Level 3 Advanced Technical Certificate in Forestry and Arboriculture (0174-35)

Version 1.7 (May 2019)

Qualification Handbook Technicals

Qualification at a glance

Industry area	Horticulture and Forestry
City & Guilds qualification number	0174-35
Age group	16-19 (Key Stage 5), 19+
Entry requirements	Centres must ensure that any pre-requisites stated in the *What is this qualification about?* section are met.
Assessment	To gain this qualification, candidates must successfully achieve the following assessments: • Two externally set, externally moderated assignment • One externally set, externally marked exams, sat under examination conditions • One portfolio of evidence • Optional unit assessments as required
Additional requirements to gain this qualification	Employer involvement in the delivery and/or assessment of this qualification is essential for all candidates and will be externally quality assured.
Grading	This qualification is graded Pass/Merit/Distinction/Distinction* For more information on grading, please see Section 7: Grading.
Approvals	These qualifications require full centre and qualification approval
Support materials	Sample assessments Guidance for delivery Guidance on use of marking grids
Registration and certification	Registration and certification of this qualification is through the Walled Garden, and is subject to end dates.
External quality assurance	This qualification is externally quality assured by City & Guilds, and its internally marked assignments are subject to external moderation. There is no direct claim status available for this qualification.

Title and level	Size (GLH)	TQT	City & Guilds qualification number	Ofqual accreditation number
Level 3 Advanced Technical Certificate in Forestry and Arboriculture	360	600	0174-35	601/7507/2

Version and date	Change detail	Section
1.1 May 2016	Small typographical errors	Throughout
	TQT added for qualifications Assessment component titles amended	1. Introduction
	Employer involvement guidance updated throughout	4. Employer involvement
	Summary of assessment methods and conditions	5. Assessment
	Moderation and standardisation of assessment updated throughout	6. Moderation and standardisation of assessment
	Awarding individual assessments Awarding grades and reporting results	7. Grading
	Enquiries about results Re-sits and shelf-life of assessment results Malpractice Access arrangements and special consideration	8. Administration
1.2 January 2017	Units 301 assessment method changed, weighting updated	1.Introduction 5. Assessment 6. Moderation and standardisation of assessment
1.3 June 2017	Addition of the examination paper based on module number	1. Introduction – Assessment requirements and employer involvement 5. Assessment 5. Assessment – exam specification 7. Grading – Awarding grades and reporting results
	Removal of AO6-8 from synoptic Assignments and readjusted approximate weightings	5. Assessment – Assessment Objectives
	Revised Exam Specification, Exam Duration and AO weightings	5. Assessment – Exam Specification
	Addition of Provisional Grade Boundaries for the Synoptic Assignment	7. Grading
	Branding Changes	City & Guilds Logo

1.4 August 2017	Removed QCF	Guidance for delivery
1.5 October 2018	Addition of Royal Forestry Societies, "Certification in Forestry" ("RFS CertFor.")	1. About this qualification
1.6 November 2018	Assessment method for unit 301 amended	1. Introduction 5. Assessment
1.7 May 2019	Wording changed regarding retakes	5. Assessment – Summary of assessment methods and conditions 8. Administration – Re-sits and shelf-life of assessment results

Contents

1   Introduction

What is this qualification about?

The following purpose is for the **Level 3 Advanced Technical Certificate in Forestry and Arboriculture**

Area	Description
OVERVIEW	
Who is this qualification for?	This qualification is for you if you are aged 16-19, and want to work in forestry or arboriculture. It provides you with the core practical skills and knowledge which will equip you to seek employment or further learning and training within the forestry and arboricultural industries.
What does this qualification cover?	You will learn how to work safely as activities often require physical work using equipment and machinery. You will learn how to operate equipment and machinery, including chainsaws. You will learn how to fell and cross cut small tress. You will also be able to undertake stump and brush chipping removal. You will study plant and soil science and how to plant and establish trees and shrubs.
	Centres and providers work with local employers who will contribute to the knowledge and delivery of training. Employers will provide demonstrations and talks on the industry and where possible work placements will also be provided by the employers. This practically based training is ideal preparation for gaining employment in the forestry and arboricultural industries or specialist further study.
WHAT COULD THIS QUALIFICATION LEAD TO?	
Will the qualification lead to employment, and if so, in which job role and at what level?	You might progress into work as a: • Entry level tree worker • Apprenticeship in a forestry or arboricultural business
Why choose this qualification over similar qualifications?	City & Guilds offers two sizes of Level 3 qualification in Forestry & Arboriculture: Certificate and Extended Diploma (1080). This Technical Certificate is typically delivered alongside other qualifications such as GCSEs, AS or A Levels. It provides an introduction to the core skills and knowledge required to enter employment in the forestry and arboricultural industries and opens first steps to a career in tree work. You would take the large Extended Diploma (1080) if you want to specialise and develop the skills and knowledge required by employers in the forestry and arboricultural industries. The Extended Diploma (1080) is likely to be taken as a full-time programme of study over two years. By taking this large qualification, you will be exposed to, and have the opportunity

	to gain experience in, the wider tree work sector. This will enable you to progress to a diverse range of employment opportunities, as you will have gained hands-on experience over 2 years, which employers really value.
Will the qualification lead to further learning?	You may wish to move onto an Advanced Apprenticeship in Trees and Timber, which allows you to combine working for a forestry contractor, in an arboretum, or a similar job, and typically attending one day a week at college or with a training provider. You may wish to progress onto further learning within a Higher Education Institution. You can go on to study subjects such as an Arboriculture Foundation Degree

WHO SUPPORTS THIS QUALIFICATION?

Employer/Higher Education Institutions/ Professional Membership Body	The Arboricultural Association

Royal Forestry Society, "Certification in Forestry" ("RFS CertFor.")

This Level 3 qualification is the standard theory component of the Royal Forestry Society's "Certificate in Forestry" ("RFS CertFor.").

The post nominal RFS Certification is designed to provide holders with industry recognition for their commitment to professional development in Forestry, demonstrating the holders ability to study both theoretical and practical competencies.

It also acts to provide employers a reassurance that a level of industry competence has been achieved.

This course, when combined with a suite of 8 industry accepted practical modules, qualifies the learner to apply for full RFS certification.

This is an industry accreditation that has been around for over a century. There is no time constraint on applying between achieving your theory and required practical modules.

To learn how to apply for RFS certification please follow this link :-
http://www.rfs.org.uk/learning/qualifications-post-nominal-awards/

Please note that the successful completion of this City & Guilds qualification does not entitle the holder to use "RFS Cert Arb. or RFS Cert For." post nominally, until they have submitted both theory and practical evidence to the RFS for approval.

Qualification structure

For the **Level 3 Advanced Technical Certificate in Forestry and Arboriculture** the teaching programme must cover the content detailed in the structure below:

Unit number	Unit title	GLH
Mandatory		
301	Principles of Health and Safety	30
302	Undertake and review work related experience in the land based industries	30
305	Land based industry machinery operations	60
307	Plant and soil science	60
350	Principles of tree felling and chainsaw use	60
352	Principles and identification of pests, diseases and disorders of trees	60
Optional – Learners must be taught at least 60 GLH from units 351, 356 – 357, 364		
351	Identification, planting, establishment and aftercare of plants for forestry and arboriculture	60
356	Tree and shrub pruning and maintenance	60
357	Principles of silviculture	60
364	Principles of amenity or forestry establishment	60

Total qualification time (TQT)

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	Size (GLH)	TQT
Level 3 Advanced Technical Certificate in Forestry and Arboriculture	360	600

Assessment requirements and employer involvement

To achieve the **Level 3 Advanced Technical Certificate in Forestry and Arboriculture** candidates must successfully complete **all** the mandatory assessment components **as well as** the optional assessment components for their chosen optional unit(s).

Component number	Title
Mandatory	
011 or	Level 3 Forestry and Arboriculture - Synoptic assignment (1)*
012 or 512	Level 3 Forestry and Arboriculture - Theory exam (1)*
301	Level 3 Principles of health and safety – Theory exam
302	Level 3 Undertake and review work related experience in the land-based industries - Portfolio
Optional	
351	Level 3 Identification, planting, establishment and aftercare of plants for forestry and arboriculture - Assignment
356	Level 3 Tree and shrub pruning and maintenance - Assignment
357	Level 3 Principles of silviculture - Assignment
364	Level 3 Principles of amenity and forestry establishment - Assignment

In addition, candidates **must** achieve the mandatory employer involvement requirement for this qualification **before** they can be awarded a qualification grade. For more information, please see guidance in *Section 4: Employer involvement*.

Employer involvement	
Component number	**Title**
Mandatory	
835	Employer involvement

Number of mandatory assessments per assessment type

2 Centre requirements

Approval

New centres will need to gain centre approval. Existing centres who wish to offer this qualification must go through City & Guilds' **full** Qualification Approval Process. There is no fast track approval for this qualification. Please refer to the City & Guilds website for further information on the approval process: **www.cityandguilds.com**

Resource requirements

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.

Centre staffing

Staff delivering this qualification must be able to demonstrate that they meet the following requirements:
- be technically competent in the areas in which they are delivering
- be able to deliver across the breadth and depth of the content of the qualification being taught
- have recent relevant teaching and assessment experience in the specific area they will be teaching, or be working towards this
- demonstrate continuing CPD.

Physical resources

Centres must be able to demonstrate that they have access to the equipment and technical resources required to deliver this qualification and its assessment.

Internal Quality Assurance

Internal quality assurance is key to ensuring accuracy and consistency of tutors and markers. Internal Quality Assurers (IQAs) monitor the work of all tutors involved with a qualification to ensure they are applying standards consistently throughout assessment activities. IQAs must have, and maintain, an appropriate level of technical competence and be qualified to make both marking and quality assurance decisions through a teaching qualification or recent, relevant experience.

Learner entry requirements

Centres must ensure that all learners have the opportunity to gain the qualification through appropriate study and training, and that any prerequisites stated in the *What is this qualification about?* section are met when registering on this qualification.

Age restrictions

This qualification is approved for learners aged 16 – 19, 19+.

3 Delivering technical qualifications

Initial assessment and induction

An initial assessment of each learner should be made before the start of their programme to identify:

- if the learner has any specific learning or training needs,
- support and guidance they may need when working towards their qualification,
- the appropriate type and level of qualification.

We recommend that centres provide an introduction so that learners fully understand the requirements of the qualification, their responsibilities as a learner, and the responsibilities of the centre. This information can be recorded on a learning contract.

Employer involvement

Employer involvement is essential to maximise the value of each learner's experience. Centres are required to involve employers in the delivery of technical qualifications at Key Stage 5 and/or their assessment, for every learner. This must be in place or planned before delivery programmes begin in order to gain qualification approval. See *Section 4: Employer involvement* for more detail.

Support materials

The following resources are available for this qualification:

Description	How to access
Sample assessments	
Guidance for delivery	Available 2016 on the qualification pages on the City & Guilds Website: **www.cityandguilds.com**
Guidance on use of marking grids	

4   Employer involvement

Employer involvement is a formal component of Key Stage 5 Technical qualifications. It does not contribute to the overall qualification grading, but is a mandatory requirement that all learners must meet. As such it is subject to external quality assurance by City & Guilds.

Department for Education (DfE) requirements state:

Employer involvement in the delivery and/or assessment of technical qualifications provides a clear 'line of sight' to work, enriches learning, raises the credibility of the qualification in the eyes of employers, parents and students and furthers collaboration between the learning and skills sector and industry.
[Technical qualifications] must:
- *require all students to undertake meaningful activity involving employers during their study; and*
- *be governed by quality assurance procedures run by the awarding organisation to confirm that education providers have secured employer involvement for every student.*

Extract from: ***Vocational qualifications for 16 to 19 year olds, 2017 and 2018 performance tables: technical guidance for awarding organisations***, ***paragraphs 89-90***

City & Guilds will provide support, guidance and quality assurance of employer involvement.

Qualification approval
To be approved to offer City & Guilds technicals, centres must provide an Employer Involvement planner and tracker showing how every learner will be able to experience meaningful employer involvement, and from where sufficient and suitable employer representatives are expected to be sourced.

Centres must include in their planner a sufficient range of activities throughout the learning programme that provide a range of employer interactions for learners. Centres must also plan contingencies for learners who may be absent for employer involvement activities, so that they are not disadvantaged.

As part of the approval process, City & Guilds will review this planner and tracker. Centres which cannot show sufficient commitment from employers and/or a credible planner and tracker will be given an action for improvement with a realistic timescale for completion. **Approval will not be given** if employer involvement cannot be assured either at the start of the qualification, or through an appropriate plan of action to address this requirement before the learner is certificated.

Monitoring and reporting learner engagement
Employer involvement is a formal component of this qualification and is subject to quality assurance monitoring. Centres must record evidence that demonstrates that each learner has been involved in meaningful employer based activities against the mandatory content before claiming the employer involvement component for learners.

Centres must record the range and type of employer involvement each learner has experienced and submit confirmation that all learners have met the requirements to City & Guilds. If a centre cannot provide evidence that learners have met the requirements to achieve the component, then the learner will not be able to achieve the overall Technical Qualification.

Types of involvement

Centres should note that to be eligible, employer involvement activities **must** relate to one or more elements of the mandatory content of this qualification. This does not mean that employer involvement in the optional units is not valuable, and centres are encouraged to consider this wherever appropriate.

As the aim of employer involvement is to enrich learning and to give learners a taste of the expectations of employers in the industry area they are studying, centres are encouraged to work creatively with local employers.

Employers can identify the areas of skills and knowledge in their particular industry that they would wish to see emphasised for learners who may apply to work with them in the future. Centres and employers can then establish the type of input, and which employer representative might be able to best support these aims.

To be of most benefit this must add to, rather than replace the centre's programme of learning. Some examples of meaningful employer involvement are listed below. Employer involvement not related to the mandatory element of the qualification, although valuable in other ways, does not count towards this element of the qualification.

The DfE has provided the following examples of what does and does not count as meaningful employer involvement, as follows[1,2]:

The following activities meet the requirement for meaningful employer involvement:
- *students undertake structured work-experience or work-placements that develop skills and knowledge relevant to the qualification[3];*
- *students undertake project(s), exercises(s) and/or assessments/examination(s) set with input from industry practitioner(s);*
- *students take one or more units delivered or co-delivered by an industry practitioner(s). This could take the form of master classes or guest lectures;*
- *industry practitioners operate as 'expert witnesses' that contribute to the assessment of a student's work or practice, operating within a specified assessment framework. This may be a specific project(s), exercise(s) or examination(s), or all assessments for a qualification.*

In all cases participating industry practitioners and employers must be relevant to the industry sector or occupation/occupational group to which the qualification relates.

The following activities, whilst valuable, do not meet the requirement for meaningful employer involvement:
- *employers' or industry practitioners' input to the initial design and content of a qualification;*
- *employers hosting visits, providing premises, facilities or equipment;*
- *employers or industry practitioners providing talks or contributing to delivery on employability, general careers advice, CV writing, interview training etc;*
- *student attendance at career fairs, events or other networking opportunities;*
- *simulated or provider-based working environments eg hairdressing salons, florists, restaurants, travel agents, small manufacturing units, car servicing facilities;*
- *employers providing students with job references.*

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[1] As extracted from: Vocational qualifications for 16 to 19 year olds
2017 and 2018 performance tables: technical guidance for awarding organisations
[2]This list has been informed by a call for examples of good practice in employer involvement in the delivery and assessment of technical qualifications - **Employer involvement in the delivery and assessment of vocational qualifications**
[3] **DfE work experience guidance**

Types of evidence

For each employer involvement activity, centres are required to provide evidence of which learners undertook it, e.g. a candidate attendance register. The types of additional evidence required to support a claim for this component will vary depending on the nature of the involvement. Eg for a guest lecture it is expected that a synopsis of the lecture and register would be taken which each learner and the guest speaker will have signed; expert witnesses will be identified and will have signed the relevant assessment paperwork for each learner they have been involved in assessing; evidence of contribution from employers to the development of locally set or adapted assignments.

Quality assurance process

As the employer involvement component is a requirement for achieving the KS5 Technical qualifications, it is subject to external quality assurance by City & Guilds at the approval stage and when centres wish to claim certification for learners.

Evidence will be validated by City & Guilds before learners can achieve the employer involvement component. Where employer involvement is not judged to be sufficient, certificates cannot be claimed for learners.

Sufficiency of involvement for each learner

It is expected that the centre will plan a range of activities that provide sufficient opportunities for each learner to interact directly with a range of individuals employed in the related industry. Centres must also provide contingencies for learners who may be absent for part of their teaching, so they are not disadvantaged. Any absence that results in a learner missing arranged activities must be documented. Where learners are unable to undertake all employer involvement activities due to temporary illness, temporary injury or other indisposition, centres should contact City & Guilds for further guidance.

Live involvement

Learners will gain most benefit from direct interaction with employers and/or their staff; however the use of technology (eg the use of live webinars) is encouraged to maximise the range of interactions. Where learners are able to interact in real time with employers, including through the use of technology, this will be classed as 'live involvement'.

It is considered good practice to record learning activities, where possible, to allow learners to revisit their experience and to provide a contingency for absent learners. This is not classed as live involvement however, and any involvement of this type for a learner must be identified as contingency.

Timing

A learner who has not met the minimum requirements cannot be awarded the component, and will therefore not achieve the qualification. It is therefore important that centres give consideration to scheduling employer involvement activities, and that enough time is allotted throughout delivery and assessment of the qualification to ensure that requirements are fully met.

5   Assessment

Summary of assessment methods and conditions

Component numbers	Assessment method	Description and conditions
011	Synoptic assignment	The synoptic assignment is **externally set, internally marked and externally moderated.** The assignment requires candidates to identify and use effectively in an integrated way an appropriate selection of skills, techniques, concepts, theories, and knowledge from across the content area. Candidates will be judged against the assessment objectives. Assignments will be released to centres as per dates indicated in the Assessment and Examination timetable published on our website. Centres will be required to maintain the security of all live assessment materials. Assignments will be password protected and released to centres through a secure method. There will be one opportunity within each academic year to sit the assignment. Candidates who fail the assignment will have one re-sit opportunity. The re-sit opportunity will be in the next academic year, and will be the assignment set for that academic year once released to centres. If the re-sit is failed, the candidate will fail the qualification. Please note that for externally set assignments City & Guilds provides guidance and support to centres on the marking and moderation process. Assignments will be released to centres as per dates indicated in the Assessment and Examination timetable published on our website.
012 or 512	Externally marked exam	The exams are **externally set and externally marked**, and will be taken either online through City & Guilds' computer-based testing platform (012) or as a paper-based test (512). The exams are designed to assess the candidate's depth and breadth of understanding across content in the qualification at the end of the period of learning, using a range of question types and will be sat under invigilated examination conditions. See JCQ requirements for details: **http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations** Candidates who fail the exam at the first sitting will have a maximum of two opportunities to retake. If the candidate fails the exam three times then they will fail the qualification. (Note: the third and final retake opportunity applies to Level 3 only.) For exam dates, please refer to the Assessment and Examination timetable.

301	Internally marked theory exam	This theory exam is **externally set, internally marked and externally moderated.** It is designed to assess the candidate's depth and breadth of understanding from across the unit content area and will be sat under supervised conditions.
		This assessment is available on our website. The assessment can be taken at any point during the academic year, but evidence must be submitted on to the Moderation Portal by the deadline in Assessment and Examination timetable, published on our website.
		Centres will be required to maintain the security of all live assessment materials. Assessments will be password protected and released to centres through a secure method.
		There is no re-sit limit for this assessment. If a learner fails, they can re-sit a different version. Assessors should allow seven days before reassessment.
302	Portfolio of evidence	This unit will be assessed by a portfolio of evidence, externally moderated by City & Guilds.
Optional units 351, 356 357, 364	Unit Assignment	The unit assignments are **externally set, internally marked and externally moderated.** The assignment requires candidates to identify and use effectively skills, knowledge and understanding from across the unit content area. Candidates will be judged against the unit grading criteria
		Arrangements for release, security and re-sitting assignments are the same as detailed for the synoptic assignment.

What is synoptic assessment?

Technical qualifications are based around the development of a toolkit of knowledge, understanding and skills that an individual needs in order to have the capability to work in a particular industry or occupational area. Individuals in all technical areas are expected to be able to apply their knowledge, understanding and skills in decision making to solve problems and achieve given outcomes independently and confidently.

City & Guilds technical qualifications require candidates to draw together their learning from across the qualification to solve problems or achieve specific outcomes by explicitly assessing this through the synoptic assignment component.

In this externally set, internally marked and externally moderated assessment the focus is on bringing together, selecting and applying learning from across the qualification rather than demonstrating achievement against units or subsets of the qualification content. The candidate will be given an appropriately levelled, substantial, occupationally relevant problem to solve or outcome to achieve. For example this might be in the form of a briefing from a client, leaving the candidate with the scope to select and carry out the processes required to achieve the client's wishes, as they would in the workplace.

Candidates will be marked against assessment objectives (AOs) such as their breadth and accuracy of knowledge, understanding of concepts, and the quality of their technical skills as well as their ability to use what they have learned in an integrated way to achieve a considered and high quality outcome.

How the assignment is synoptic for this qualification

The typical assignment brief could be to maintain an area of wooded land. Learners would use their knowledge to identify various plant species and pests, as well as soil types. They would also use their knowledge and understanding gained to plan and perform seasonal forestry and arboricultural activities. Learners will be required to provide evidence of their involvement in a range of practical activities, eg planting woody plants, monitoring for pests and diseases, operating forestry and arboriculture machinery, maintaining trees and shrubs, felling and dismantling trees, removing waste.

External exam for stretch, challenge and integration

The external assessment will draw from across the mandatory content of the qualification, using a range of shorter questions to confirm breadth of knowledge and understanding. Extended response questions are included, giving candidates the opportunity to demonstrate higher level understanding and integration through discussion, analysis and evaluation, and ensuring the assessment can differentiate between 'just able' and higher achieving candidates.

Optional unit assessments and integration into the synoptic qualification content

While the mandatory units for this qualification provide the main skills and knowledge required to work in Forestry and Arboriculture industry, the optional units provided give centres flexibility when devising programmes to meet local employment needs, where the purpose of the qualification demands this.

The assessments for the optional units will require that the candidate has experienced the full breadth of mandatory learning of the qualification in order to better demonstrate the rounded performance expected at higher grades.

Assessment objectives

The assessments for this qualification are set against a set of assessment objectives (AOs) which are used across all City & Guilds Technicals to promote consistency among qualifications of a similar purpose. They are designed to allow judgement of the candidate to be made across a number of different categories of performance.

Each assessment for the qualification has been allocated a set number of marks against these AOs based on weightings recommended by stakeholders of the qualification. This mark allocation remains the same for all versions of the assessments, ensuring consistency across assessment versions and over time.

The following table explains all AOs in detail, including weightings for the synoptic assignments. In some cases, due to the nature of a qualification's content, it is not appropriate to award marks for some AOs. Where this is the case these have been marked as N/A. Weightings for exams (AOs 1, 2 and 4 only) can be found with the exam specification.

Assessment objective	Level 3 Advanced Technical Certificate in Forestry and Arboriculture Typical expected evidence of knowledge, understanding and skills	Approximate weighting (Assignment)
AO1 Recalls knowledge from across the breadth of the qualification.	Terminology, health, safety and risk assessment, legislation, land-based machinery use and maintenance, environmental impact, soil characteristics, pest and disease identification, felling methods for problem trees, plant structures and physiological processes, life cycle of plants, factors influencing plant growth and development, causes of ill health in trees, diagnosis, monitoring and management of ill health in trees, prevention and control of pathogens, control methods for pests and diseases.	15%
AO2 Demonstrates understanding of concepts, theories and processes from across the breadth of the qualification.	Application of legislation and codes of practices, safety, importance of pre- and post-use machinery checks, minimising environmental impacts, impacts of soil properties on plant processes, plant structures, cultural maintenance, evaluation, ill health in trees and diagnosis, monitoring and management, consequences of pests, diseases and disorders for trees, host and pathogen relationships, importance of correctly identifying pathogens; consequences of misidentification of pathogens.	30%
AO3 Demonstrates technical skills from across the breadth of the qualification.	Planting, felling, cutting, soil testing, use of equipment and machinery, reporting on safety requirements, risk assessment, minimising environmental impacts, stump and brush removal, dealing with problem trees.	30%
AO4 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	Applying and linking knowledge, understanding and practical skills to a particular situation, justifying decisions/ approaches taken, contingencies, reflection and evaluation.	15%

| AO5 Demonstrates perseverance in achieving high standards and attention to detail while showing an understanding of wider impact of their actions. | Coherent charts, graphs, measurements, plant identification, correctly used botanical names, Care of equipment, time management, accuracy in practical tasks, routinely checking on quality, changing work practices in relation to external stimuli. | 10% |

Exam specifications

AO weightings per exam

AO	Exam 012 or 512 weighting (approx. %)
AO1 Recalls knowledge from across the breadth of the qualification.	30
AO2 Demonstrates understanding of concepts, theories and processes from across the breadth of the qualification.	50
AO4 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	20

The way the exam covers the content of the qualification is laid out in the tables below:

Assessment conditions: Invigilated examination conditions
Grading: X/P/M/D

012 or 512	Duration: 2 hours		
Unit	Unit title	Number of marks	%
307	Plant and soil science	15	25
350	Principles of tree felling and chainsaw use	13	22
352	Principles and identification of pests, diseases and disorders of trees	20	33
N/A	Integration across the units	12	20
	Total	**60**	**100**

*These exams are sat under invigilated examination conditions, as defined by the JCQ: **http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations**.

Entry for exams can be made through the City & Guilds Walled Garden.

6   Moderation and standardisation of assessment

City & Guilds' externally set assignments for technical qualifications are designed to draw from across the qualifications' content, and to contribute a significant proportion towards the learner's final qualification grade. They are subject to a rigorous external quality assurance process known as external moderation. This process is outlined below. For more detailed information, please refer to 'Marking and moderation - Technicals centre guidance' available to download on the City & Guilds website.

It is vital that centres familiarise themselves with this process, and how it impacts on their delivery plan within the academic year.

Supervision and authentication of internally assessed work

The Head of Centre is responsible for ensuring that internally assessed work is conducted in accordance with City & Guilds' requirements.

City & Guilds requires both tutors and candidates to sign declarations of authenticity. If the tutor is unable to sign the authentication statement for a particular candidate, then the candidate's work cannot be accepted for assessment.

Internal standardisation

For internally marked work[4] the centre is required to conduct internal standardisation to ensure that all work at the centre has been marked to the same standard. It is the Internal Quality Assurer's (IQA's) responsibility to ensure that standardisation has taken place, and that the training includes the use of reference and archive materials such as work from previous years as appropriate.

Provision for reworking evidence after submission for marking by the tutor

It is expected that in many cases a candidate who is struggling with a specific piece of work may themselves choose to restart and rectify the situation during their normal allocated time, and before it gets to the stage of it being handed in for final marking by the tutor.

In exceptional circumstances however, where a candidate has completed the assignment in the required timescales, and has handed it in for marking by the tutor but is judged to have significantly underperformed, may be allowed to rework or supplement their original evidence for remarking prior to submission for moderation. For this to be allowed, the centre must be confident that the candidate will be able to improve their performance without additional feedback from their tutor and within the required timescales ie the candidate has shown they can perform sufficiently better previously in formative assessments.

The reworked and/or supplemented original evidence must be remarked by the tutor in advance of the original moderation deadline and the moderator informed of any candidates who have been allowed to resubmit evidence.
The process must be managed through the IQA. The justification for allowing a resubmission should be recorded and made available on request. The use of this provision will be monitored by City & Guilds.

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[4] For any internally assessed optional unit assignments, the same process must be followed where assessors must standardise their interpretation of the assessment and grading criteria.

Internal appeal

Centres must have an internal process in place for candidates to appeal the marking of internally marked components, ie the synoptic assignment and any optional unit assignments. This must take place before the submission of marks for moderation. The internal process must include candidates being informed of the marks (or grades) the centre has given for internally assessed components, as they will need these to make the decision about whether or not to appeal.

Centres cannot appeal the outcome of moderation for individual candidates, only the moderation process itself. A request for a review of the moderation process should be made to **appeals@cityandguilds.com**.

Moderation

Moderation is the process where external markers are standardised to a national standard in order to review centre marking of internally marked assessments. These markers are referred to as 'moderators'. Moderators will mark a representative sample of candidates' work from every centre. Their marks act as a benchmark to inform City & Guilds whether centre marking is in line with City & Guilds' standard.

Where moderation shows that the centre is applying the marking criteria correctly, centre marks for the whole cohort will be accepted.

Where moderation shows that the centre is either consistently too lenient or consistently too harsh in comparison to the national standard, an appropriate adjustment will be made to the marks of the whole cohort, retaining the centre's rank ordering.

Where centre application of the marking criteria is inconsistent, an appropriate adjustment for the whole cohort may not be possible on the basis of the sample of candidate work. In these instances a complete remark of the candidate work may be necessary. This may be carried out by the centre based on feedback provided by the moderator, or carried out by the moderator directly.

Moderation applies to all internally marked assignments. Following standardisation and marking, the centre submits all marks and candidate work to City & Guilds via the moderation platform. The deadline for submission of evidence will be available on Walled Garden. See the *Marking and moderation - Technicals Centre Guidance* document for full details of the requirements and process.

In most cases candidate work will be submitted directly to the moderator for moderation. This includes written work, photographic and pictorial evidence, or video and audio evidence. For some qualifications there will be a requirement for moderators to visit centres to observe practical assessments being undertaken. This will be for qualifications where the assessment of essential learner skills can only be demonstrated through live observation. The purpose of these visits is to ensure that the centre is assessing the practical skills to the required standards, and to provide the moderators with additional evidence to be used during moderation. These visits will be planned in advance with the centre for all relevant qualifications.

Post-moderation procedures

Once the moderation process has been completed, the confirmed marks for the cohort are provided to the centre along with feedback from the moderator on the standard of marking at the centre, highlighting areas of good practice, and potential areas for improvement. This will inform future marking and internal standardisation activities.

City & Guilds will then carry out awarding, the process by which grade boundaries are set with reference to the candidate evidence available on the platform.

Centres retaining evidence

Centres must retain assessment records for each candidate for a minimum of three years. To help prevent plagiarism or unfair advantage in future versions, candidate work may not be returned to

candidates. Samples may however be retained by the centre as examples for future standardisation of marking.

7   Grading

Awarding individual assessments

Individual assessments will be graded, by City & Guilds, as pass/merit/distinction where relevant. The grade boundaries for pass and distinction for each assessment will be set through a process of professional judgement by technical experts. Merit will usually be set at the midpoint between pass and distinction. The grade descriptors for pass and distinction, and other relevant information (eg archived samples of candidate work and statistical evidence) will be used to determine the mark at which candidate performance in the assessment best aligns with the grade descriptor in the context of the qualification's purpose. Boundaries will be set for each version of each assessment to take into account relative difficulty.

Please note that as the Merit grade will usually be set at the arithmetical midpoint between pass and distinction, there are no descriptors for the Merit grade for the qualification overall.

Grade descriptors

To achieve a pass, a candidate will be able to

- Demonstrate the knowledge and understanding required to work in the occupational area, its principles, practices and legislation.
- Describe some of the main factors impacting on the occupation to show good understanding of how work tasks are shaped by the broader social, environmental and business environment it operates within.
- Use the technical industry specific terminology used in the industry accurately.
- Demonstrate the application of relevant theory and understanding to solve non-routine problems.
- Interpret a brief for complex work related tasks, identifying the key aspects, and showing a secure understanding of the application of concepts to specific work related tasks.
- Carry out planning which shows an ability to identify and analyse the relevant information in the brief and use knowledge and understanding from across the qualification (including complex technical information) to interpret what a fit for purpose outcome would be and develop a plausible plan to achieve it.
- Achieve an outcome which successfully meets the key requirements of the brief.
- Identify and reflect on the most obvious measures of success for the task and evaluate how successful they have been in meeting the intentions of the plan.
- Work safely throughout, independently carrying out tasks and procedures, and having some confidence in attempting the more complex tasks.

To achieve a distinction, a candidate will be able to

- Demonstrate the excellent knowledge and understanding required to work to a high level in the occupational area, its principles, practices and legislation.
- Analyse the impact of different factors on the occupation to show deep understanding of how work tasks are shaped by the broader social, environmental, and business environment it operates within.
- Demonstrate the application of relevant theory and understanding to provide efficient and effective solutions to complex and non-routine problems.
- Analyse the brief in detail, showing confident understanding of concepts and themes from across the qualification content, bringing these together to develop a clear and stretching plan that would credibly achieve an outcome that is highly fit for purpose.

- Achieve an outcome which shows an attention to detail in its planning, development and completion, so that it completely meets or exceeds the expectations of the brief to a high standard.
- Carry out an evaluation in a systematic way, focussing on relevant quality points, identifying areas of development/ improvement as well as assessing the fitness for purpose of the outcome.

Awarding grades and reporting results

The overall qualification grade will be calculated based on aggregation of the candidate's achievement in each of the assessments for the mandatory units, taking into account the assessments' weighting. The **Level 3 Advanced Technical Certificate in Forestry and Arboriculture** will be reported on a four grade scale: Pass, Merit, Distinction, Distinction*.

All assessments **must** be achieved at a minimum of Pass for the qualification to be awarded. Candidates who fail to reach the minimum standard for grade Pass for an assessment(s) will not have a qualification grade awarded and will not receive a qualification certificate.

The approximate pass grade boundary(ies) for the synoptic assignment(s) in this qualification are:

Synoptic Assignment	Pass Mark (%)
011	40%

Please note that each synoptic assignment is subject to an awarding process before final grade boundaries confirmed.

The contribution of assessments towards the overall qualification grade is as follows:

Assessment method	Grade scale	% contribution
Synoptic Assignment (011)	X/P/M/D	60%
Exam (012/ 512)	X/P/M/D	40%

Both synoptic assignments and exams are awarded (see 'Awarding individual assessments', at the start of Section 7, above), and candidates' grades converted to points. The minimum points available for each assessment grade is listed in the table below. A range of points between the Pass, Merit and Distinction boundaries will be accessible to candidates. For example a candidate that achieves a middle to high Pass in an assessment will receive between 8 and 10 points, a candidate that achieves a low to middle Merit in an assessment will receive between 12 and 14 points. The points above the minimum for the grade for each assessment are calculated based on the candidate's score in that assessment.

	Pass	Merit	Distinction
Assignment (011) 60%	6	12	18
Exam (012/ 512) 40%	6	12	18

The candidate's points for each assessment are multiplied by the % contribution of the assessment and then aggregated. The minimum points required for each qualification grade are as follows:

Qualification Grade	Minimum points
Distinction*	20.5
Distinction	17
Merit	11
Pass	6

Candidates achieving Distinction* will be the highest achieving of the Distinction candidates.

8   Administration

Approved centres must have effective quality assurance systems to ensure valid and reliable delivery and assessment of qualifications. Quality assurance includes initial centre registration by City & Guilds and the centre's own internal procedures for monitoring quality assurance procedures.

Consistent quality assurance requires City & Guilds and its associated centres to work together closely; our Quality Assurance Model encompasses both internal quality assurance (activities and processes undertaken within centres) and external quality assurance (activities and processes undertaken by City & Guilds).

For this qualification, standards and rigorous quality assurance are maintained by the use of:
- internal quality assurance
- City & Guilds external moderation.

In order to carry out the quality assurance role, Internal Quality Assurers (IQAs) must have and maintain an appropriate level of technical competence and have recent relevant assessment experience. For more information on the requirements, refer to *Section 2: Centre requirements* in this handbook.

To meet the quality assurance criteria for this qualification, the centre must ensure that the following procedures are followed:
- suitable training of staff involved in the assessment of the qualification to ensure they understand the process of marking and standardisation
- completion by the person responsible for internal standardisation of the Centre Declaration Sheet to confirm that internal standardisation has taken place
- the completion by candidates and supervisors/tutors of the record form for each candidate's work.

External quality assurance
City & Guilds will undertake external moderation activities to ensure that the quality assurance criteria for this qualification are being met. Centres must ensure that they co-operate with City & Guilds staff and representatives when undertaking these activities.

City & Guilds requires the Head of Centre to
- facilitate any inspection of the centre which is undertaken on behalf of City & Guilds
- make secure arrangements to receive, check and keep assessment material secure at all times, maintain the security of City & Guilds confidential material from receipt to the time when it is no longer confidential and keep completed assignment work and examination scripts secure from the time they are collected from the candidates to their dispatch to City & Guilds.

Enquiries about results
The services available for enquiries about results include a review of marking for exam results and review of moderation for internally marked assessments.

For further details on enquiries and appeals process and for copies of the application forms, please visit the **appeals page** of the City & Guilds website at **www.cityandguilds.com.**

Re-sits and shelf-life of assessment results

Re-sits and shelf-life of assessment results Candidates who have failed an exam or wish to re-take it in an attempt to improve their grade, can do so **twice**. The best result will count towards the final qualification. See guidance on individual assessment types in Section 5.

Factors affecting individual learners

If work is lost, City & Guilds should be notified immediately of the date of the loss, how it occurred, and who was responsible for the loss. Centres should use the JCQ form, JCQ/LCW, to inform City & Guilds Customer Services of the circumstances.

Learners who move from one centre to another during the course may require individual attention. Possible courses of action depend on the stage at which the move takes place. Centres should contact City & Guilds at the earliest possible stage for advice about appropriate arrangements in individual cases.

Malpractice

Please refer to the City & Guilds guidance notes *Managing cases of suspected malpractice in examinations and assessments*. This document sets out the procedures to be followed in identifying and reporting malpractice by candidates and/or centre staff and the actions which City & Guilds may subsequently take. The document includes examples of candidate and centre malpractice and explains the responsibilities of centre staff to report actual or suspected malpractice. Centres can access this document on the City & Guilds website.

Examples of candidate malpractice are detailed below (please note that this is not an exhaustive list):
- falsification of assessment evidence or results documentation
- plagiarism of any nature
- collusion with others
- copying from another candidate (including the use of ICT to aid copying), or allowing work to be copied
- deliberate destruction of another's work
- false declaration of authenticity in relation to assessments
- impersonation.

These actions constitute malpractice, for which a penalty (eg disqualification from the assessment) will be applied.

Where suspected malpractice is identified by a centre after the candidate has signed the declaration of authentication, the Head of Centre must submit full details of the case to City & Guilds at the earliest opportunity. Please refer to the form in the document *Managing cases of suspected malpractice in examinations and assessments*.

Access arrangements and special consideration

Access arrangements are adjustments that allow candidates with disabilities, special educational needs and temporary injuries to access the assessment and demonstrate their skills and knowledge without changing the demands of the assessment. These arrangements must be made before assessment takes place.

It is the responsibility of the centre to ensure at the start of a programme of learning that candidates will be able to access the requirements of the qualification.

Please refer to the *JCQ access arrangements and reasonable adjustments and Access arrangements - when and how applications need to be made to City & Guilds* for more information. Both are available on the City & Guilds website: **http://www.cityandguilds.com/delivering-our-**

qualifications/centre-development/centre-document-library/policies-and-procedures/access-arrangements-reasonable-adjustments

Special consideration
We can give special consideration to candidates who have had a temporary illness, injury or indisposition at the time of the examination. Where we do this, it is given after the examination.

Applications for either access arrangements or special consideration should be submitted to City & Guilds by the Examinations Officer at the centre. For more information please consult the current version of the JCQ document, *A guide to the special consideration process*. This document is available on the City & Guilds website: **http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/access-arrangements-reasonable-adjustments**

Unit 301   Principles of Health and Safety

UAN:	A/507/4634
Level:	3
GLH:	30

What is this unit about?

This unit aims to provide learners with an understanding of the principles of health and safety and identify how these can be applied in practice within land-based or related industries. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

Learners will be able to understand common health and safety practices and processes which they will encounter within the workplace. The land-based sector has one of the worst fatal accident records of any major industrial sector and a lack of basic training and/or competency is often a contributory factor. There is a need for new entrants to these industries to gain essential health and safety knowledge in order to minimise harm to themselves and to improve attitudes and behaviour in the workplace. In addition, the learners have the opportunity to consider factors which are specific to their workplace.

This unit must be taught alongside **all** technical units within the qualification ensuring learners gain an appreciation of its importance and so that they are equipped with knowledge and understanding to protect themselves and others when working in the industry.

Learning outcomes

In this unit, learners will be able to
1. Understand health and safety legislation
2. Understand the risk assessment process
3. Understand first aid requirements
4. Understand safe manual handling principles
5. Understand the use of fire extinguishers

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome

1. **Understand health and safety legislation**

Topics

1.1 Impact of good and bad practice upon individuals and businesses
1.2 Key legislation relating to health, safety and welfare
1.3 Statutory duties of employers, employees and the self-employed
1.4 Consequences of not complying with statutory duties
1.5 How individuals can contribute to establishing a good health and safety culture

Topic 1.1
Learners will know direct and indirect consequences of poor standards of workplace health and safety practice on both businesses and individuals, to include:
Financial eg:
- prosecution fines and legal fees
- compensation claims
- repairs/replacement of equipment
- recruit and train new staff
- increased insurance premiums

Emotional eg:
- guilt and grief
- stress

Reputation eg:
- loss of reputation
- bad publicity

Employees eg:
- reduced staff morale and productivity
- increased staff turnover and sickness

Social eg:
- loss of independence
- reduced social activity

Topic 1.2
Learners will know key legislation relating to health, safety and welfare within the workplace, for example, Health and Safety at Work etc. Act 1974 and the Management of Health and Safety at Work Regulations 1999. Learners will understand the importance of accident and incident reporting in accordance with the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013. Learners will understand the legal status and practical implications of approved codes of practice and industry specific best practice guidance.

Topic 1.3
Learners will know the statutory duties of employers, employees and the self-employed, to include:
Employers
- provide a safe working environment
- provide safe equipment and systems of work.
- provide information, instruction, training and supervision.
- arrange for the safe storage, transport and use of articles and substances.
- provide adequate welfare facilities.
Employees
- take reasonable care of their own health and safety.

- take reasonable care of other people who may be affected by what they do or don't do at work.
- cooperate with their employer on health and safety.
- not interfere with or misuse anything provided for their health, safety or welfare

Topic 1.4
Learners will know the powers of health and safety enforcement officers (e.g. inspection, investigation and guidance) and identify the range of enforcement actions and penalties that may be imposed (e.g. prohibition and improvement notices, intervention fee and prosecutions).

Topic 1.5
Learners will understand how individuals can contribute to establishing a good health and safety culture within their workplace, for example:
- prompt reporting of defective safety equipment or other matters of concern
- always use control measures and personal protective equipment (PPE) as instructed
- help others to work safely by sharing knowledge and good practice
- set a good example to others by always working safely
- Follow instructions and safe working procedures

Learning outcome
2. Understand the risk assessment process

Topics
2.1 Principles of risk assessment
2.2 Workplace hazards
2.2 Risk assessment

Learning Outcome 2 provides learners with the knowledge on the requirements and importance of carrying out risk assessments. Learners will be expected to carry out risk assessments in practice when performing their industry specific activities as required.

Topic 2.1
Learners will understand the legal requirement to carry out suitable and sufficient risk assessments. They will understand the responsibilities of the employer, self-employed and employee within the risk assessment process and identify when expert advice and guidance may be required (e.g. lack of experience or knowledge).

Topic 2.2
Learners will know common hazards associated with a workplace which could result in serious harm to themselves or others (e.g. visitors, colleagues, members of the public).

Topic 2.3
Learners will understand how to undertake a detailed risk assessment within the context of their workplace, following the Health and Safety Executive 'Five Steps to Risk Assessment', to include:
- identification of the hazards
- identification of who might be harmed and how they might be harmed
- evaluation of the risks and decide how the level of risk may be controlled
- recording and implementation of the results, as well as communication to others who may be affected
- reviewing risk assessments and suggesting when risk assessments should be reviewed

Learners will also know the hierarchy of risk control:
- elimination
- substitution
- safe working procedures

- training, instruction and supervision
- personal and respiratory protective equipment (PPE/RPE)

Learning outcome
3. Understand first aid requirements

Topics
3.1 Planning for emergencies and first aid provision in the workplace
3.2 Procedures when encountering an accident or medical emergency
3.3 First aid for common emergencies

In this outcome learners will explore the importance of planning to and subsequently how to manage common first aid emergencies which may arise in the workplace, with emphasis upon their workplace. Learners should be aware of the aims of first aid (i.e., preserve life, prevent injuries worsening and promote recovery) Evidence towards this outcome could come from a current first aid training qualification (i.e., appointed persons or first aid at work).

Topic 3.1
Learners will understand the importance of emergency planning, especially for lone or isolated working, and the responsibilities of a first aider. Learners will also know the minimum requirements for first aid at work and identify supplementary arrangements which may be appropriate for their workplace.

Topic 3.2
Learners will know the procedures to follow when encountering an accident or medical emergency. Learners will know how to check the incident site to minimize risk to themselves, assess the situation, and how and when to contact the emergency services and identify prioritisation of activities (e.g., 'DRABC').

Topic 3.3
Learners will know how to manage the following common situations as well as other significant situations appropriate to their workplace:
- wounds and burns
- choking
- severe bleeding
- shock
- concussion
- unconscious casualties
- falls from height
- suspected broken limbs and dislocations
- heart attacks

Learners will know how to understand their own limitations and understand how to monitor the condition of the casualty and prevent an injury from worsening.

Learning outcome
4. Understand safe manual handling principles

Topics
4.1 Principles of safe manual handling
4.2 Safe manual handling of common items

In this outcome learners will investigate the principles of risk assessment relevant to manual handling in order to plan for and safely move a range of common items associated with their workplace. Learners should have access to a range of common mechanical aids and these should be used as appropriate.

Topic 4.1
Learners will understand how manual handling at work should be minimised and identify appropriate alternatives and mechanical aids. They will know the common causes of injuries associated with poor manual handling within the workplace.

Topic 4.2
Learners will understand how to safely move a range of common items within their workplace. They will know appropriate mechanical aids for a range of common manual handling activities within their workplace.

Learning outcome
5.   Understand the use of fire extinguishers

Topics
5.1   Use of fire extinguishers

Learners will know the types, use and colours of portable fire extinguishers, to include:
- water
- dry powder
- foam
- CO2

Learners will know how to understand their own limitations in managing fires in the workplace.

Guidance for delivery

On completion of this unit, the learner will have developed an understanding of some of the key underlying principles and practices of health and safety to help prepare them to enter the workplace. It will be important that delivery relates to example situations that are vocationally relevant to the learners.

Visiting speakers e.g. paramedics, health and safety consultants or inspectors could enhance the relevance of the subject to learners.

Suggested learning resources

Books
Anon. 2013. *Farmwise - Your Essential Guide to Health and Safety in Agriculture*. Health and Safety Executive ISBN 0717665097

Chadder P. and Duncan M. 2014. *Health & Safety at Work Essentials. 8th Edition*. Lawpack Publishing Ltd. ISBN 1910143006

Stranks, J. 2010. *Health and Safety at Work: An Essential Guide for Managers. 9th Edition*. Kogan Page. ISBN 0749461195

Websites

Health and Safety Executive (HSE)   http:// www.hse.gov.uk
The Royal Society for the Prevention of Accidents (ROSPA)   http://www.rospa.com/

Unit 302   **Undertake and review work related experience in the land based industries**

UAN:	F/507/4635
Level:	3
GLH:	30

What is this unit about?

The aim of this unit is to give learners the skills needed to identify, participate in and review work experience in the environmental and land based sector. The unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

Learning outcomes

In this unit, learners will be able to
1. Determine employment opportunities in the environmental and land based industries
2. Prepare for a work-based experience in the environmental and land based industry
3. Understand the importance of effective interpersonal skills in the workplace
4. Review a work-based experience in the environmental and land based sector.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome

1. Determine employment opportunities in the environmental and land based industries

Topics

1.1. Career and progression opportunities within an environmental and land based industry

In this outcome, learners will explore the different job roles and responsibilities, and the job titles commonly associated with them in their specialist sector. This background understanding is likely to require some formal classroom teaching. Learners should be encouraged to explore the range of employment opportunities and career paths within their specialist sector. Learners will then consider the skills and qualifications that are required for appropriate jobs for themselves and should be encouraged to think about skills and qualifications that they may acquire to achieve their employment and careers ambitions. This should help them to identify suitable work experience.

Topic 1.1
Learners will know the job roles relevant to the land based sector, to include: managerial, supervisory, team worker, trainee, volunteer, common job titles within the relevant sector, main duties and responsibilities

Learners will also know the skills, qualifications and experience needed to fulfil duties and responsibilities of appropriate jobs, to include: job specific, vocational and personal

Learning outcome

2. Prepare for a work-based experience in the environmental and land based industry

Topics

2.1 Appropriate work-based experience and the application process
2.2 Interview skills

This outcome involves learners going through the process of applying for work experience. They will locate suitable job adverts or work experience opportunities, but can be supported by centres suggesting suitable placements. When applying for work experience learners should produce, as a minimum, a detailed curriculum vitae and letter of application using a computer. It will be beneficial for learners to attend a real or simulated interview, and reflect on their performance outlining how they could improve their effectiveness.

Topic 2.1
Learners will find a suitable job opportunity based on existing skills, experience, qualifications, development of skills and experience to achieve future employment goals. They will use a range of sources of information about work opportunities e.g. trade magazines, websites. Learners will complete an application form (if applicable), curriculum vitae and letter of application.

Topic 2.2
Learners will know how to prepare for an interview, eg:

Research the business and job role, suitable dress and personal presentation, information to find out and suitable questions to ask.
Learners will also know how to behave in an interview:
eg attend punctually and dressed appropriately, answering questions, completion of other tests (e.g. practical, aptitude), and reflection on interview performance

3. Understand the importance of effective interpersonal skills in the workplace

Topics
3.1 The importance of effective interpersonal skills in the workplace

It would be appropriate for employers to be invited to outline to learners their expectations in the workplace.

Topic 3.1
Learners will understand the importance of effective interpersonal skills in the workplace when dealing with customers and colleagues, to include:
- effective communication (e.g. addressing others face to face, appropriate telephone manner, effective written communication, use of social media)
- courtesy and helpfulness
- appropriate dress and body language
- product knowledge
- use of technical terms

Learning outcome
4   Review a work- based experience in the environmental and land based sector

Topics
4.1 Present evidence of activities and achievements during a work-based experience
4.2 Review a work-based experience, identifying strengths and areas for improvement
4.3 Evaluate future career aspirations

In this outcome, learners will use evidence from their work experience to present a report (eg written or visual), on their work experience business, job role, learning and achievements. They will then review the effectiveness of the workplace, making realistic and justified suggestions for improvement. Review of their own workplace performance and achievements should include all of the content identified, with reference to relevant evidence, e.g. reports, progress reviews, and the extent to which their aims, objectives/targets have been achieved. Learners should consider further training and experience that will help them to achieve their career ambitions.

Topic 4.1
Learners will present evidence of activities and achievements during a work-based experience to include, as appropriate: name of work experience provider, nature of the organisation (type of business, products or services, customers), organisation structure chart, main duties and responsibilities, regular daily working routine, evidence of safe working practices (eg PPE, risk assessments)

Topic 4.2
Learners will review their work-based experience, identifying strengths and areas for improvement, to include: work rate, work quality and effectiveness, punctuality, attendance, reliability, dress and personal presentation, working relationships with others work experience aims, objectives and targets

Topic 4.3
Learners will evaluate career aspirations, to include: advantages and disadvantages of identified pathways, suitability to personal interests, skills and qualifications,

Guidance for delivery

Learners on vocational courses should have experience of the type of work that they hope to do, and of the expectations of potential future employers.
Ideally this unit should be undertaken in a real business environment relevant to the subject interest of the learner, but actual work experience may be gained by a number of routes, e.g. as part of an industrial placement whilst within the programme, whilst working on a planned daily or weekly basis on the centre's commercial and/or educational facilities, whilst undertaking voluntary work within the industry, as previous relevant and current work experience in the industry or as a member of a group of learners invited to carry out practical work on a suitable business.

Throughout the unit, the emphasis should be on safe working. It is expected that learners will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working.

Learners should complete a minimum of 150 hours of work experience to achieve this unit. If work experience is in the industry, centres should be mindful of their responsibilities for ensuring that work placements have appropriate supervision, insurance and health and safety policies in place.

It is recommended that a summary report is completed by the employer at the end of the work placement.

Unit 305   Land based industry machinery operations

UAN:	J/507/4636
Level:	3
GLH:	60

What is this unit about?

This unit aims to provide learners with an understanding of the principles of land based machinery operations and how these can be applied in practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The learners will study the purpose and operation of land based machines including machine operating and working principles. They will explore routine maintenance and appropriate Personal Protective Equipment. They will also develop knowledge of the legal requirements and industry best practice guidance for land based machinery. They will learn how to safely operate and maintain machinery and consider the different conditions in which machinery might operate.

Learning outcomes
In this unit, learners will be able to:
1. Understand the purpose and operation of land based industry machinery
2. Prepare land based industry machinery for work
3. Operate land based industry machinery

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome

1 Understand the purpose and operation of land based industry machinery

Topics

1.1 Current legislation and industry guidance for land based industry machinery operation
1.2 Purpose and operation of land based machines

In Outcome 1 learners will understand the significance of current legislation and industry best practice guidance to the machinery they operate. Learners will also demonstrate understanding of the construction and working principles of a selection of machines commonly used in their specific land based industry, and knowledge of their work and performance parameters.

Topic 1.1
Learners will understand the significance of current legislation and industry best practice guidance to the machinery they operate. To include:

- legislation: eg Provision and Use of Work Equipment Regulations 1998 (PUWER), Health and Safety at Work Act 1974, Management of Health and Safety at Work Regulations 1999, Control of Substances Hazardous to Health Regulations 2002 (COSHH), Manual Handling Operations Regulations 1992, Personal Protective Equipment (PPE) at Work Regulations 1992, Environmental Protection Act 1990, Wildlife and Countryside Act 1981, Control of Noise at Work Regulations 2005, Control of Vibration at Work Regulations 2005, Lifting Operations and Lifting Equipment Regulations 1998
- industry best practice guidance

Topic 1.2
Learners will understand the purpose, operating and working principles and limitations of land based industry machinery. For example:

- purpose built, trailed, tractor mounted, self-propelled or pedestrian ,
- power source (eg electric, battery, spark ignition, compression ignition, PTO and hydraulic)
- drive and transmission systems
- cutting mechanisms
- cutting/loading capacity or range
- input and output ranges and levels
- terrain suitability
- safety features

Learning outcome

2. Prepare land based industry machinery for work

Topics

2.1 Machinery preparation
2.2 Carry out pre-use checks
2.3 Identify common faults and suggest appropriate remedial action
2.4 Check and report on safety requirements

In Outcome 2 learners will demonstrate the ability to prepare machines for work. Machines will be specific to learners' area of study. It is essential that manufacturers' recommendations, user's manuals and machinery handbooks are available to the learner. It is expected that leaners do this for three different machines.

Topic 2.1
Learners will prepare selected land based industry machinery for work in accordance with the manufacturers' recommendations, user's manual or machinery handbook.

Topic 2.2
Learners will carry out pre-use checks for selected land based industry machinery in accordance with the manufacturers' recommendations, user's manual or machinery handbook.

Topic 2.3
Learners will identify common faults and suggest appropriate remedial action to the machinery available to them. Common faults may include:
- incorrect, polluted or lack of fuel
- blocked filters (air, fuel, oils)
- poor oil pressure
- damaged sprockets and fouled drive systems
- damaged or blunt blades
- fouled or incorrectly set gap of spark plugs
- starter recoil tension
- blocked mechanisms

Topic 2.2
Learner will be able to check and report on the safety requirements for selected land based industry machinery in accordance with the manufacturers' recommendations, user's manual or machinery handbook.

Learning outcome
3.   Operate land based industry machinery

Topics
3.1   Carry out risk assessments
3.2   Ways to minimise possible environmental impacts of using selected land based industry machinery
3.3   Operate land based industry machinery
3.4   Carry out post operating procedures

In outcome 3 learners will be required to operate land based industry machinery. It is anticipated that the delivery of this outcome will be through supervised practical training and the learners will be able to consolidate operational skills within realistic working environments. As a minimum, it is expected that the learner will be able to operate three powered machines appropriate to their area of study in a realistic industrial environment where possible. The learner should be given appropriate time in order to develop operational skills before assessment. The learner is not required to transport machinery, but should be aware of transport requirements.

Topic 3.1
Learners will carry out risk assessments for the machines they are to operate in accordance with The Management of Health and Safety at Work Regulations 1999

Topic 3.2
Learners will know how to minimise possible environmental impacts of land based industry machinery, eg:
- oil and fuel spillage and storage
- emissions
- soil stability and erosion
- protected species
- waste disposal

- watercourses

Topic 3.3

Learners will demonstrate safe and efficient operation of specialist land based industry machinery, to include as appropriate:
- risk assessment
- adherence to industry safety guidance and operator's manual,
- safe start and stop,
- monitoring of machine performance and output
- effective communications
- clearance of blockages,
- conversion between work and transport positions
- economic operation
- safe and efficient operation,

Topic 3.4

Learners will carry out post operating procedures appropriate to machinery operated. To include:
- cleaning
- inspecting for and reporting of damage or defects
- lubrication
- storage

Guidance for delivery

This unit is designed to give learners knowledge, understanding and practical skills to enable them to understand and understand the working principles of land based industry machinery typically used in their area of study.

Learners will be able to demonstrate pre use checks and fault finding of a range of selected machines. They will be able to prepare machines for work and operate them safely and efficiently. An emphasis will be put on the use of manufacturers' recommended procedures, health and safety issues and safe working practices.

Learners will show awareness and consideration of hazards and risks at all times, particularly during operational situations where levels of risk may vary at any given time.

Where possible, tasks should be undertaken in a real working environment. Following operations, learners will demonstrate simple inspection and maintenance and pre storage tasks to minimise degeneration of the machine, and to ensure it is in a useable condition for subsequent operations.

Suggested learning resources

Books

Arboricultural Association. 2005. *Arboricultural Association Health and Safety Package*. Cheltenham: Arboricultural Association. ISBN 0900978406.

Ireland, D. 2004. *Winching Operations in Forestry: Tree Takedown and Vehicle Debogging*. Norwich: Stationary Office Books. ISBN 085538638X.

Hathaway, L. 1994. *Tractors Fundamentals of Machine Operation.* Davenport: John Deere Publishing. ISBN 0866912126.

Kestel, B. 2009. *Chainsaw Operator's Manual: The Safe Use of Chainsaws.* Australia: Landlinks Press. ISBN 0643090282.

Southorn, N. 1999. *Tractor Operation and Maintenance*. Sydney: Inkata Press. ISBN 0750689145.

Williams, M. 2000. *Tractor Power.* Ipswich: Farming Press. ISBN 0852365144.

Bell B. 2005. *Farm Machinery*. Old Pond Publishing. ISBN 1903366682

Culpin C. 1992. *Farm Machinery,12th edition*. Blackwell Scientific. ISBN 063203159X

Manufacturers publications and manuals

Journals and magazines

Horticultural Weekly
Profi International
Farmers Weekly
Arboricultural Association newsletter
Forestry and British Timber
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides
Forest Industry Safety Accord (FISA) Safety Guides

Websites

www.bagma.com	British Agricultural and Garden Machinery Association
www.defra.gov.uk	Dept for Environment, Food and Rural Affairs
www.wales.gov.uk	Welsh Assembly Government
www.scotland.gov.uk	Scottish Executive Environment and Rural Affairs Department
www.dardni.gov.uk	Department of Agriculture and Rural Affairs (Northern Ireland)
www.hse.gov.uk	Health and Safety Executive
http://www.trees.org.uk	The Arboricultural Association
http://www.ukfisa.com	The Forest Industry Safety Accord
http://www.gorestry.gov.uk	The Forestry Commission
http:/www.hse.gov.uk	The Health and Safety Executive

Unit 307   Plant and soil science

UAN:	L/507/4637
Level:	3
GLH:	60

What is this unit about?

This unit aims to provide learners with an understanding of the principles of plant and soil science and how these can be applied in practice within land-based or related industries. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

Learners will be able to develop an understanding of soil characteristics and their relationship to crop growth and development. They will investigate how plants grow and develop, through a knowledge of their structure and physiology. In addition, the learners have the opportunity to consider factors which influence production of commercial crops and other plants, which provides a basis for plant and soil management techniques.

Learning outcomes

In this unit, learners will be able to
1. Understand the function of plant structures
2. Understand the main physiological processes and growth and development of plants
3. Understand how soils affect plant growth and development

Scope of content
This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome
1. Understand the function of plant structures

Topics
1.1   Internal and external structures of plants
1.2   Function of plant structures

Topic 1.1
Learners will understand the major internal and external structures of plants:
- major internal structures: cell structure (cytoplasm, organelles), parenchyma, collenchyma, sclerenchyma, xylem tissue, phloem tissue, cambium, epidermis, guard cells, and stomata
- major external structures: roots, shoots, stem, leaves, buds, flowers, fruit and seeds
- specialised cells, tissues and organs: eg pericycle, endodermis, lenticels, cotyledons, stolons, rhizomes, bulbs, corms, root and stem tubers

Topic 1.2
Learners will understand the function of the major plant structures (e.g. photosynthesis, reproduction, support, transport, anchorage, absorption, storage, defence, attraction, gaseous exchange, respiration, division)

Learning outcome
2 Understand the main physiological processes and growth and development of plants

Topics
2.1   Processes of plant physiology
2.2   Life cycle of selected plants
2.3   Growth and development of plants

In this outcome learners will explore the major processes of plant physiology and identify factors affecting growth and development of plants. Learners will also need an awareness of how knowledge of plant physiology can be applied within land-based management scenarios.

Topic 2.1
Learners will understand the major processes of plant physiology:
- photosynthesis: process and equation for photosynthesis, chloroplasts, function of chlorophyll, functionality of guard cells and stomata, factors influencing the rate of photosynthesis (light, chlorophyll, temperature, carbon dioxide, water, leaf colour)
- respiration: definition of aerobic and anaerobic respiration, equation for aerobic respiration, structure and function of mitochondria, diffusion, compensation point, factors influencing the rate of respiration (temperature, water availability, seasonal growth)
- uptake, transport and loss of water and nutrients: osmosis, diffusion, plasmolysis, turgor, translocation, transpiration, factors influencing transpiration (e.g. temperature, humidity, air movement, water supply, light, stomata)

Topic 2.2
Learners will understand the life cycle of plants:
- life cycle types: ephemeral, annual, biennial, perennial
- germination: process and stages, types of germination (e.g. epigeal, hypogeal),
  types of reproduction (sexual reproduction e.g. flower structures, pollination and fertilisation, seed production, dispersal), (asexual reproduction e.g. vegetative

propagation, parthenogenesis)

Topic 2.3
Learners will understand the growth and development of plants, to include: cell division, cell expansion, cell differentiation, apical meristems, lateral meristems, formation of roots, shoots, leaves and buds

Learning outcome
3   Understand how soils affect plant growth and development

Topics
3.1   Soil types and soil formation
3.2   Investigate characteristics of soil types
3.3   How soils affect plant growth and development
3.4   Cultural techniques that affect soil characteristics

In this outcome learners will investigate a range of soil types and carry out supervised basic soil experiments to investigate different soil characteristics. These could include investigating the proportion of sand, silt and clay through suspending in water, investigating the water holding capacity of different soil types, and determining soil pH. The learners' understanding of the effects of soil characteristics on plant growth and development could be supported by some controlled experiments, where learners grow plants in different soil types.

Delivery could be enhanced by visits to see different types of plants growing in different soil types. Visiting expert speakers' input would be useful, as they would describe practical aspects of managing soil structure and plant nutrition.

Topic 3.1
Learners will identify a range of soil types to include loams, clays, silts, sands, organic soils, and understand how soil is formed.

Topic 3.2
Learners will investigate the characteristics of a range of soil types and profiles to include:
- soil profiles and different horizons
- properties of soil particles and texture (clay, silt and sand),
- soil structure (i.e. crumb structure, aggregate sizes)
- water holding capacity,
- aeration,
- stability,
- organic matter,
- pH,
- soil life: decomposers, mycorrhizae.

Topic 3.3
Learners will understand how soil properties and characteristics can affect plant growth and development, to include
- rooting depth and plant stability,
- pH and organic matter,
- availability or lack of macronutrients and micronutrients,
- effects of organic and inorganic fertiliser application,
- nutrient retention to include cation exchange capacity
- drainage/water logging,
- compaction/poor aeration
- effects of high or low soil water content
- effects on ability to prepare soil for planting

Topic 3.4

Learners will understand how cultural techniques affect soil structure, to include:

- Soil amelioration (eg green manure, addition of lime, organic matter, hydrogels, mycorrhizae, textural amendment)
- Soil cultivation (eg sub-soiling, ploughing, single and double digging, rotavating, minimal cultivation, zero cultivation)
- Soil protection and prevention of damage (eg capping, erosion, cultivation pans, surface and subsurface compaction

Guidance for delivery

On completion of this unit, the learner will have developed an understanding of how plants grow and develop, through knowledge of their structure and physiology. It will be important that delivery relates to plants that are vocationally relevant to the learners. Laboratory and field based practicals will be essential to help learners to explore soil characteristics, plant physiology and structure, and a series of visits to growing plants could help learners better understand plant growth and development. Learners are required to study a range of plants for this unit, although they should be able to focus upon plant types that are most relevant to their vocational area of study. Learners will also have access to a range of soils, as well as appropriate equipment and resources to undertake soil sampling and investigate soil profiles.

Visiting speakers could enhance relevance of the subject to learners Development of areas within a college environment where learners are able to modify and manipulate plant environments may enhance understanding of the complexities of plants and their life cycles.

Suggested learning resources

Books

Adams C.R. and Early M. 2011. *Principles of Horticulture. 6th Edition*. Routledge. ISBN 0080969577

Allaby, M. 2012. *A Dictionary of Plant Science. 3rd Edition*. OUP Oxford. ISBN 0199600570

Ashman M. and Puri, G. 2008. *Essential Soil Science: A clear and concise introduction to soil science.* Wiley-Blackwell ISBN 0632048859.

Beck C.B. 2010. *An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century. 2nd Edition*. Cambridge University Press. ISBN 0521518059

Brady N.C. and Weil R.R. 2014. Nature and Properties of Soils. 14th Edition. Pearson Education. ISBN 9332519102.

Cutler D.F., Botha T. and Stevenson D.W. 2008. *Plant Anatomy: An Applied Approach.* John Wiley & Sons. ISBN 1405126795

Buchanan B.B., Gruissem W. and Jones, R. 2015. *Biochemistry and Molecular Biology of Plants. 2nd Edition.* Wiley-Blackwell. ISBN 0470714212

Evert R.F and Eichhorn S.E. 2012. Raven *Biology of Plants.* 8th Edition. WH Freeman & Co Ltd. ISBN 1464113513.

Lack, A. and Evans, D. 2005. *Instant Notes in Plant Biology.* 2nd Edition. Taylor and Francis. ISBN 0415356431

Mauseth, J.D. 2014. *Botany: An Introduction to Plant Biology. 5th Edition.* Jones & Bartlett Publishers. ISBN 1284068854

Reiss, M, Monger, G. 2000. *Advanced Biology.* Cheltenham: Nelson Thornes. ISBN 0174387326

Roberts, M. and Ingram N. 2001. *Biology. 2nd Revised Edition* Nelson Thornes. ISBN 0748762388.

Smith A., Coupland G., Dolan L., Harberd N., Jones J., Martin C., Sablowski R. and Amey A. 2009. *Plant Biology*. Garland Science. ISBN 0815340257

Taiz, L., Zeiger, E. 2010. Plant Physiology. 5th Edition. Hampshire: Sinauer Associates. ISBN 0878935657

Wayne R. 2009. *Plant Cell Biology*. Academic Press. ISBN 0123747783

White R.E. 2005. *Principles and Practice of Soil Science: The Soil as a Natural Resource*. 4th Edition. Wiley-Blackwell. ISBN 0632064552.

Journals and magazines

Arborist News

Essential Arb

Forestry Journal

Journal of Arboriculture

Quarterly Journal of Forestry

The Arb Magazine

Field mycology

Websites

Biotechnology and Biological Sciences Research Council	http://www.bbsrc.ac.uk
British Society of Soil Science	http://www.soils.org.uk/
DEFRA	http:// www.defra.gov.uk
Environment Agency	http:// www.environment-agency.gov.uk
Health and safety Executive	http:// www.hse.gov.uk
Science and Plants for Schools	http://www.saps.org.uk/
The Arboricultural Association	http://www.trees.org.uk/
The Forestry Commission	http://www.forestry.gov.uk

Unit 350   Principles of tree felling and chainsaw use

UAN:	R/507/4638
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to provide learners with an understanding of the principles of chainsaw maintenance, felling small trees (200- 300mm at felling height) and stump removal and how these can be applied in practice. This unit is aimed at learners within a centre-based setting looking to progress into the sector or further education and training.

The learner will identify and understand a range of petrol-driven chainsaws and felling techniques currently used within the industry, to develop efficient chainsaw maintenance skills and to carry out basic repairs and troubleshooting.

If learners want to achieve the Level 2 Award in Chainsaw and Related Operations they will register and take the assessment separately through City & Guilds.

Learning outcomes

In this unit, learners will:
1. Understand the uses of chainsaws and commonly used methods for dealing with problem trees
2. Maintain chainsaws to manufacturer's recommendations
3. Safely fell and cross cut small diameter trees
4. Safely use stump and brush removal methods

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome

1. **Understand the uses of chainsaws and commonly used methods for dealing with problem trees**

Topics

1.1   The variety of uses of chainsaws
1.2   Assessment of different problem trees
1.3   Methods for felling problem trees
1.4   Evaluate tree felling activities

In this outcome the learners will assess a number of factors involved with tree felling and chainsaw use (these include problem trees). The learner will identify problem trees up to 380mm at felling height and understand how to deal with them but will not work on them.

Topic 1.1
The learners will understand the uses of chainsaws such as:
- felling
- cross cutting
- de-limbing / snedding
- logging
- tree surgery
- chainsaw carving.

Topic 1.2
The learners will understand assessment of different problem trees such as:
- leaning trees
- hung-up trees
- co-dominant stumps
- trees with damage
- trees with rot
- dead trees
- trees in difficult locations,
- trees close to other objects.

Topic 1.3
The learners will know methods for felling problem trees including:
- dismantling
- use of mechanical aids (eg winch, felling lever, wedges)
- specialist cutting techniques (eg safe-corner cut, Danish pie, split level, dog tooth)

Topic 1.4
The learners will evaluate tree felling activities from the following standpoints:
- suitability for purpose
- end product
- disposal of waste
- finished state of site
- cost
- labour involved
- environmental impact
- disturbance to public

- risk involved.

Learning outcome
2. Maintain chainsaws to manufacturer's recommendations

Topics
2.1   Safety features of a chainsaw
2.2   Inspect and carry out maintenance operations on selected chainsaws
2.3   Identify common faults in chainsaws

In this outcome learners will carry out routine maintenance tasks on chainsaws with a maximum guide bar length of 380mm. They will also learn how to understand common chainsaw faults. The faults may be engine related, assembly related or evident by chainsaw use and identified by cutting problems.

Topic 2.1
The learners will understand the function of the 10 safety features on a chainsaw. The safety features are:
- flared rear handle
- clearly marked and functioning on/off switch
- safety trigger interlock
- safety stickers
- anti-vibration mounts
- front hand guard incorporating the chain brake mechanism
- chain catcher
- exhaust directing fumes away from the operator
- bar and chain combination
- scabbard

Topic 2.2
Learners will visually inspect chainsaws and carry out maintenance in accordance with manufacturer's recommendations and health and safety guidelines on the following components:
- air filter
- spark plug
- bar and chain
- anti-vibration mounts
- oil and fuel systems
- starter mechanism
- chain break mechanism
- exhaust

Topic 2.3
Learners will identify the common faults on chainsaws to include:
- uneven sharpening (left/right hand)
- incorrect depth gauges
- bent or worn bar
- blocked air filter
- faulty on/off switch
- symptoms of poor or incorrect fuel mix
- lack of chain oil
- worn or slack chain
- worn anti-vibration mounts
- dirty chainsaw

Learning outcome
3. Safely fell and cross cut small diameter trees

Topics
3.1 Assess risks prior to felling and cross cutting operations
3.2 Methods for felling and cross cutting selected small diameter trees to meet given objectives
3.3 Dispose of waste using appropriate methods

In this outcome learners assess a site and if safe to do so fell small trees with a diameter up to 380mm. They will also cross cut the timber and dispose of the waste. Pre- start checks, safe starting techniques and safe cutting methods will be central to this outcome.

Topic 3.1
Learners will assess risks prior to felling operations:
- ground conditions / undergrowth
- escape routes
- weather conditions
- above and below ground utilities
- loose or dangerous limbs overhead
- local dangerous trees including leaning, windblown, dead and rotten trees
- foreign objects in tree at cutting level such as wires or fencing

Topic 3.2
Learners will safely fell and cross cut trees whilst considering the following:
a) pre felling:
- risk assessment carried out
- escape routes established
- felling only if safe to do so
- direction of fell
b) felling:
- correct use of chainsaw/felling aids
- choice and positioning of cuts
- appropriately sized hinge
- body positioning/stance
c) cross cut:
- meeting given specifications
- avoiding hitting ground with bar and chain
- awareness of tension and compression
- work technique
- avoid 'pinching' the bar

Topic 3.3
Learners will dispose of waste appropriately. Waste disposal will involve:
- meeting the requirements of the site
- cutting waste to a suitable size if required and stacking it as required
- burning or removing of waste if necessary
- considering waste as a secondary source of income

Learning outcome
4. Use stump and brush removal methods

Topics
4.1 Select appropriate stump and brush removal methods and equipment
4.2 Use appropriate stump and brush removal methods
4.3 Identify environmental impacts of removal method used
4.4 Evaluate commonly used stump and brush removal methods

In this outcome the learners will understand the methods and equipment available for stump and brush removal. They will be able to select and use an appropriate method for a given situation while paying particular attention to safe working practice and the need for PPE.

Topic 4.1
Learners will select appropriate stump and brush removal methods and equipment, e.g.:

a) stump removal:
- stump grinder
- winching
- hand digging
- mechanical excavation
- mulcher
- fire
- chemical
- natural processes

b) brush removal:
- chipper
- mulcher
- fire
- brash mat
- dead hedging
- windrow
- brash baling/biomass.

Topic 4.2
Learners will safely use stump and brush removal methods, to include:
- signage and barriers as appropriate
- Personal Protective Equipment to include both eye and ear protection
- adherence to codes of practice
- use in accordance with manufacturer's instructions
- reinstatement of soil and ground post extraction.

Topic 4.3
Learners will identify environmental impacts of removal methods used including:
- noise
- dust
- stump grindings
- wood chip
- exhaust gas pollution
- possible hydraulic oil pollution
- visual damage
- damage to ground and soil.

Topic 4.4
The learners will evaluate commonly used stump and brush removal methods from the following perspectives:
- availability of machinery
- competency of operator
- cost (purchase and hire)
- access
- location
- timing of operations
- waste
- customer requirements
- tree species.

Guidance for delivery

This unit is designed to provide the learner with a sound knowledge of chainsaws and their use and the skills required to use a chainsaw to fell and cross cut and process the arisings of small trees. It also enables them to remove stumps and to identify and evaluate, but not deal with, problem trees.

Throughout the unit, the emphasis should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for the learner to operate machinery, therefore health and safety issues relevant to the equipment and tasks involved will be stressed and regularly reinforced. Adequate Personal Protective Equipment (PPE), appropriate to the learner, the equipment and the task will be provided and worn in accordance with the associated risk assessment, industry and operator's manual.
This outcome is best initially delivered in a workshop context with eventual move to a working woodland environment. Emphasis should also be put on the need for cleanliness throughout. The requirement for regular maintenance and sharpening and use of the manufacturer's manuals should also be identified.

This unit will **not** directly lead to certification of competence in the Level 2 Award in Chainsaw and Related Operations. This unit could be used to contribute towards preparative training for the Level 2 Award in Chainsaw and Related Operations. If learners want to achieve the Level 2 Award in Chainsaw and Related Operations they will register and take the assessment separately through City & Guilds.

It is recommended that simple trees are used initially and as the learner gains confidence and experience then the working area can be more challenging. It is advised that simulation of a real working environment is used in the first instance. Pre- start checks and safe starting techniques will form part of this outcome.

Particular attention will be made to safe working practice and the need for PPE. Possible danger to the public and fellow workers needs to be emphasised. Where winching is carried out, the learner needs to be aware of how to check and maintain cables and the particular danger of their use.

The learner will learn to identify problem trees but will not work on them. The learner will be made aware of methods of dealing with problem trees. This can all be taught in a real working environment. It is essential that risk assessments are carried out and the learner is not put at risk when examining problem trees. It is possible that some of this may initially be taught in the classroom using slides or PowerPoint presentations. The uses and maintenance of chainsaws will also be understood.

Suggested learning resources

Books

Ireland D., 2004. *Winching Operations in Forestry*. The Stationary Office. ISBN 085538638X
Kestel B., 2005. *Chainsaw Operators Manual: The Safe Use of Chainsaws*. Landlinks Press. ISBN 0643090282
Shetterly R. & Blair D., 1995. *Arborist Equipment: A Guide to the Tools and Equipment of Tree Maintenance and Removal*. International Society of Arboriculture. ISBN 188195613X

Journals,magazines and guides

Arboricultural Advisory Information Service publications
Arboricultural Association newsletter
Forestry and British Timber
Journal of Arboriculture
NPTC workbooks 2001 / 2002 / 2004
AFAG guides
FISA guides

Websites

http://www.husqvarna.com/uk/support/working-with-chainsaws/different-techniques-for-the-felling-cut/

https://www.osha.gov/SLTC/etools/logging/manual/felling/cuts/special_techniques.html

Unit 351   Identification, planting, establishment and aftercare of plants for forestry and arboriculture

UAN:	Y/507/4639
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to provide learners with an understanding of the identification, planting and care of trees and how this can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will be able to identify trees and shrubs by botanic name and specify woody plants that are suitable for the situation and site. In addition, learners will be able to plant a range of tree types and provide immediate aftercare. They will also be able to specify future maintenance need.

Learning outcomes
In this unit, learners will:
1. Identify plants
2. Plant trees and shrubs
3. Establish trees and shrubs
4. Understand the aftercare requirements of trees and shrubs

Scope of content
This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome
1. Identify plants

Topics
1.1   Identifying plants by botanical names.
1.2   The nomenclature and taxonomy of plants.
1.3   Features that aid identification of plants in all seasons.
1.4   Keys and available technology used to identify plants by botanical characteristics.

In this outcome learners should concentrate on plants relevant to their chosen industry.
Topic 1.1
Learners will identify relevant plants (minimum 40) using the genus and specific epithet in accordance with the binomial naming system.

Topic 1.2
Learners will understand nomenclature and taxonomy systems including the following: Carl Linnaeus, vernacular names, binomial scientific names, authorities, kingdom, division, class, order, family, genus, species, epithets, variety and cultivar, inter-specific, inter-generic and graft hybrids.

Topic 1.3
Learners will understand the key features that aid identification of plants in all seasons including: leaves, buds, twigs, bark, flowers, fruit, petioles, shape, form and height.

Topic 1.4
Learners will use keys and available technology to identify plants by botanical characteristics including: leaf form, shape, arrangement, base, tip, and margin as well as buds, twigs, bark, flowers, fruit and petioles.

Learning outcome
2. Plant trees and shrubs

Topics
2.1   Plant bare-root and containerised stock
2.2   Provide appropriate support and immediate aftercare to trees

In this outcome learners will carry out planting, support and protection of trees and shrubs. Learners will complete a specified project that should include the planting of a range of nursery stock, use of differing planting techniques, the application of support, protection and immediate aftercare. Learners will meet the requirements of a specification, and should have an awareness of industry best practice requirements, commercial pressure and implications of poor working practices

Topic 2.1
Learners will plant bare-root and containerised stock using appropriate methods and in line with a given specification:
- appropriate planting method: mound planting, notch, pit planting, tree spades
- plant trees: work to planting specifications, check stock against order, correct transport and storage, distribution to ensure efficient planting, appropriate planting density and depth, correct working techniques, safe working practices, appropriate disposal of waste, leave worksite in a tidy condition, prevention of pollution, minimise environmental impact

Topic 2.2
Learners will demonstrate the application of support, protection and immediate aftercare of the planted stock in line with the specification:
- use appropriate supports as specified: stakes, frames, guys, ground anchors, tree-shelters
- apply appropriate aftercare as specified: fertilisers, irrigation, pruning, pesticides, mulch

Learning outcome
3. Establish trees and shrubs

Topics
3.1   The range of nursery stock
3.2   The equipment and methods available for establishing trees
3.3   The use of conditioners and ameliorants in tree establishment
3.4   Establish trees and shrubs

In this outcome the learners will explore the establishment of trees and shrubs in a variety of site conditions and requirements that inform the choice of tree species, as well as the choice of establishment methods and nursery stock. Learners will also establish trees and shrubs using appropriate methods and equipment.

Topic 3.1
Learners will know a range of nursery stock types, including: transplants, undercut, cuttings, plugs, whips, feathered trees, light standard, standard, heavy standard, semi mature. They will also understand the following stock categories: bare-root, root balled and containerised.

Topic 3.2
Learners will know suitable equipment and machinery available for establishing trees. This will include: spades (Standard, Schlick, Mansfield), graft and spike, hydraulic tree spades, rotary planters and augers.

Learners will also understand appropriate methods for planting trees, such as: notch, pit and mound.

Topic 3.3
Learners will know different conditioners and ameliorants in tree establishment. These will include: fertilisers, organic materials, mycorrhizae and water retention materials.

Topic 3.4
Learners will select and use suitable equipment to establish trees and shrubs using appropriate methods, taking the following into account:
- size, shape and depth of the pit
- appropriate support and protection
- water and drainage needs
- weed and pests control
- fertilisation, conditioners and ameliorants
- formative pruning

Learning outcome
4. Understand the aftercare requirements of trees and shrubs

Topics
4.1   Methods of protection.
4.2   Use of supports.
4.3   Aftercare requirements.

In this outcome learners will explore the methods of protecting and supporting trees after planting. This should extend to a range of site situations so that the learner can appreciate limitations, feasibility and effectiveness. They will also investigate the aftercare requirements of trees post planting and develop an awareness of the implications on success from poor practice, environmental factors, vandalism, pests and disease. It is accepted that this outcome will require formal delivery but it should be primarily delivered in practical situations.

Topic 4.1
Learners will understand a range of methods and materials available for protection following planting:
- mulching
- rabbit spirals and tree-shelters
- fencing
- guards
- tree cages
- tree grilles

Topic 4.2
Learners will understand a range of support techniques, equipment available and their application:
- canes
- stakes/ties
- underground anchors
- guy wires

Topic 4.3
Learners will know aftercare methods including inspection, beating-up, nutrition, formative pruning requirements, irrigation, mulching, adjustment/removal of support, weeding/competition management and pest/disease control.

Guidance for delivery

This unit is designed to provide the learner with the knowledge and skills required to successfully identify plants and care for trees appropriate to the area of study. The unit should cover as wide a range of planting and aftercare techniques as possible, appropriate to the area of study as well as those locally or regionally significant to the learners.

Throughout the unit, the emphasis should be on safe working and sound environmental practices. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is not a requirement for the learner to operate machinery to clear and prepare sites for planting or use hydraulic tree spades, but if machinery is used it must comply with relevant requirements of the Provision and Use of Work Equipment Regulations (PUWER) 1998. Health and safety issues relevant to any machinery and equipment used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is not a requirement for the learner to use fertilisers, pesticides or other methods of tree protection which require legal approval. Simulation and demonstration could be used to illustrate appropriate methods and equipment which are commonly used, but are unavailable to the learner.

Learners should be given sufficient opportunity to identify a wide range of woodland and amenity trees in their growth and dormant stages. They should also be encouraged to collect and preserve specimens as a means of improving their identification skills.
A wide range of site conditions and planting requirements should be available to study. These will inform the choice of tree species, as well as the choice of planting methods and stock.

The learner should be given the opportunity to explore the interaction between trees and infrastructure, as well as successful and unsuccessful planting combinations. They should also consider the aesthetic value of tree and shrub combinations and how this influences site establishment.

Suggested learning resources

Books
Anon. 2006. *Field Guide to the Trees and Shrubs of Britain.* Reader's Digest. ISBN 0276425073
Agate E. 2000. *Toolcare: A Maintenance and Workshop Manual.* BTCV, ISBN 0946752249
Agate E. 2001. *Fencing: A Practical Handbook* BTCV, ISBN 094675229X
Agate E. 2001. *Tree Planting and Aftercare: A Practical Handbook* BTCV, ISBN 0946752257
Agate E. 2002. *Woodlands: A Practical Handbook* BTCV, ISBN 0946752338
Coombes A 2000. *Trees* Dorling Kindersley, ISBN 0751327468
Hibberd B. 1991. *Forestry Practice* The Stationery Office Books, ISBN 0117102814
Johnson O and More D. 2006. *Collins Tree Guide* Harper Collins, ISBN 0007207719
Kerr G. 1993. *Growing Broadleaves for Timber* Forestry Commission, ISBN 0117103144
Mason WL. 1999. *Cultivation of Soils for Forestry.* Forestry Commission. ISBN 085538400X
May A and Panter J. 2000. *Guide to the ID of Broad-leaved Trees and Shrubs in Winter.* Field Studies Council.
Mitchell A. 1992. *Collins Field Guide: Trees of Britain and Northern Europe.* Harper Collins. ISBN 0002192136
Morgan JL. 1999. *Forest Tree Seedlings*. Forestry Commission. ISBN 0855384042
Pepper HW. 1992. *Forest Fencing.* Forestry Commission. ISBN 0855386886
Pepper HW. 1998. *The Prevention of Rabbit Damage to Trees in Woodland.* Forestry Commission. ISBN 0855383720
Pepper HW. 1999. *Recommendations for Fallow, Roe and Muntjac Deer Fencing: New Proposals for Temporary and Reusable Fencing.* Forestry Commission. ISBN 0855385057
Potter MJ. 1991. *Treeshelters*. Forestry Commission. ISBN 0117102881
Trout RC. 2006. *Forest Fencing.* Forestry Commission. ISBN 0855386886

Arboriculture and Forestry Advisory Group (AFAG) Safety Guides
BS 8545 (2014.) Trees: from nursery to independence in the landscape. Recommendations

Journals,magazines and guides
Arboricultural Association newsletter
Forestry and British Timber
Quarterly Journal of Forestry
The Garden

Websites
Cambridge university plant science pages   www-saps.plantsci.cam.ac.uk/trees
Woodland Trust   www.woodlandtrust.org.uk
http://www.forestry.gov.uk/pdf/ODW1002.pdf/$file/ODW1002.pdf
http://www.peakdistrict.gov.uk/__data/assets/pdf_file/0007/78865/treeplanting.pdf

Unit 352   Principles and identification of pests, diseases and disorders of trees

UAN:	L/507/4640
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to provide learners with an understanding of pests, diseases and disorders of trees and how this can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will develop a broad perspective of tree pathology and understand the range of common biotic pathogens and abiotic disorders. The signs and symptoms of common biotic pathogens and abiotic disorders will be described and the life cycles of biotic pathogens will be examined. In addition, the learner will evaluate appropriate monitoring, prevention and control measures for common biotic pathogens.

Learning outcomes
In this unit, learners will:
1. Understand the principles of ill health in trees
2. Diagnose signs and symptoms of common biotic pathogens and abiotic disorders
3. Understand common biotic pathogens.
4. Understand monitoring, prevention and control of common biotic pathogens

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome
1. Understand the principles of ill health in trees

Topics
1.1   The principles of ill health in trees
1.2   The common causes of ill health in trees
1.3   The consequences of pests, diseases and disorders for trees

In this outcome learners will investigate the common causes of ill health in trees, the consequences of disease and the systematic approach for the purpose of diagnosis, treatment and control. With a focus upon pathology, learners will develop a knowledge of the signs and symptoms of common diseases which should be relevant to their location.

Topic 1.1
Learners will know the requirements for healthy growth of trees and how to recognise unhealthy trees. They will also know a range of factors that pre-dispose trees to ill health, for example: age, environment and injury.

Topic 1.2
Learners will know a range of common causes of ill health in trees including:
- biotic pathogens: bacteria, fungi, vertebrate pests invertebrate pests, invasive plants
- abiotic disorders: wind, lightning, frost, drought, nutrient deficiencies, herbicides, air pollution, planting failure
- Human: vandalism, vehicle impact, fire damage, incorrect pruning cuts, mower damage, strimmer damage, root severance, lowered gradient, raised gradient and pollution etc.

Topic 1.3
Learners will understand the consequences of pests, diseases and disorders including:
- rot/ fungal colonisation
- physical damage
- growth reduction
- reduced vigour (increased susceptibility to further infection)
- loss of economic, aesthetic and amenity value
- premature death
- dangerous trees and risk assessment

Learning outcome
2. Diagnose signs and symptoms of common biotic pathogens and abiotic disorders

Topics
2.1   The signs and symptoms of common biotic pathogens
2.2   The signs and symptoms of common abiotic disorders
2.3   Diagnose damage to trees

In this outcome, learners will know a range of common pathogens and disorders of trees specific to their area of study. Learners will consider existing pathogens and disorders relevant to their geographical location but also have knowledge of potential threats from overseas. Learners will diagnose ill health using signs and symptoms, identification keys and sampling

Topic 2.1
Learners will understand a range of common biotic pathogens including:
- bacteria
- fungi - examples of Ascomycetes, Basidiomycetes and Oomycetes

- invertebrate pests - examples of Hemiptera, Hymenoptera, Lepidoptera, Coleoptera
- vertebrate pests–examples include squirrels, rabbits, deer hares and voles

Topic 2.2
Learners will understand the consequences of common abiotic disorders including lightning, drought, flooding, frost, herbicides, soil problems, nutrient deficiencies, road salt, air pollution, mechanical damage.

Topic 2.3
Learners will diagnose ill health in trees using signs and symptom recognition, sampling, use of identification keys.

Learning outcome
3. Understand common biotic pathogens

Topics
3.1 Lifecycles of common invertebrate, vertebrate, fungal and bacterial pathogens
3.2 The significance of the lifecycle for correctly identifying pathogens
3.3 Host and pathogen relationships

In this outcome learners will explore the life cycles of common pathogens in order to appreciate the host/pathogen relationship and the various stages of infection/infestation. Learners will also consider the significance of the lifecycle stages to aid the identification of pathogens and appreciate the host responses to infection.

Topic 3.1
Learners will know the lifecycles of a range of common pathogens including examples of fungi, bacteria, vertebrates and invertebrates. Learners will have a knowledge of reproduction methods and rates, breeding seasons, behavioural characteristics, growth and development, social structure, preferred habitat, food supply and preferences, natural population controls, mode of movement (insect vectors, wind spores, territory)

Topic 3.2
Learners will know the significance of life cycles of common pathogens that aid in their identification. A knowledge of seasonality and timing of signs and symptoms, visibility and occurrence (fructifications, grazing damage). Learners will also understand the consequences of misidentification including financial, legal, liability, environmental and reputation issues.

Topic 3.3
Learners will be expected to know the host/pathogen relationship of a range of common fungi, bacteria, vertebrate and invertebrates including colonisation and invasion strategies, factors promoting infection, host response mechanisms

Learning outcome
4. Understand monitoring, prevention and control of common biotic pathogens

Topics
4.1 Monitoring of common biotic pathogens
4.2 Prevention of common biotic pathogens
4.3 Control of common biotic pathogens
4.4 Legal and environmental considerations associated with control of common biotic pathogens

In this outcome learners will explore the control measures associated with common pathogens. They will gain an appreciation of the monitoring methods relevant to common pathogens including fungi, bacteria, invertebrate and vertebrate threats. They will also investigate the potential prevention and control measures available including the regulatory constraints of cultural, chemical

and biological intervention.

Topic 4.1
Learners will inspect trees in their immediate environment in order to ascertain the presence and significance of pathogens. They should have knowledge of: signs of insect and mammal activity, visual assessment, decay detection equipment, sampling methods.

Topic 4.2
Learners will understand the importance of promoting healthy tree growth in the prevention of ill health. They will explore the practicalities and limitations of: irrigation, feeding, approved repellents, physical barriers, fencing, tree shelters, breeding for natural resistance. Learners will also understand the importance of future species selection and planting plans utilised as a preventative measure to counteract the immigration of pests from other countries. Learners are also know the protocols for plant passports and import legislation, reportable pests and diseases and plant bio-security strategies.

Topic 4.3
Learners will know a range of control options for pests and diseases including:
- cultural
- chemical
- biological
- targeted intervention: timely and appropriate control measures within the life cycle of biotic pathogens.

Topic 4.4
Learners will know the legislation pertaining to practice and products for controlling tree pests and diseases including:
- Health and Safety at Work Act 1974
- Personal Protective Equipment (PPE)
- Food and Environment Protection Act 1990 (as amended)
- Control of Substances Hazardous to Health (2002) (COSHH)
- Wildlife and Countryside Act 1981 (as amended)
- Pests Act 1954 (as amended)
- Plant Health Act 1967 (as amended)

Learners should also explore the implications upon: non-target species, environmental effects of control methods, approved products, occupiers' responsibilities to visitors, risk assessment

Guidance for delivery

Throughout the unit, the emphasis should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is not a requirement for the learner to use pesticides or other approved methods of control. Learners must hold the appropriate Certificate of Competence (PA) required by law to apply pesticides if they do so. Simulation and demonstration could be used to illustrate appropriate control methods which are commonly used.

A learner working towards level 3 is likely to have experience of the promotion of the successful establishment and initial growth of healthy trees. This unit aims to extend the learner's knowledge and skills involved with ensuring the long term health of trees. Emphasis should be placed not only on 'doing', but also upon the importance of planning and strategies to promote tree health within their charge. It is important that the learner understands the importance of maintaining an awareness of current legislation and Codes of Practice in relation to tree health and disease management.

Centres are encouraged to introduce employers and specific professionals from the horticulture or forestry or arboriculture industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits throughout the year to add depth to the learner experience.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are linked directly with interactive lessons in a real environment. Learners will be given the opportunity to deal with a range of trees and pathogens in different situations which reflects current industry practice.

Suggested learning resources

Books

Bevan D. 1987. *Forest Insects.* The Stationery Office Books. ISBN 0117102008
Butin H, Lonsdale D and Strouts RG. 1995. *Tree Diseases and Disorders: Causes, Biology and Control in Forest and Amenity Trees*. Oxford University Press. ISBN 0198549326
Fay N, Dowson D and Helliwell R. 2005. *Tree Surveys: A Guide to Good Practice.* Arboricultural Association. ISBN 0900978388
Gregory S and Redfern D. 1998. *Diseases and Disorders of Forest Trees: A Guide to Identifying Causes of Ill-health in Woods and Plantations.* The Stationery Office Books. ISBN 0117103381
Lonsdale D. 1999. *Principles of Tree Hazard Assessment and Management*. The Stationery Office Books. ISBN 0117533556
Mattheck C. 2007. *Field Guide for Visual Tree Assessment*. Karlsruhe Research Centre. ISBN 9783923704590
Peace T. 2001. *Pathology of Tree and Shrubs*. Trollius Publications. ISBN 0953971813
Phillips DH and Burdekin DA. 1992. *Diseases of Forest and Ornamental Trees*. The Macmillan Press Ltd. ISBN 0333494938
Prior R. 1994. *Trees and Deer: How to Cope with Deer in Forest, Field and Garden*. Swan Hill Press. ISBN 1853104329
Schwarze F, Engels J, Mattheck C and Linnard W. 2000. *Fungal Strategies of Wood Decay in Trees*. Springer-Verlag. ISBN 3540672052
Schwarze F. 2008. *Diagnosis and Prognosis of the Development of Wood Decay in Urban Trees*. ENSPEC.
Strouts B and Winter T. 2000. *Diagnosis of Ill-Health in Trees, 2nd Edition*. The Stationery Office Books. ISBN 0117535451
Watson G. 2013. *Tree Pests and Diseases: An Arborists Field Guide*. Arboricultural Association. ISBN 9780900978-56-2
Watson G. and Green T. 2011. *Fungi on Trees; An Arborists Field Guide*. Arboricultural Association. ISBN 978-0-900978-55-5

Weber K and Mattheck C. 2003. *Manual of Wood Decays in Trees*. Arboricultural Association. ISBN 090097835X

Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Journals and magazines

Arboricultural Association newsletter
Arboricultural Journal
Forestry and British Timber
Horticultural Week
Journal of Arboriculture
Quarterly Journal of Forestry

Websites
www.arbtalk.co.uk
www.trees.org.uk
www.forestry.gov.uk

Unit 356   Tree and shrub pruning and maintenance

UAN:	M/507/4646
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to provide learners with an understanding of tree and shrub pruning and maintenance and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will understand the reasons for undertaking pruning of trees and shrubs and their varying requirements, as well as the law relevant to the work. Common equipment used to undertake this work will be examined, as well as the biological processes of trees and shrubs and their impact upon pruning and maintenance work. The learner will be able to assess trees and shrubs for failure and suggest appropriate pruning and other remedial action.

Learning outcomes
In this unit, learners will:
1. Understand the pruning of trees and shrubs
2. Prune and maintain trees and shrubs
3. Assess trees for potential failure.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome

1. **Understand the pruning of trees and shrubs**

Topics

1.1   The aims and considerations of pruning trees and shrubs
1.2   Pruning techniques
1.3   The immediate and long term biological processes of trees and shrubs in response to pruning and possible consequences of not pruning
1.4   Legislation relevant to pruning trees and shrubs

Topic 1.1
Learners will understand the common reasons for pruning which should include:
- health and safety
- physical access (pedestrian and vehicular)
- improvement of formative appearance (structure, flower, fruit)
- disease controls
- restoration

Learners should also be aware of the threat from competition for space, light, and nutrients. The financial constraints and client requirements of pruning should also be considered.

Topic 1.2
Learners will understand the common pruning techniques for trees and shrubs and the British Standard (3998) requirements for crown thinning, crown reduction, crown lifting, formative pruning, dead-wooding, pollarding and coppicing. Learners will also understand the natural target pruning process, branch collars, branch bark ridge, and be able to use appropriate tools and equipment to carry out pruning which should include a range of the above where appropriate.

Topic 1.3
Learners will understand how pruning impacts upon energy use, wound response and closure, storage and mobilisation of energy reserves, *Compartmentalisation* of Decay in Trees (CODIT), wound and callus growth and the development of epicormic and adventitious shoots. Learners will understand how the age, species of trees and environmental constraints affect pruning.

Topic 1.4
Learners will understand how legislation dictates, restricts and controls pruning operations and should include
- Planning processes, Town and Country Planning Act1990, Conservation areas, The Town and Country Planning (Tree Preservation)(England) Regulations 2012 (TPOs),
- Health and Safety at WorkAct 1974
- Wildlife and Countryside Act (1981) (as amended)
- Highways Act 1980
- Common law
- exemptions

Learners will also understand how failure to carry out pruning could result in nuisance, liability and negligence including high hedges and highway trees.

Learning outcome

2. Prune and maintain trees and shrubs

Topics

2.1 Plan the pruning and maintenance of trees and shrubs
2.2 Carry out appropriate pruning and maintenance of trees and shrubs

In this outcome learners will plan and carry out pruning work on trees and shrubs. It is not a requirement for the learner to climb or use other mechanisms to access tree crowns to undertake pruning for this outcome but where access/climbing occurs, this should be accompanied by appropriate risk assessment, management and supervision to ensure the safety of the learner.

Topic 2.1
Learners will to carry out a survey of tree and shrub condition to identify tree age classes, maintenance work required, prioritisation of work, protection measures and a schedule of works.

Topic 2.2
Learners will carry out tree and shrub pruning by selecting appropriate methods and equipment, as follows:
- correct pruning techniques,
- correct operation of tools and equipment,
- safe working practices
- appropriate disposal of waste,
- prevention of pollution
- minimising environmental impact.

Learning outcome

3. Assess trees for potential failure

Topics

3.1 The potential of trees for failure
3.2 Assess trees for potential failure
3.3 Remedial actions for potential failure

In this outcome learners will learn to assess trees using a range of techniques to understand the potential for failure and recommend remedial actions. The learners will be required to assess trees and shrubs for potential failure using a range of techniques. Learners will also know the range of equipment available for investigating internal condition. It is anticipated that the delivery of this outcome will require some formal delivery, but it should be delivered in practical situations and appropriate to the area of study. The learner is required to recommend structural supports and pruning as remedial actions. The potential to erect structural supports will vary according to the trees available and associated requirements, therefore simulation within realistic working environments or review of existing supports may be used if real-work opportunities are not available. It would be beneficial to include learning within the wider context of potential failure. Reference and links to current biomechanical theories explaining tree structure and development would enhance the learner's understanding.

Topic 3.1
Learners will know the variety of symptoms that can lead to failure in trees and shrubs including decay, structural weaknesses, injury, species characteristics, growth habit, site and environmental influences and factors

Topic 3.2
Learners will assess trees for failure using non-invasive methods, Visual Tree Assessment (VTA) and recognition of defects. Learners will also have an awareness of sounding and acoustic equipment, increment borer, fractometer, resistograph, radar, tomography devices, and static and dynamic

load testing equipment.

Topic 3.3
Learners will understand the range of remedial actions available in potential failure situations including invasive and non-invasive methods, cable bracing, flexible bracing, rod bracing, propping, guying, felling, pruning and the implications of these methods on health and safety, risk management and liabilities

Guidance for delivery

This unit is designed to provide the learner with sound knowledge and practical skills associated with the requirements to maintain trees and shrubs by pruning. The content and context of the unit should be adapted where possible to the learner's area of study. The unit should cover a range of trees and shrubs, as well as techniques and equipment, appropriate to the area of study and those that are locally or regionally significant to the learner. Consideration should be given to the seasonal nature and timing of pruning in relation to tree and shrub species, as well as when signs and symptoms associated with causes of potential failure may be easily observed.

It is anticipated that the delivery of this unit may initially focus mainly upon formal lectures but it is recommended that, as far as is possible, they are linked directly with interactive lessons in a real environment. Where practical learning is undertaken, the emphasis should be on safe working. It is expected that learners will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working.

Any legal permission required to prune trees must be obtained and equipment/machinery used must comply with relevant requirements of the Provision and Use of Work Equipment Regulations (PUWER) 1998. If chainsaws are used, the learner must hold a Certificate of Competence in Chainsaw and Related Operations.

Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is a requirement for the learner to use pruning equipment; health and safety issues relevant to the equipment being used must be stressed and regularly reinforced. In addition the learner should be actively involved in comprehensive risk assessment. Simulation and demonstration could be used to illustrate appropriate equipment and techniques, such as decay detection or bracing which are commonly used, but unavailable to the learner.

A learner working towards level 3 is likely to have experience of the promotion of healthy establishment and growth of trees. This unit aims to extend the learner's knowledge and skills involved with ensuring the long term health and management of trees and shrubs. Emphasis should be placed on the importance of planning and implementation of strategies to promote the health of trees within their charge and the practical application of current knowledge. Current and topical issues regarding pruning should be highlighted as and when they arise.

Centres are encouraged to introduce employers and specific professionals from the horticulture, forestry or arboriculture industries to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of establishments to add depth to the learner experience and enable them to examine pruned and un-pruned trees throughout the year.

Suggested learning resources

Books

Arboricultural Association. 1994.*A Guide to Tree Pruning*. Cheltenham: Arboricultural Association. ISBN 090097821X.

Arboricultural Association. 2005. *Arboricultural Association Health and Safety Package*. Cheltenham: Arboricultural Association. ISBN 0900978406

British Standards Institute. 2010. *Tree work - Recommendations (British standard 3998:2010).* London:British Standards Institution.

British Standards Institute. 2012. BS 5837:2012*Trees in relation to design, demolition and construction – Recommendations*. London: British Standards Institution. ISBN 0580464180

Brown G.E., Kirkham T. 2009. *The Pruning of Trees, Shrubs and Conifers*. Portland: Timber Press. ISBN 0881926132.

Lonsdale, D. 1999. *Principles of Tree Hazard Assessment and Management*. Norwich: Stationery Office Books. ISBN 0117533556.

Mattheck C. 2007. *Field Guide for Visual Tree Assessment*. Karlsruhe Research Centre. ISBN 9783923704590

Mynors, C. 2010. *The Law of Trees, Forests and Hedgerow.*London: Sweet and Maxwell. ISBN 0421590408.

Shigo A.L. 1989. *Tree Pruning: A Worldwide Photo Guide.* Snohomish: Shigo and Trees Associates. ISBN 0943563089.

Strouts, R.G., Winter, T.G. 2000. *Diagnosis of Ill-Health in Trees*. 2nd ed. Norwich: The Stationery Office Books. ISBN 0117535451.

Journals and magazines

Arboricultural Advisory Information Service publications
Arboricultural Association newsletter
Forestry and British Timber
Journal of Arboriculture
Quarterly Journal of Forestry
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides
Forest Industry Safety Accord (FISA) Safety Guides

Websites

The Arboricultural Association – resources page
                      http://www.trees.org.uk/Help-for-Arborists/Help-becoming-an-ArbAC
The Health and Safety Executive   http://www.hse.gov.uk/

Unit 357   Principles of silviculture

UAN:	T/507/4647
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to provide learners with an understanding of the principles of silviculture and how these can be put into practice. The learner will understand common silvicultural systems, as well as silvicultural techniques and practices used to successfully establish and manage a woodland or forest for commercial gain. Methods commonly used to protect and improve established forests and woodlands will also be examined. The learner will also examine the harvesting systems associated with common silvicultural systems. Learners will understand the silvicultural characteristics of key forestry species, and discuss alternative species for future use in British Forestry. Learners will also develop an understanding of sustainable forest management, particularly in relation to threats from climate change and pests and diseases.

Learning outcomes
In this unit, learners will be able to:
1. Understand common silvicultural systems and the silvicultural characteristics of a range of forestry species
2. Understand the requirements for the successful establishment of forests or woodland
3. Understand how to protect and improve forest and woodland
4. Understand common harvesting systems.
5. Understand the principals of sustainable forest management

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome

1. **Understand common silvicultural systems and the silvicultural characteristics of a range of forestry species**

Topics

1.1   Common silvicultural systems
1.2   Silvicultural characteristics of forestry species

In this outcome learners will be required to understand common silvicultural systems. It is accepted that this outcome will require formal delivery but it should be primarily delivered in practical situations. It would be beneficial to include learning within the wider context of silvicultural systems. For example, reference and links to non-timber management aims and objectives would enhance the learner's experience. Learners will also understand the silvicultural characteristics of a range of forestry species including those commonly used in British forestry, and those of potential use in the future. Current and topical issues should be highlighted as and when they arise.

Topic 1.1
Learners will understand common silvicultural systems, which should include:
- coppice
- coppice with standards
- clear-cutting system
- selection system
- group system
- strip system
- shelterwood system
- agroforestry systems

Topic 1.2
Learners will understand the silvicultural characteristics of a range of minimum 30 forestry tree species, including those commonly associated with British forestry, and those of potential use in the future. Characteristics should include:
- identification features
- site requirements (soil type, moisture regime, temperature regime, shelter, shade tolerance)
- pests and diseases
- appropriate silvicultural systems
- timber properties and uses

Learners should also be able to identify and describe the characteristics of a minimum of 10 shrub species associated with forest stands.

Learning outcome

2. Understand the requirements for the successful establishment of forests or woodland

Topics

2.1   The requirements of artificial and natural regeneration systems

In this outcome, learners will understand the requirements for the successful establishment of forests or woodland. It would be beneficial to include learning within the wider context of forestry establishment. Reference and links to common nursery practices would enhance the learner's experience. In addition, current and topical issues should be highlighted when they arise.

Topic 2.1
Learners will understand the requirements of artificial and natural regeneration systems including:
- high forest systems
- even aged/uniform/regular systems
- uneven aged/irregular systems
- species mixtures
- nurse crops
- underplanting
- direct seeding
- coppice systems

Learning outcome

3. Understand how to protect and improve forest and woodland

Topics

3.1   Techniques and practices to protect forests and woodlands from fire
3.2   Techniques and practices to protect forests and woodlands from pests and pathogens
3.3   Techniques and practices to protect forests and woodlands from weeds
3.4   Management objectives and maintenance practices associated with individual silvicultural systems

In this outcome learners will understand how to protect and improve forests and woodlands. The learner should be able to experience as wide a range of real examples of techniques and methods as possible; this may vary according to the forest sites available.

Topic 3.1
Learners will understand the causes of fire, ignition sources, danger periods, types of fire (ground, surface, crown), fire behaviour, impact upon crop, financial implications and insurance.

Learners will need an awareness of fire prevention methods: ride layout and removal of combustible material. Learners will also know about approaches to firefighting including communication systems, water supplies, emergency services, provision and location of equipment.

Topic 3.2
Learners will understand techniques and practices to protect forests and woodland from pests and pathogens including bacteria, fungi, vertebrate pests (rabbits, deer, squirrels, humans), and invertebrate pests. The impact upon crop and financial implications will also be discussed.

Learners will know survey methods including monitoring of faeces, damage type, timing of damage, distribution and frequency of damage and decay detection equipment.

Learners will know trapping methods (including approved traps, use of pheromones, pesticides and repellents), physical barriers (fencing, tree shelters, guards) and breeding for natural resistance (species selection, plant passports and import legislation, biological control (predators and

parasites), shooting and culling, pruning and sanitation felling).

Topic 3.3
Learners will understand techniques and practices to protect forests and woodlands from competing vegetation including woody vegetation, herbaceous vegetation and grass.

Learners will understand appropriate control methods including approved herbicides, mulching, tree shelters, manual weeding, motor-manual weeding and mechanised weeding. The impact upon crop and financial implications will also be considered.

Topic 3.4
Learners will understand the management objectives and maintenance practices associated with individual silvicultural systems. Management objectives will include: improvement of timber qualities, improvement of access, improvement of form, increasing visibility, minimising windthrow risk, management of competition, weed control and maintenance of optimum stocking densities. Learners will understand management practices including:
- thinning: thinning methods (manual, motor-manual, mechanised), thinning intensity, thinning cycles, timing, thinning regime (systematic, selective), thinning yield, residual stand characteristics
- re-spacing: methods (manual, motor-manual, mechanised), timing (eg crown closure)
- brashing and pruning: types (formative pruning, high pruning), residual stand characteristics, timing

The impact of management practices upon the crop and financial implications will also be considered.

Learning outcome
4. Understand common harvesting systems

Topics
4.1   Harvesting activities associated with common silvicultural systems

In this unit learners will understand common forest harvesting systems. It is anticipated that the delivery of this outcome will require some formal sessions but it should be primarily delivered in practical situations. The learner should be able to experience as wide a range of real examples of systems and methods as possible; this may vary according to the forest sites available.

Topic 4.1
Learners will understand the features of common harvesting systems including:
- tree length system
- shortwood system
- whole tree system
- felling and delimbing methods (manual, motor-manual, mechanised),
- extraction to roadside (skidder, forwarder, cable crane, horse), transport to market, road systems (planning, design, construction, intensity)
- terrain classification and machinery optimisation
- windthrow risk
- crop characteristics and market requirements.

Learning outcome
5. Understand the principals of sustainable forest management

Topics
5.1   Principles of sustainable forest management

In this outcome learners will develop an understanding of sustainable forest management in the UK. It is anticipated that delivery of this outcome will primarily involve formal classroom delivery,

Guidance for delivery

This unit is designed to provide the learner with the knowledge of the principles of sustainable silviculture associated with the successful raising, tending and harvesting of forest crops. The unit should cover as wide a range of common operations as possible to enable the learner to adapt and apply their knowledge to the range of forest and woodland types they may encounter and focus on methods locally or regionally significant to the learner.

Throughout the unit, the emphasis should be on safe working and good environmental practices. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a not requirement for learners to operate or use equipment. However, if the learner is given the opportunity to undertake practical silvicultural techniques and practices, health and safety issues relevant to any equipment used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the equipment and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is not a requirement for the learner to use pesticides or other approved chemical or trapping methods. Simulation and demonstration should be used to illustrate appropriate methods and equipment, particularly those commonly used, but unavailable to the learner.

A learner working towards level 3 is likely to have experience of practical forestry activities. This unit aims to extend the learner's knowledge and skills involved with the practical establishment and maintenance of healthy forests and woodlands. Emphasis should be placed upon the importance of long term planning and strategies to ensure safe, efficient, effective and successful implementation of tree management systems. It is important that the learner understands the importance of maintaining awareness and understanding of current legislation and Codes of Practice in relation to forest and woodland management.

Centres are encouraged to introduce employers and specific professionals from the forestry industry to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner experience by studying sustainable management systems and machinery in operation. The unit should be delivered throughout the year, with consideration given to appropriate seasonal aspects of forest and woodland work and the impact of extreme weather conditions on operations.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are they are linked directly with interactive practical lessons in a real environment. The learner must be given the opportunity to examine a wide range of harvesting and extraction equipment and machinery in different forest and woodland situations which reflects current industry practice. It is anticipated that the range of machinery may include that adapted from the construction or agricultural industries as well as purpose built equipment.

Suggested learning resources

Books

Agate E. 2001. *Tree Planting and Aftercare: A Practical Handbook*. BTCV. ISBN 0946752256
Agate E. 2002. *Woodlands: A Practical Handbook.* BTCV. ISBN 0946752331
CAB 2014. *THE Forestry Compendium*
Evans J. 1984. *Silviculture of Broadleaved Woodlands.* The Stationary Office Books. ISBN 0117101548
Hart C. 1995. *Alternative Silvicultural Systems to Clear Cutting in Britain: A Review.* The Stationary Office Books. ISBN 0117103344
Hibberd B. 1991. *Forestry Practice*. The Stationery Office Books. ISBN 0117102811
Kerr G. 1993. *Growing Broadleaves for Timber.* Forestry Commission. ISBN 0117103146
Kerr G and Haufe, J. *Thinning Practice - A Silvicultural Guide*. Forestry Commission, ISBN
Matthews JD. 1991. *Silvicultural Systems.* Oxford University Press. ISBN 0198546702
Mason WL. 1999. *Cultivation of Soils for Forestry.* Forestry Commission. ISBN 0855384005
Potter MJ. 1991. *Treeshelters.* Forestry Commission. ISBN 0117102880
Savill P. 1991. *The Silviculture of Trees used in British Forestry.* CABI Publishing. ISBN 0851987392
Savill P, Evans J, Auclair D and Falck J. 1997. *Plantation Silviculture in Europe.* Oxford University Press. ISBN 0198549086
Trout RC. 1992. *Forest Fencing.* Forestry Commission. ISBN 0117103047

Best Practice Guidance including Forest Industry Safety Accord (FISA) and Arboriculture and Forestry Advisory Group (AFAG)

Journals and magazines

Forestry and British Timber
Quarterly Journal of Forestry
The UK Forestry Standard

Websites

Forestry Commission   http://www.forestry.gov.uk/england
Forest Research   http://www.forestry.gov.uk/forestresearch

Unit 364   Principles of amenity or forestry establishment

UAN:	D/507/4674
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to provide learners with an understanding of tree and shrub establishment and protection and how these can be put into practice. This unit is primarily aimed at learners within a centre-based setting looking to progress into the sector or to further education and training.

The learner will understand the importance to society and the environment of tree establishment. The objectives of tree establishment, possible financial support and legal considerations will also be examined. The learner will also develop their understanding of the limitations of common establishment and protection methods and be able to develop their practical skills to establish and protect either amenity or forest trees.

Learning outcomes
In this unit, learners will:
1. Identify woody plants
2. Understand the site and establishment requirements of trees and shrubs
3. Understand the environmental and legal considerations relevant to tree establishment and protection
4. Plan for successful amenity or forestry establishment

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome

1. Identify woody plants

Topics

1.1 Identifying woody plants by botanical names.
1.2 Dendrological features of woody plants

Topic 1.1
Learners will identify relevant woody plants (minimum 80) using the genus and specific epithet in accordance with the binomial naming system.

Topic 1.2
Learners will understand dendrological features of woody plants selected in Topic 1.1, eg:
leaf, buds, leaf and buds scars, bark, lenticels, flowering form, fruit/seed formation and dispersal, crown habit

Learning outcome

2. Understand the site and establishment requirements of trees and shrubs

Topics

2.1 The suitability of trees and shrubs for a variety of conditions
2.2 The influence of infrastructure on the selection of trees and shrubs
2.3 The factors that influence plant selection

Topic 2.1
Learners will evaluate the suitability of trees and shrubs for a variety of situations, including:
exposed sites, confined sites, weedy sites, compacted soils, poor drainage/wet sites, shallow soil depth, dry, acid soils, clay and sandy soils.

Topic 2.2
Learners will understand the influence of infrastructure on the selection of trees and shrubs such as:
underground and overhead services, highways, footpaths, rights of way, easement, building foundations, non-poreous surfacing, reflective surfaces and sustainable urban drainage systems.

Topic 2.3
Learners will describe the factors that influence plant selection such as: ultimate size, shape, seasonal colour, flowering period, hardiness, ability to cope with site specific conditions eg high or low water availability, aesthetic value, root spread, fruit production, possible seasonal nuisance, arboricultural or silvicultural merit.

Learning outcome

3. Understand the environmental and legal considerations relevant to tree establishment and protection

Topics

3.1 Benefits to society of tree establishment.
3.2 Financial support available for tree establishment and protection.
3.3 Environmental considerations associated with tree establishment and protection.
3.4 The legal considerations associated with tree establishment and protection

In this outcome learners will consider the range of benefits to society and the growing importance of green infrastructure as well as the practical aspects of tree planting. They will also explore the environmental and legal considerations pertaining to the establishment of trees.
A thorough knowledge of funding opportunities is vital and should emphasise the use and application of grants, sponsorship and associated support.

Topic 3.1
Learners will understand how trees benefit society through reduced pollution, improved air quality, increased employment prospects, increased visitor numbers, increased property values, increased access to the countryside, healthier lifestyles, community interaction, social improvements, reduced energy consumption, financial benefits, regeneration of derelict and industrial land, improved landscapes, increased wildlife habitat and diversity

Topic 3.2
Learners will know the potential financial support opportunities for planting schemes such as commercial loans, sponsorship, grants and fundraising

Topic 3.3
Learners will understand the environmental aspects of tree establishment including the requirements under the control of pollution legislation, oil and fuel spillage and storage, soil stability and erosion, soil compaction, nesting and breeding seasons, protected species, waste disposal, watercourses, archaeology, brash matting

Topic 3.4
Learners will understand how legislation and industry standards apply to tree establishment practices and could include the Control of Substances Hazardous to Health (2002), Environmental Protection Act 1990 (as amended), Food and Environmental Protection Act 1990 (as amended), Wildlife and Countryside Act 1981 (as amended), Highways Act (1980), Plant Health Act 1967 (as amended) specifically the phytosanitary certification and import requirements, Forestry Act 1967 (as amended) BS 8545-2013 Trees: from nursery to independence in the landscape - Recommendations
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides

Learning outcome

4. Plan for successful amenity or forestry establishment

Topics

4.1 Future considerations of tree establishment
4.2 Methods of site preparation
4.3 Produce planting specifications

In this outcome learners will plan tree establishment using knowledge of species characteristics, site appraisal and preparation, and the formulation of a planting specification appropriate to a selected project. They will also investigate the developing technologies and materials available for the establishment of urban trees and the potential for wider urban planting.

Topic 4.1

Learners will understand the future considerations for tree establishment, eg: mature size, growth rate, timber characteristics, root morphology, water requirements, resilience (pest and diseases, climate), longevity, future maintenance requirements and phenology

Topic 4.2

Learners will understand the methods of site preparation prior to the establishment of trees and shrubs including:

- Site appraisal: aspect, micro-climate, prevailing problems, soil type, pH, indicator species.
- Surface preparation: mowing, herbicide application, cultivation
- Hand preparation of soil: digging with spades, slitting
- Mechanical soil preparation: ploughing and cultivation including sub-soiling, use of borers (handheld and tractor mounted), use of tree spades, slitters, rotavators, spading machines, scarifying, mulching, mounding and dolloping
- Specialised urban planting systems : tree pits, paved zones, geo-grids, cellular confinement , structural soil

Topic 4.3

Learners will prepare a planting specification for a given project. The specification will include:

- Site preparation requirements
- Species, quantity, spacing, quality and type trees and shrubs
- Planting method: mound planting, notch, pit planting, tree spades
- Planting protection: tree shelters, fencing, guards, mulching
- Equipment, storage and transport, irrigation

Guidance for delivery

This unit is designed to provide the learner with the sound knowledge and skills required to successfully establish and protect trees appropriate to the area of study. The unit should cover as wide a range of establishment and protection techniques as possible, appropriate to the area of study as well as those locally or regionally significant to the learner.

Throughout the unit, the emphasis should be on safe working and sound environmental practices. It is expected that the learner will be aware of safe working practices and familiar with accepted practices and behaviours within the context in which they are working. It is a requirement for learners to operate machinery to clear and prepare sites for planting therefore health and safety issues relevant to the machinery used must be stressed and regularly reinforced. The learner should be actively involved in comprehensive risk assessment. Adequate Personal Protective Equipment (PPE) appropriate to the learner, the machinery and the task must be provided and worn in accordance with the associated risk assessment, industry guidance and operator's manual. It is not necessary for the learner to use fertilisers, pesticides or other methods of tree protection which require legal approval. Simulation and demonstration could be used to illustrate appropriate methods and equipment which are commonly used, but which are unavailable to the learner.

A learner working towards level 3 is likely to have experience of practical forestry or arboricultural activities. This unit aims to extend the learner's knowledge and skills involved with ensuring the successful establishment and protection of healthy trees and forests. Emphasis should be placed not only on 'doing', but also upon the importance of planning and strategies to ensure safe, efficient and effective operations. It is important that the learner understands the importance of maintain an awareness of current legislation and Codes of Practice in relation to establishment and protection work.

Centres are encouraged to introduce employers and specific professionals from the forestry and arboriculture industries to provide interesting and relevant information to the learner. Teaching would also benefit from visits to a variety of working sites and trade shows to add depth to the learner's experience. In addition, current and topical issues regarding tree establishment and protection should be highlighted as and when they arise.

It is anticipated that the delivery of this unit will be delivered through supervised practical training and the learner be able to consolidate operational skills within realistic working environments. The unit should be delivered throughout the year, with consideration given to appropriate seasonal aspects of tree planting and the impact of weather extremes on operations.

It is accepted that formal lectures will be necessary at level 3 but for this unit it is recommended that they are linked directly with interactive practical lessons in a real environment. The learner must be given the opportunity to work with a range of equipment and machinery in different establishment situations which reflects current industry practice.

Suggested learning resources

Books

Agate E. 2000. *Tool care: A Maintenance and Workshop Manual.* BTCV, ISBN 0946752249
Agate E. 2001. *Fencing: A Practical Handbook* BTCV, ISBN 094675229X
Agate E. 2001. *Tree Planting and Aftercare: A Practical Handbook* BTCV, ISBN 0946752257
Agate E. 2002. *Woodlands: A Practical Handbook* BTCV, ISBN 0946752338
Hibberd B. 1991. *Forestry Practice* The Stationery Office Books, ISBN 0117102814
Kerr G. 1993. *Growing Broadleaves for Timber* Forestry Commission, ISBN 0117103144
Mason WL. 1999. *Cultivation of Soils for Forestry.* Forestry Commission. ISBN 085538400X
Pepper HW. 1992. *Forest Fencing.* Forestry Commission. ISBN 0855386886
Pepper HW. 1998. *The Prevention of Rabbit Damage to Trees in Woodland.* Forestry Commission. ISBN 0855383720
Trout RC. 2006. *Forest Fencing.* Forestry Commission. ISBN 0855386886
Potter MJ. 1991. *Tree shelters*. Forestry Commission. ISBN 0117102881
Pepper HW. 1999. *Recommendations for Fallow, Roe and Muntjac Deer Fencing: New Proposals for Temporary and Reusable Fencing.* Forestry Commission. ISBN 0855385057
Arboriculture and Forestry Advisory Group (AFAG) Safety Guides.

Journals and magazines

Arboricultural Association newsletter
Forestry and British Timber
Quarterly Journal of Forestry

Websites

Forestry Commission   www.forestry.gov.uk
Conservation volunteers   www.tcv.org.uk

Appendix 1   Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on **www.cityandguilds.com**.

City & Guilds Centre Manual
This document provides guidance for organisations wishing to become City & Guilds approved centres, as well as information for approved centres delivering City & Guilds qualifications. It covers the centre and qualification approval process as well as providing guidance on delivery, assessment and quality assurance for approved centres.

It also details the City & Guilds requirements for ongoing centre and qualification approval, and provides examples of best practice for centres. Specifically, the document includes sections on:
- the centre and qualification approval process
- assessment, internal quality assurance and examination roles at the centre
- registration and certification of candidates
- non-compliance and malpractice
- complaints and appeals
- equal opportunities
- data protection
- management systems
- maintaining records
- internal quality assurance
- external quality assurance.

Our Quality Assurance Requirements
This document explains the requirements for the delivery, assessment and awarding of our qualifications. All centres working with City & Guilds must adopt and implement these requirements across all of their qualification provision. Specifically, this document:
- specifies the quality assurance and control requirements that apply to all centres
- sets out the basis for securing high standards, for all our qualifications and/or assessments
- details the impact on centres of non-compliance

The **centre homepage** section of the City & Guilds website also contains useful information on
- **Walled Garden**: how to register and certificate candidates on line
- **Events**: dates and information on the latest Centre events
- **Online assessment**: how to register for e-assessments.

Useful contacts

UK learners

General qualification information

E: learnersupport@cityandguilds.com

International learners

General qualification information

E: intcg@cityandguilds.com

Centres

Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results

E: centresupport@cityandguilds.com

Single subject qualifications

Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change

E: singlesubjects@cityandguilds.com

International awards

Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports

E: intops@cityandguilds.com

Walled Garden

Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems

E: walledgarden@cityandguilds.com

Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

E: business@cityandguilds.com

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: **feedbackandcomplaints@cityandguilds.com**

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. City & Guilds is understand and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group is a leader in global skills development. Our purpose is to help people and organisations to develop their skills for personal and economic growth. Made up of City & Guilds, City & Guilds Kineo, The Oxford Group and ILM, we work with education providers, businesses and governments in over 100 countries.

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