspect a selected land-based machine to identify the need for safe repair or replacement of identified worn or damaged components [IE, TW, SM, EP]		
P11 prepare tools and materials and safely repair or replace worn or damaged land-based equipment components to meet given specifications [RL, TW, SM, EP]		
P12 make recommendations for possible changes to repair and component replacement procedures carried out on a selected land-based machine. [CT, SM, EP]		

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 CT – creative thinkers	RL – reflective learners TW – team workers	SM – self-managers EP – effective participators
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Essential guidance for tutors

Delivery

Delivery of this unit will involve practical and written assessments, visits to suitable collections and will link to industrial experience placements. It is likely to include a mixture of classroom learning and supervised practical sessions in a workshop. Assessment is likely to be in the form of a portfolio of relevant evidence collecting together recorded and authenticated documents and images.

Tutors have the opportunity to use as wide a range of techniques as possible. Lectures, discussions, seminar presentations, site visits, supervised land-based workshop practicals, internet and library-research and the use of personal and/or industrial experience would all be suitable.

Work placements should be monitored regularly in order to ensure the quality of the learning experience. It would be beneficial if learners and supervisors were to be made aware of the requirements of this unit before any work-related activities, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to contribute to the maintenance or repair of land-based machinery and installations and they should be encouraged to ask for observation records and/or witness statements to be provided as evidence. Guidance on the use of observation records and witness statements is provided on the Edexcel website.

Whichever delivery methods are used, it is essential that tutors stress the importance of the principles and application of health and safety legislation and guidance, good workshop practice, environmental protection issues and the need to manage the resource using legal methods. Although specifically stated in learning outcome 1, these principles should be embedded in all stages of delivery and throughout all learning activities. Tutors must consider the safety of those working in or coming into contact with the machinery and equipment to be maintained and/or repaired. Risk assessments must be undertaken before practical activities. Tutors should not ask learners to undertake tasks that are beyond their physical capabilities. As learners develop their skills, tutors should encourage them to identify and remedy faults in real situations, selecting and using necessary tools and equipment under supervision.

Tutors should consider integrating the delivery, private study and assessment relating to this unit with any other relevant units and assessment instruments learners may also be taking as part of their programme of study.

Learning outcome 1 is likely to be delivered using formal lectures, discussion, supervised land-based workshop practicals and independent learner research. Learners will develop their awareness of the health and safety requirements of working in land-based workshops. Learners should be able to differentiate between 'hazard' and 'risk' and identify and apply the controls or precautions that can be used to limit and control them. Visiting expert speakers could add to the relevance of the subject for learners. For example, a safety adviser or environmental officer could talk about their work and the implications on relevant land-based industries. Tutors should maintain a current knowledge of legislation and ensure that all practical work is carried out safely and legally. Learners are not expected to state the exact provisions of various Acts of Parliament or statutory instruments. However, they should know where and how relevant legislation affects them whilst carrying out practical tasks in the centre and the workplace.

Learning outcome 2 is likely to be delivered using formal lecture, discussion, supervised land-based workshop practicals and independent learner research. Learners will develop proficiency in the use of common types of hand and power tools found in most workshop situations. Learners will cover the safe and correct application of these tools and the maintenance and storage requirements that ensure their continued efficiency and safe operation. The unit seeks to develop a sense of 'good working practice' wherever tools are used, to control costs and prevent injury to users or damage to machinery. Visiting expert speakers could add to the relevance of the subject for learners. For example, a mechanic working with land-based machinery could talk about their

work and the tools they use to maintain and repair appropriate machinery.

Learning outcome 3 is likely to be delivered through guided experimentation with and investigation of materials. Definition of the range of materials commonly used in the construction of land-based machinery and equipment will provide a foundation for the selection of material to be used in repair situations. Workshop tests to define material characteristics and suitability should be reinforced with formal lectures and discussion. Visits to original equipment (OE) manufacturers will provide an insight into the rationale for material choice and support the need to use suitable repair materials and processes to maintain the integrity of machinery and the effectiveness of repairs.

Learning outcome 4 is likely to be delivered using formal lectures, discussion, supervised land-based workshop practicals and independent learner research. Learners will apply organisational health and safety procedures, whilst working in land-based workshops, when maintaining and/or repairing land-based machinery and equipment. Learners must be encouraged to refer to service and maintenance schedules to undertake routine and non-routine tasks. Learning outcome 4 is an opportunity for tutors to help learners apply and embed the skills and knowledge covered in learning outcomes 1, 2 and 3, in conducting inspection, repair and maintenance activities on a range of land-based machinery and equipment. The need for the application of good working practices will be reinforced as learners look at typical exercises in machinery inspection, maintenance, repair and reporting. Visiting expert speakers could add to the relevance of the subject for learners as in learning outcomes 1 and 2.

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
Introduce unit and assessment processes.
Assignment 1: Hazard Spotting, Legislation and Compliance (P1, P2, P3, M1, D1)
Review HSAW Act and broad areas of responsibility.
Review risk assessment rationale and techniques.
Practical activity – hazard spotting exercise for assignment 1.
Identification of risks from eg fire, faulty equipment, unsafe storage, unguarded machinery, poisons, blocked emergency exits to all parties and control measures to be applied.
Comparison of RA documentation – compilation recording and storage.
Organisational approaches to RA.
Review COSHH legislation and link to environmental considerations. PPE and hygiene.
Practical activity – workshop substance audit and information sources.
First aid regulations and requirements. RIDDOR. Accident book (possible case study).
Manual handling and safe lifting techniques – demo and skill development activities.
Assignment 2: Portfolio of Practical Activities (P4, P5, P6, M2, D2)
Practical repair activities involving the replacement of components to land-based machines and equipment – preparing and using hand and power tools.
Inspection techniques and recording findings.
Analysis of inspection and economic repair/modification potential.

Topic and suggested assignments/activities and/assessment

Assignment 3: Materials in Repair Activities (P7, P8, P9, M2, M3, D2)

Identify materials used in land-based equipment according to properties.

Characteristic of materials.

Practical activity – workshop tests on materials.

Practical repair and modification activity involving the fabrication and manufacture of components in the range.

Assignment 4: Inspect and Repair an Identified Land-based Machine (P10, P11, P12, M2, D2)

Identify range of machinery available for inspection and repair activity.

Research information source specifications and minimum levels of performance.

Practical activity – inspect identified machine and compile report identifying components for replacement and fabrication/re-fabrication.

Sources of replacement parts, repair materials and consumables.

Practical activity – carry out repairs agreed with supervisor (owner) and report completion (non-completion).

Unit review.

Assessment

To obtain a pass grade, learners must achieve the 12 pass criteria in the assessment and grading criteria grid.

For P1, P2 and P3, assessment could take the form of a hazard spotting exercise for a typical workshop situation. The production of a workshop plan illustrating these hazards, linked to a key identifying the legislation covering the area of work, could be accompanied by a search for organisational/legislative codes of practice showing where and how compliance is met. Tutors should consider the preparation of a work area with both simulated and naturally occurring illustrations of hazards covering the range of legislation in the unit content. Evidence could take the form of an observation and discussion supported by images and search results presented in a portfolio or pictorial presentation using suitable software.

For P4, P5 and P6, learners could be observed carrying out a range of practical workshop activities engaged in the repair and maintenance of land-based machines and equipment. Both naturally occurring and simulated activities should be presented for learners to select and prepare powered and non-powered hand tools for use. Tutors should appraise land-based machines and equipment carefully before learners start work to ensure a full range of information and techniques are covered. Assessment could be observation of individual and or group activity supported by a personal portfolio of evidence to an industry/organisational standard and authenticated job cards or work schedules. If assessed during a placement, witness statements should be provided by a suitable representative and verified by the tutor. Guidance on the use of observation records and witness statements is provided on the Edexcel website.

For P7, P8 and P9, evidence could take the form of a search for and series of workshop tests to determine the properties and characteristics of a range of materials used in workshop repair activities. Tutors could select potential repair or refurbishment situations on land-based machinery and discuss with learners the most suitable materials to make effective repairs or replacements. Tutors should encourage learners to investigate original equipment (OE) material usage so that accurate comparisons can be made between repair and replacement parts and materials. If this format is used suitable evidence from guided activities would be observation records completed by the learner and tutor and accompanied by appropriate work logs or other relevant learner notes.

Evidence for P10, P11 and P12 could be obtained through observation of learners inspecting a piece of land-based machinery or equipment. Through either simulated or naturally occurring failures learners should be able to identify broken or worn out components and prepare the necessary tools, materials and

equipment accurately applying safe and effective techniques to complete repairs, or in some cases report the impracticalities of repair and recommend alternative repair or replacement procedures. Tutors should identify the given objectives which may depend on the specific requirements of the centre at the time of assessment. Where possible, the size and complexity of these should be the same for each learner to ensure fairness of assessment. It should be possible to integrate these assessment criteria with evidence occurring during practical activities for P4–P9. Evidence could take the form of a designed and completed inspection checklist representing the condition of a land-based machine or piece of equipment accurately with highlighted failures and proposals for the sourcing of parts/materials for their repair or replacement.

To achieve a merit grade, the learner must achieve all of the pass grade criteria and the three merit grade criteria.

For M1, learners could use the hazard spotting exercise for P1–P3 and carry out a review of the identified areas and produce an analysis of the effects the unaddressed hazards are likely to pose when operating in the area. Evidence could take the form of a poster campaign or illustrated presentation directing potential users to sources of information (legislative and organisational) regarding the hazards.

For M2, the learners could be directed to record all practical activities undertaken in a portfolio of evidence on authenticated organisational documents such as job cards or work schedules. Reference should be made to tool preparation maintenance and storage for each type of activity, along with references to information sources both legislative and organisational. Tutors should be careful to ensure as comprehensive a coverage of the range of tools and techniques as possible to ensure fairness and equality of assessment and provide or identify tasks commensurate with a Level 3 unit. If assessed during a placement, witness statements should be provided by a suitable representative and verified by the tutor. Guidance on the use of observation records and witness statements is provided on the Edexcel website. This criteria is directly related to the work undertaken for P4–P12.

For M3, learners could undertake a case study of an identified item of land-based machinery or equipment and carry out an audit of the materials used in its construction. Evidence could take the form of an illustrated and referenced report identifying the range of materials used, their properties and characteristics and possible rationale for their application to the chosen machine or piece of equipment. Where possible, the given objectives should be the same for each learner. However, it is appreciated that this may be difficult to organise for larger learner groups, in which case tutors should try to ensure fairness of assessment for all learners.

To achieve a distinction grade the learner must achieve all the pass and all of the merit grade criteria and the two distinction grade criteria.

D1 provides an opportunity to bring together work carried out for P1–P6, P10–P12, M1 and M2 in the compilation and application of industry standard risk assessments. Working with information gathered during hazard spotting activities, practical workshop sessions and machine inspections, learners should be encouraged to apply risk assessment procedures to ensure the management of a safe working environment for themselves, colleagues and visitors to workshop situations. Ultimately, tutors should maintain a current knowledge of legislation and ensure that all practical work is carried out safely. However, learners should be able to demonstrate an understanding of the risk assessment process and relate this to a range of workshop activities. Evidence could take the form of an authenticated risk assessment portfolio for tasks undertaken within the unit showing the steps taken to compile the risk assessments accompanied by a strategy document for their application showing how compliance benefits organisations.

D2 provides an opportunity for learners to reflect on their working practices the tools and equipment used and materials employed in repair activities undertaken for the P4–P6, P10–P12 and M3. Learners could be directed to produce an evaluative report reviewing materials used in the fabrication, strengthening or modification of components for land-based machines or equipment referring to their particular properties and characteristics and comparing with original materials. Tool and workshop equipment inventories could be attached showing what and where particular tool requirements were essential to repair or maintenance operations. Learners could be asked to comment on the effectiveness of their chosen repair strategies and to

illustrate alternative processes or procedures. Where possible, the given objectives should be the same for each learner. However, it is appreciated that this may be difficult to organise for larger learner groups, in which case tutors should try to ensure fairness of assessment for all learners. Evidence for D2 is likely to be diverse and wide ranging in nature, observation and discussion will play a vital role and authenticated records will require careful monitoring for completeness. Illustrated reports and searches will also provide documentary evidence within the portfolio.

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, P3, M1, D1	Hazard Spotting, Legislation and Compliance	Learners to carry out hazard-spotting exercise in simulated or real-life workshop situation. Posters compiled to illustrate applicable legislation. Report on likely outcomes of not complying with legislation.	Observation and discussion. Poster campaign. Annotated report and risk assessment documentation.
P4, P5, P6 M2, D2	Portfolio of Practical Activities	Learners to compile a portfolio of evidence of repair activities. Standard reports (job cards) detailing work carried out and machinery encountered within the range. Evaluation of repairs for effectiveness and machine integrity.	Observation. Portfolio of practical activities.
P7, P8, P9, M2, M3, D2	Materials in Repair Activities	Identification of the range of materials for a given land-based machine. Rationale for use explained and justified. Practical workshop tests carried out on a range of materials to determine suitability for stated repair activities.	Observation. Results of research from a range of manufacturers. Annotated report.
P10, P11, P12, M2, D2	Inspect and Repair an Identified Land-based Machine	Learners to negotiate a subject machine according to interests and availability. Carry out and document results of an inspection identifying remedial work, parts and materials to return the machine to an acceptable standard. Source parts and materials needed and carry out identified repairs. Document and evaluate repair activities.	Observation. Discussion. Annotated report.

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	Element CU28.1 Prepare equipment and machines for maintenance Element CU28.2 Maintain and repair equipment and machines
	Undertaking Specialised Land-based Workshop Practices

Essential resources

Learners will need access to an equipped workshop, welding and gas cutting equipment.

A range of equipment to repair is necessary as well as the consumable items needed for fabrication projects. There must be sufficient resources to give learners the opportunity to develop practical skills over a period of time. It is vital that there is adequate PPE as well as first aid facilities.

Workshop facilities should have the appropriate procedures for storing and disposing of chemicals, paints and waste products in line with legislation.

Tutors delivering this unit should be competent and experienced in the use of workshop tools and machinery maintenance/repair. Ideally they should have recent industrial experience or show evidence of regular contact with the industry and/or technical updating.

Employer engagement and vocational contexts

The unit has a very practical focus and, in this respect, employer engagement will provide the modern context into which workshop skills and employer and manufacturer requirements can be placed.

Good employer links will also help secure a valuable resource for the benefit of learners. Work placement opportunities should be actively sought alongside visits by experienced practitioners to illustrate current equipment, trends and practice in maintenance and repair operations. Learners could be encouraged to develop links with employers and arrange visits and demonstrations.

Indicative reading for learners

Textbooks

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

Pearce A – *Farm Welding, 2nd Edition* (Old Pond Publishing Press, 2006) ISBN 1905523300

Journals

Farm Ideas

PROFI

Websites

www.hse.gov.uk

Health and Safety Executive

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	identifying workshop hazards searching for health and safety legislation researching tools and their uses
Creative thinkers	applying good working practices identifying suitable repair materials recommending repair strategies
Reflective learners	compiling risk assessments using materials carrying out inspections
Team workers	working on land-based machinery and equipment testing materials inspecting machinery
Self-managers	inspecting machinery repairing machinery reporting repairs
Effective participators	using tools and equipment selecting materials presenting findings

● 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	using web based research skills to obtain health and safety information and guidance delivering AV presentations for assessment
Use ICT to effectively plan work and evaluate the effectiveness of the ICT system they have used	planning work processes for particular tasks preparing and submitting work for assessment
Manage information storage to enable efficient retrieval	using electronic storage mediums for planned and completed tasks recording risk assessments for later adaptation and use
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	researching tools and techniques for personal use reviewing tool supplier catalogues and price lists
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	accessing and using welding standards information accessing and using health and safety websites and information
ICT – Develop, present and communicate information	
Enter, develop and format information independently to suit its meaning and purpose including: <ul style="list-style-type: none"> • text and tables • images • numbers • records 	preparing and delivering AV presentations using suitable software recording set up specifications (gas pressures, nozzle size, voltages, amps etc) measuring and recording compliance with standards compiling risk assessments to a pro forma
Bring together information to suit content and purpose	compiling risk assessments to a pro forma preparing and presenting poster information
Present information in ways that are fit for purpose and audience	compiling risk assessments to a pro forma preparing and presenting poster information
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	measuring, marking out, calculating and cutting to tolerances calculating material requirements calculating and applying torque settings and tolerances
Identify the situation or problem and the mathematical methods needed to tackle it	measuring and marking out from a datum point using error reduction techniques
Select and apply a range of skills to find solutions	using tables and standards to work effectively
Use appropriate checking procedures and evaluate their effectiveness at each stage	using tables and standards to work effectively
Interpret and communicate solutions to practical problems in familiar and unfamiliar routine contexts and situations	calculating material requirements calculating quantities and sizes interpreting engineering drawings and tolerances
Draw conclusions and provide mathematical justifications	Self-assessing fabricated components complying with specifications and standards
English	
Speaking and listening – make a range of contributions to discussions and make effective presentations in a wide range of contexts	presenting assessed work and obtaining feedback working in groups to meet objectives requesting materials and tools for particular tasks
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reviewing standards to ensure compliance comparing workshop information with legislative requirements analysing content for completeness
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	compiling portfolios of evidence preparing risk assessments for practical activities reporting on particular work processes and general workshop activities.