

# Unit 1: Health and Safety in the Engineering Workplace

<b>Unit code:</b>	<b>T/600/0249</b>
<b>QCF Level 3:</b>	<b>BTEC National</b>
<b>Credit value:</b>	<b>10</b>
<b>Guided learning hours:</b>	<b>60</b>

## ● Aim and purpose

This unit will give learners an understanding of the key features of health and safety legislation and regulations and how these are applied in engineering to ensure safe working conditions.

## ● Unit introduction

The welfare of people working or operating within any manufacturing or engineering environment is of prime importance. All workers should expect to be able to carry out their work in a safe manner that has no negative effect on their health and wellbeing. In fact, many organisations not only reduce risks and make improvements to the working environment but try to make their own working environment superior to others, making it a competitive aspect when recruiting staff.

Health and safety in the workplace is about measures designed to protect the health and safety of employees, visitors and the general public who may be affected by workplace activities. Safety measures are concerned with controlling and reducing risks to anyone who might be affected by these activities.

Health and safety is controlled largely by legislation and regulations and the law is continually being revised and updated. It is important that organisations are aware of these changes and keep up to date with developments.

This unit will give learners an understanding of hazards and risks associated with health, safety and welfare in an engineering workplace, the associated legislation and regulations and of their roles in complying with the related legal obligations. Learners will also be required to undertake full risk assessments and to appreciate the significant risks encountered in the workplace and the measures taken to deal with them. They will also study the principles of reporting and recording accidents and incidents, again within a legal context.

This unit could form a key component within many learning programmes since the content is highly applicable to many manufacturing, engineering and industrial situations.

## ● Learning outcomes

### On completion of this unit a learner should:

- 1 Understand the key features of health and safety legislation and regulations
- 2 Know how to identify and control hazards in the workplace
- 3 Be able to carry out a risk assessment, identifying control measures
- 4 Understand the methods used when reporting and recording accidents and incidents.

# Unit content

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## 1 Understand the key features of health and safety legislation and regulations

*Key features of legislation and regulations:* legislation eg Health and Safety at Work Act 1974, Employment Act 2002, Factories Act 1961, Fire Precautions Act 1971; regulations eg Employment Equality (Age) Regulations 2006, Management of Health and Safety at Work Regulations 1999, Provision and Use of Work Equipment Regulations (PUWER) 1998, Control of Substances Hazardous to Health (COSHH) Regulations 2002, Lifting Operations and Lifting Equipment Regulations 1998, Manual Handling Operations Regulations 1992, Personal Protective Equipment at Work Regulations 1992, Confined Spaces Regulations 1997, Electricity at Work Regulations 1989, Control of Noise at Work Regulations 2005, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 1995, Working Time Regulations 1998, Workplace (Health, Safety and Welfare) Regulations 1992, Health and Safety (First Aid) Regulations 1981, Supply of Machinery (Safety) (Amendment) Regulations 2005 (SI 2005/831)

*Roles and responsibilities of those involved:* employers; employees; Health and Safety Executive (HSE) eg span of authority, right of inspection, guidance notes and booklets; others eg management, sub-contractors, public, suppliers, customers, visitors

## 2 Know how to identify and control hazards in the workplace

*Within the workplace:* methods to identify hazards eg statements, analysis of significant risks, prediction of results or outcomes of those risks, use of accident data, careful consideration of work methods

*Working environment:* consideration of the workplace and its potential for harm eg confined spaces, working over water or at heights, electrical hazards, chemicals, noise

*Hazards which become risks:* identification of trivial or significant risk; potential to cause harm; choosing appropriate control measures; electrical safety eg identify and control hazards, cause of injury, effects of electricity on the body, circuit overloading; mechanical safety eg identify and control hazards, cause of injury, rotating equipment, sharp edges; safety devices eg residual current device (RCD), fuses, guards, fail safe, sensors

## 3 Be able to carry out a risk assessment and identify control measures

*Risk assessments:* items/area to be assessed eg machine operation, work area; five steps (principal hazards, who is likely to be injured/harmed, evaluate the risks and decide on adequacy of precautions, recording findings, review assessment)

*Use of control measures:* eg remove need (design out), use of recognised procedures, substances control, guarding, lifting assessments and manual handling assessments, regular inspection, use of Personal Protective Equipment (PPE), training of personnel, other personal procedures for health, safety and welfare

#### 4 Understand the methods used when reporting and recording accidents and incidents

*Principles:* why employers keep records of serious accidents, incidents and emergencies; responsibilities of competent persons; cost of accidents eg direct, indirect, human consequences; trends eg major causes, fatal and serious injury, methods of classification, statistics

*Recording and reporting procedures:* regulations on accident recording and reporting eg Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 1995, accident book, company procedures; procedures to deal with near misses or dangerous occurrences

## 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.

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:
<b>P1</b> explain the key features of relevant regulations on health and safety as applied to a working environment in two selected or given engineering organisations [IE4]	<b>M1</b> explain the consequences of management not abiding by legislation and regulations and carrying out their roles and responsibilities in a given health and safety situation	<b>D1</b> justify the methods used to deal with hazards in accordance with workplace policies and legal requirements
<b>P2</b> describe the roles and responsibilities under current health and safety legislation and regulations, of those involved	<b>M2</b> explain the importance of carrying out all parts of a risk assessment in a suitable manner	<b>D2</b> determine the cost of an accident in the workplace from given data.
<b>P3</b> describe the methods used to identify hazards in a working environment	<b>M3</b> explain how control measures are used to prevent accidents.	
<b>P4</b> describe how hazards which become risks can be controlled		
<b>P5</b> carry out a risk assessment on a typical item/area of the working environment [SM2]		
<b>P6</b> suggest suitable control measures after a risk assessment has been carried out and state the reasons why they are suitable [CT1, EP4]		
<b>P7</b> explain the principles that underpin reporting and recording accidents and incidents		
<b>P8</b> describe the procedures used to record and report accidents, dangerous occurrences or near misses.		

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

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

# Essential guidance for tutors

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## Delivery

It is necessary to integrate health and safety at an early stage in all engineering units. Case studies/projects could be used for the delivery of this unit in an attempt to focus learners on the relationship between the process, the environment and health, safety and welfare.

Case studies might be based on a site where the learner is working. Where this is the case, learners may need to formulate and agree the scenario and the terms of reference for the case study or project with their tutor.

Alternatively the unit could be taught using case studies that tutors can research from trade union material, the Health and Safety Executive (HSE) or local and national newspapers and radio stations. Indeed, the death of over 600 people every year at work is an illustration of the importance of effective education and training on health and safety. Many local HSEs will be very willing to give guidance and advice on accident prevention, along with statistics on health and safety performance.

The learning outcomes form a natural order for delivery. The full range of legislation and regulations can be made available, but learners could be asked to only research a given area and present their findings to the rest of the group, so that the whole group benefits from the exercise. All the areas of content are likely to be found easily on the internet.

Learning outcome 2 is about knowing how to identify hazards and could be covered through practical visits to workshops, companies or other areas. Before learning outcome 3 is delivered it is appropriate to emphasise the differences between hazards and risks. The ways that risks are controlled could be dealt with in a practical way. Learners should be given opportunities to build their confidence in carrying out a risk assessment by practising this skill over a number of scenarios. This should allow them to achieve when asked to do one as an assessed activity. Photographs and drawings could be used to capture what they have done for future reference.

Learners should be taught about the principles involved when reporting and recording accidents and near misses. The pyramid of deaths to accidents to near misses should be emphasised. It is possible that research from learning outcome 1 might contain useful information regarding the requirements of RIDDOR. Visits to companies to see their procedures will strengthen learners' understanding of this and all other health, safety and welfare aspects.

Note that the use of 'eg' in the content is to give an indication and illustration of the breadth and depth of the area or topic. As such, not all content that follows an 'eg' needs to be taught or assessed.

## 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 demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
<p><i>Whole-class teaching:</i></p> <ul style="list-style-type: none"><li>• introduction to unit, scheme of work and methods of assessment</li><li>• introduction to the key features of health and safety legislation and regulations</li><li>• examine examples of the application and use of health and safety legislation and regulations in industry.</li></ul> <p><i>Individual/small group work:</i></p> <ul style="list-style-type: none"><li>• work using case studies to explore relevant health and safety legislation and regulations within a range of industrial settings.</li></ul>
<p><i>Whole-class teaching:</i></p> <ul style="list-style-type: none"><li>• describe roles and responsibilities of those involved in health and safety.</li></ul> <p><i>Group work:</i></p> <ul style="list-style-type: none"><li>• case studies of roles and responsibilities.</li></ul> <p><i>Individual learner research:</i></p> <ul style="list-style-type: none"><li>• investigate roles and responsibilities of HSE and their reports.</li></ul>
<p>Preparation for and carrying out <b>Assignment 1: Health and Safety Legislation and Regulations</b> (P1, P2 and M1).</p>
<p><i>Whole-class teaching:</i></p> <ul style="list-style-type: none"><li>• introduction to hazards and hazard control in the workplace</li><li>• describe methods used to identify hazards in a working environment and how to work with and use accident data.</li></ul> <p><i>Industrial visit(s):</i></p> <ul style="list-style-type: none"><li>• view a working environment to consider potential for harm.</li></ul> <p><i>Group work:</i></p> <ul style="list-style-type: none"><li>• use of case studies to look at working environments and identify the potential for harm in a number of relevant situations.</li></ul>
<p><i>Whole-class teaching:</i></p> <ul style="list-style-type: none"><li>• describe hazards that become risks and the level of risk</li><li>• describe hazards relating to electrical and mechanical safety and their respective control measures.</li></ul> <p><i>Group work:</i></p> <ul style="list-style-type: none"><li>• classify trivial or significant risk and identify the potential for harm.</li></ul> <p><i>Individual learner exercises:</i></p> <ul style="list-style-type: none"><li>• to identify and describe potential electrical and mechanical hazards and the most appropriate control measure.</li></ul>

## Topic and suggested assignments/activities and/assessment

*Whole-class teaching:*

- explain and demonstrate safety devices and their applications.

*Industrial visit(s):*

- view a working environment to examine safety devices in-situ.

*Individual learner exercises:*

- identify and describe safety devices and their applications.

*Whole-class teaching:*

- introduction to risk assessment
- describe the five step process.

*Group work:*

- use risk assessment case studies covering a range of control measures
- carry out a number of risk assessments to evaluate risk and adequacy of control measures.

*Individual learner activity:*

- examine an engineering task, carry out a risk assessment and prepare a short training course for personnel.

Preparation for and carrying out **Assignment 2: Controlling Hazards and Risks in the Workplace** (P3, P4, P5, P6, M2, M3 and D1).

*Whole-class teaching:*

- introduction to the reporting and recording of accidents and incidents
- explain why employers keep records of serious accidents, incidents and emergencies.

*Group work:*

- look at accident and incident case study reports, the methods of classification and trends.

*Whole-class teaching:*

- describe the responsibilities of competent persons and the cost of accidents in terms of direct, indirect and human consequences.

*Group work:*

- analyse accident trends in the engineering industry and calculate the cost of an accident in the workplace from given data.

*Whole-class teaching:*

- describe the regulations on accident recording and reporting and how to deal with near misses or dangerous occurrences.

*Individual learner research:*

- investigate regulations for reporting in relevant areas of industry.

Preparation for and carrying out **Assignment 3: Reporting and Recording Accidents and Incidents** (P7, P8 and D2).

Feedback on assessment, unit evaluation and close.



## Assessment

Evidence of criteria can be collected from case studies, assignments and projects which should enable learners to explore the application of legislation and regulations and hazards and risks in the workplace.

The pass grade specifies the minimum acceptable level required by learners. Assessment will need to cover all the learning outcomes but not necessarily all the topics included in the unit content. Achievement of a merit or a distinction grade will require answers that demonstrate additional depth and/or breadth of treatment.

To achieve a pass, learners must demonstrate an understanding of health, safety and welfare issues as applied to engineering processes and companies. They will need to explain the key features of legislation and regulations and describe a range of roles and responsibilities. They will have an understanding of the connection between hazard identification, risk assessment and accident prevention. Learners will need to carry out a risk assessment, suggest suitable controls and show they understand the principles and procedures for reporting and recording accidents and other occurrences relative to health and safety.

This unit could be assessed through three assignments. The first assignment could have a series of written tasks. The first task could ask learners to research and then explain the key features of relevant regulations as applied to two separate working environments (P1). It would be expected that at least four regulations should be considered across the two selected or given engineering organisations.

Another task could then ask them to describe the roles and responsibilities of those involved, under current health and safety legislation and regulations (P2). The organisations selected could include learners' places of work, or a training workshop or machine shop environment. A combination of one electrical and one mechanical type would be most appropriate. The assignment should cover legislation and regulations. It is not expected that all the legislation and regulations listed would be covered, just those applicable to the given context.

The roles and responsibilities of those involved should include employers, employees, the Health and Safety Executive and any one from the list of others within the unit content. A further task could then be used asking learners to explain the consequences of management not abiding by legislation and regulations and carrying out their roles and responsibilities in one of these situations (M1). All responses could be in a written format, although for the pass criteria a presentation to the class or annotated poster could be used. In these cases it must be remembered that the presentation skills or poster design skills are not being assessed.

The second assignment could cover P3, P4, P5 and P6 along with the higher criteria M2, M3 and D1. The whole assignment could be based on a practical activity to produce a risk assessment on a typical item or area of a working environment. Again, this working environment could be the learner's workplace or one from the centres own workshops. Whichever item or area is chosen it should have a range of hazards that can be identified, for example a machining operation or electrical assembly/wiring type activity could be used.

Written tasks would have to be set to give learners opportunities to achieve the descriptions/explanations required for P3, P4, M2 and M3, and the justification required for D1. P6 could be achieved through an oral question and answer session after carrying out the risk assessment. A standard template can be used to capture the outcomes of the risk assessment as this is what would be found in normal company use. A witness statement/observation record could be used to show learner performance against the requirement of P5.

The final assignment could cover the remaining criteria P7, P8 and D2, with a written task given for each. Learners should be given opportunities to investigate trends in an area they are interested in, which again may be an area similar to their workplace. The assignment should include a range of data given to each learner, some of which may have been researched and collected during the delivery of this part of the unit content.

## Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and 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 and M1	Health and Safety Legislation and Regulations	A written activity requiring learners to explain the key features of relevant legislation and regulations and describe the roles and responsibilities of the personnel involved and management.	A report containing written responses about the key features, responsibilities and management of Health and Safety Legislation and Regulations set within a relevant context for the learner.
P3, P4, P5, P6, M2, M3 and D1	Controlling Hazards and Risks in the Workplace	A practical activity to carry out a risk assessment plus a written report and oral questioning.	<p>A report, carried out under controlled conditions, describing the methods used to identify hazards and how hazards become risks.</p> <p>A written risk assessment of a typical working environment.</p> <p>A report with written responses that identify control measures and their justification.</p> <p>A record of observation by the tutor of the learner's practical risk assessment</p>
P7, P8 and D2	Reporting and Recording Accidents and Incidents	A written activity requiring learners to explain principles of reporting accidents, incidents and near misses.	A report, carried out under controlled conditions, explaining reporting accidents, incidents and near misses.

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

This unit forms part of the BTEC Engineering sector suite. This unit has particular links with the following unit titles in the Engineering suite:

Level 1	Level 2	Level 3
	Working Safely and Effectively in Engineering	Applications of Mechanical Systems in Engineering
		Electro, Pneumatic and Hydraulic Systems and Devices
		Engineering Primary Forming Processes
		Engineering Secondary and Finishing Techniques and Processes
		Fabrication Processes and Technology
		Welding Technology

The unit covers some of the knowledge and understanding associated with the SEMTA Level 3 NVQ in Mechanical Manufacturing Engineering and Level 3 NVQ in Business Improvement Techniques, particularly Unit 1: Complying with Statutory Regulations and Organisational Safety Requirements.

The unit also covers some of the knowledge and understanding associated with the SEMTA Level 3 NVQ in Engineering Leadership, Unit 1: Maintain a Healthy, Safe and Productive Work Environment.

### Essential resources

Learners will require access to a wide range of safety literature. Ideally, the centre will be able to provide access to health and safety legislation and learning materials on CD ROM.

### Employer engagement and vocational contexts

Access to workplace policies, documentation and reports would help in understanding how health, safety and welfare arrangements can be effectively organised and implemented. If these could be gathered and placed in context through industrial visits then their value and relevance would be enhanced. In particular, learning outcomes 2 and 3 would benefit from company visits and extend the learner's experience of potential hazards in a working environment and the measures used to control these.

If industry visits are not possible then a visiting speaker with responsibility and experience of health and safety in an industrial setting could be used to bring an element of application and reality to an otherwise theoretical subject.

There are a range of organisations that may be able help centres engage and involve local employers in the delivery of this unit, for example:

- Work Experience/Workplace learning frameworks – Centre for Education and Industry (CEI, University of Warwick) – [www.warwick.ac.uk/wie/cei/](http://www.warwick.ac.uk/wie/cei/)
- Learning and Skills Network – [www.vocationallearning.org.uk](http://www.vocationallearning.org.uk)
- Network for Science, Technology, Engineering and Maths Network Ambassadors Scheme – [www.stemnet.org.uk](http://www.stemnet.org.uk)
- National Education and Business Partnership Network – [www.nebpn.org](http://www.nebpn.org)
- Local, regional Business links – [www.businesslink.gov.uk](http://www.businesslink.gov.uk)
- Work-based learning guidance – [www.aimhighersw.ac.uk/wbl.htm](http://www.aimhighersw.ac.uk/wbl.htm).

## Indicative reading for learners

### Textbooks

Boyce A, Cooke E, Jones R and Weatherill B – *Level 3 BTEC National Engineering Student Book* (Pearson, 2010) ISBN 9781846907241

Boyce A, Cooke E, Jones R and Weatherill B – *Level 3 BTEC National Engineering Teaching Resource Pack* (Pearson, 2010) ISBN 9781846907265

Health and Safety Executive – *Essentials of Health and Safety at Work* (HSE Books, 2006)  
ISBN 9780717661794

Health and Safety Executive – *Management of Health and Safety at Work* (HSE Books, 2000)  
ISBN 0717624889

Health and Safety Executive – *Health and Safety in Engineering Workshops* (HSE Books, 2004)  
ISBN 9780717617173

### Website

HSE website [www.hse.gov.uk](http://www.hse.gov.uk)

## Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
<b>Independent enquirers</b>	analysing and evaluating relevant regulations on health and safety to describe the key features as applied to a working environment in two selected or given engineering organisations
<b>Creative thinkers</b>	generating ideas and exploring possibilities for suitable control measures after a risk assessment has been carried out
<b>Self-managers</b>	working towards a risk assessment on a typical item/area of the working environment, showing initiative, commitment to safety and perseverance
<b>Effective participators</b>	suggesting suitable control measures that would benefit others as well as themselves after a risk assessment has been carried out.

Although PLTS 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 ...
<b>Independent enquirers</b>	exploring a range of health and safety issues using case-study examples from different perspectives
<b>Reflective learners</b>	evaluating own health and safety experiences and class activity learning to inform future working practices in engineering
<b>Team workers</b>	working in groups to reaching agreement on the most applicable and relevant health and safety regulations when working in engineering organisations
<b>Self-managers</b>	organising time and resources, prioritising actions during group work and class activities using health and safety regulations
<b>Effective participators</b>	presenting a persuasive case for action during class activities in relation to a range of industrial health and safety situations.

## ● Functional Skills – Level 2

Skill	When learners are ...
<b>ICT – Find and select information</b>	
Select and use a variety of sources of information independently for a complex task	researching key features of relevant regulations on health and safety as applied to a working engineering environments
Access, search for, select and use ICT-based information and evaluate its fitness for purpose	using CD ROMs and relevant websites to access health and safety regulations
<b>Mathematics</b>	
Understand routine and non-routine problems in a wide range of familiar and unfamiliar contexts and situations	considering the costs to industry of accidents, dangerous occurrences or near misses
<b>English</b>	
Reading – compare, select, read and understand texts and use them to gather information, ideas, arguments and opinions	reading and extracting information from relevant regulations on health and safety as applied to a working environments in engineering organisations
Writing – write documents, including extended writing pieces, communicating information, ideas and opinions, effectively and persuasively	describing the key features of relevant regulations, roles, responsibilities and applications of health and safety as applied to working environments in engineering organisations.