T-LEVELS | IfATE Institute for Apprenticeships and Technical Education

T Level Technical Qualification in Agriculture, Land Management and Production

Specification

First teaching from September 2023

Version 3.0

City & Guilds

Qualification at a glance

T Level route	Agriculture, Environmental and Animal Care
T Level pathway	T Level Technical Qualification in Agriculture, Land Management and Production
City & Guilds number	8717
Age group approved	16-18
Entry requirements	Formal entry requirements are not set by City & Guilds. However, it is expected that Learners have the appropriate attainment at Level 2 before commencing their studies.
Assessment	Core – knowledge test is externally assessed Core – employer-set project is externally assessed Occupational Specialisms are externally set, externally moderated
First registration	September 2023

Title and level	City & Guilds number	Qualification Number (QN)
T Level Technical Qualification in Agriculture, Land Management and Production (Level 3)	8717	610/2933/6

Version and date	Change Detail	Section
v0.1 May 2023	Draft version pre-approval	n/a
v2.0 June 2023	Approved version	n/a
V2.1 January 2024	Minor wording amendments. Front cover image added.	2 Centre requirements 5 Scheme of assessment
V2.2 DRAFT September 2024	Addition of 413 Livestock Production Occupational Specialism (For 2024 cohorts onwards)	1 Introduction 2 Centre requirements 413 Livestock Production

	Amended Physical Resources section to include 413 Livestock Production (For 2024 cohorts onwards) Amended OS Centre Staffing requirements for clarity	2 Centre requirements 2 Centre requirements
V3.0	Approved version - addition of unit 413 Livestock Production Occupational Specialism (For 2024 cohorts onwards)	1 Introduction 2 Centre requirements 413 Livestock Production

We would like to take this opportunity to thank all the employers, trade associations, professional bodies, providers, subject matter experts and consultants who have dedicated time to review and validate the specifications and TQ documentation. This collaborative work is to ensure that a student studying the Agriculture, Land Management and Production T Level has the best opportunities available to them as they progress through their career with a solid base as a starting point.

- Soil Association
- John Hurd's Watercress
- British Florist Association
- Morrisons Plc
- IAGRE
- City of London
- Reaseheath College
- Hartpury College
- Cirencester College
- East Durham College
- Plumpton College
- Hereford, Ludlow & North Shropshire College
- Askham Bryan College
- Shipley College
- Bishop Burton College
- Eccles Sixth Form College
- Suffolk New College
- Myerscough College
- Sparsholt College
- Royal Botanical Gardens, Kew
- Landex
- NLBC
- National Farmers Union

The Outline Content for the T Level Technical Qualification in Agriculture, Environmental and Animal Care: Agriculture, Land Management and Production has been produced by T Level panels of employers and professional bodies and is based on the same standards as those used for Apprenticeships. The outline content can be found on the Institute website:

www.instituteforapprenticeships.org/t-levels/approved-t-level-technical-qualifications-and-final-outline-content/

City & Guilds has amplified the Outline Content to create the Technical Qualification specifications.

Contents

1 Introduction

What is this qualification about?

The following purpose statement relates to the **T Level [1] Technical Qualification in Agriculture, Land Management and Production (Level 3)**.

Area	Description
OVERVIEW	
What is a T Level?	T Levels are new courses which will follow GCSEs and will be equivalent to three A Levels. These two-year courses have been developed in collaboration with employers and businesses so that the content meets the needs of industry and prepares learners for work. T Levels are one of three post 16 options for young people which are: • A Levels • Apprenticeships • T Level
How does the Technical Qualification work within the T Level?	This Technical Qualification specification contains all the required information you need to deliver the qualification in the T Level Technical Qualification in Agriculture, Land Management and Production (Level 3). The Technical Qualification forms a significant part of the T Level Technical Qualification in Agriculture, Land Management and Production (Level 3). City & Guilds are responsible for the development and ongoing operational delivery of this Technical Qualification. All other parts of the T Level as listed below will need to be achieved by a Learner for the Department for Education to award the successful completion of this T Level. It is important to note that City & Guilds do not have responsibility of delivery for the other parts of the T Level but will continue to support centres where they can on all aspects of T Level delivery. Additional mandatory parts of the T Level that need to be achieved: • An industry placement of 315–350 hours (45–50 days).
Who is this qualification for?	This qualification is for you if you are a 16–18 year-old learner, who wishes to work within the Agriculture, Land Management and Production industry. It has been designed to deliver a high level of knowledge about the industry as well as the occupational skills required to enter the

[1] T Level is a registered trade mark of the Institute for Apprenticeships and Technical Education

	industry (known as ‘threshold competence’). A learner who completes this qualification is well placed to develop to full occupational competence with the correct support and training.
What does this qualification cover?	The qualification will help you gain an understanding of the Agriculture, Land Management and Production industry and you will cover topics such as: • Health and safety • Business • Working in agriculture, environmental and animal care • Sustainability. A learner will have the choice of studying one standalone Occupational Specialism as listed below: • Crop production • Floristry • Land-based engineering • Livestock production • Ornamental and environmental horticulture and landscaping • Tree and woodland management and maintenance 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.
WHAT COULD THIS QUALIFICATION LEAD TO?	
Will the qualification lead to employment, and if so, in which job role and at what level?	This technical qualification focuses on the development of knowledge and skills needed for working in the Agriculture, Land Management and Production sector, which will prepare learners to enter the industry through employment or as an Apprentice. Furthermore, the completion of this qualification gives the learner the opportunity to progress onto higher education courses and training.
Why choose this qualification?	This technical qualification will suit someone who is not yet employed or looking to enter the industry post mainstream education. The structure of the qualification is designed to give learners the breadth of knowledge and understanding across the Agriculture, Land Management and Production industry but also equips them with necessary occupational and core skills to enter the industry. This qualification is designed to support fair access and allows learners to manage and improve their own performance.
WHO SUPPORTS THIS QUALIFICATION?	
Employer route panels	The content of this qualification is outlined by a representative panel of employers from across the industry sector. It therefore prescribes the minimum knowledge and skills required to enter the industry. The content in this specification is approved by the Institute for Apprenticeships and Technical Education (IfATE).

Key information

Below is a summary of the key information provided to centres to support delivery of this technical qualification.

Guided learning hour (GLH) value

This value indicates the average number of guided learning hours a unit will require for delivery to a learner. This includes contact with tutors, trainers or facilitators as part of the learning process, and includes formal learning such as classes, training sessions, coaching, seminars and tutorials. This value also includes the time taken to prepare for, and complete, the assessment for the unit. Guided learning hours are rounded up to the nearest five hours.

Total qualification time (TQT) value

This 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 and study.

Criteria

This section of the specification outlines the subject or topic that needs to be delivered and assessed. Criteria are often supported by **'range'** which provides the detail of the information required to be delivered as part of that topic. For example, with 'Design processes' as the topic, the range would list the processes that would need to be covered in delivery and assessment.

What do learners need to learn?

The primary purpose of these sections is to support the delivery of the content in the criteria. These sections provide context in relation to the depth and breadth to which a subject or topic needs to be taught.

Skills

This section provides a mapping reference to the core, maths, English and digital skills that are embedded within the technical qualification content.

Example

2.5 Waste management **principles.**

Range:

Principles – Reduce, reuse, recycle, recover.

What do learners need to learn?	**Skills**
Key requirements of associated legislation – Controlled waste (England and Wales) Regulations 2012. Types of materials that require specific actions – controlled waste, hazardous waste. Measures in place by the sector and organisation to meet requirements.	CSA, CSC, CSD, CSE, EC4, EC5.

T Level structure

To achieve the T Level learners must meet all requirements of the T Level framework of which the technical qualification is one part. Learners have to successfully complete an industry placement and any other requirements set by the Institute for Apprenticeships and Technical Education (IfATE) such as licence to practice qualifications.

Technical qualification structure

The technical qualification is made up of **two** components both of which need to be successfully achieved to attain the technical qualification as well as the full T Level Technical Qualification in Agriculture, Environmental and Animal Care: Agriculture, Land Management and Production (Level 3).

The core component:

The core component is made up of the common core and the core pathway. The common core content is designed to offer sufficient breadth of knowledge for the learner to apply in a variety of contexts related to the Agriculture, Environmental and Animal care industry and those Occupational Specialisms linked to this T Level.

The common core content is the building blocks of knowledge and skills that will give a learner a broad understanding of the industry and job roles. At the same time, it will develop the core skills they will need to apply when working within the industry.

The core pathway content is designed to offer sufficient breadth of knowledge for the learner to understand contexts related to a particular sector/sector in the Agriculture, Environmental and Animal care industry and those Occupational Specialisms linked to this T Level.

The core pathway content is the building blocks of knowledge that will give a learner a broad understanding of an Occupational Specialism industry sector/sectors, and at the same time, will develop the core skills they will need to apply when working within the industry.

Occupational Specialisms:

Occupational Specialisms develop the knowledge, skills and behaviours necessary to achieve threshold competence in an occupation. Threshold competence is defined as when a learner's attainment against the knowledge, skills and behaviours is of a standard for them to enter the occupation and industry. They must also demonstrate the ability to achieve occupational competence over time with the correct support and training.

To achieve the **T Level Technical Qualification in Agriculture, Land Management and Production (Level 3) (delivered by City & Guilds)** learners must complete **two** components of the Technical Qualification. These are known as the common component and the Occupational Specialism component. Learners must also ensure they complete a core pathway in the same industry sector as their chosen Occupational Specialism:

- (300) plus one from (301–304) plus one from (400–406 or 413)

	T Level Technical Qualification in Agriculture, Environmental and Animal Care: Agriculture, land management and production (Level 3)				
Programme of study (POS)	**City & Guild specification component number**	**Title**	**Level**	**GLH**	**TQT**
	Mandatory common core component				
	300	Agriculture, environmental and animal care	3	160	226
	Choose one mandatory core pathway				
8717-31	031	Crop, woodland and horticulture	3	210	290
8717-32	032	Land-based engineering	3	270	370
8717-33	033	Livestock	3	270	370
8717-34	034	Floristry	3	210	290
	Choose one standalone Occupational Specialism component				
8717-40	400	Crop production	3	1000	1370
8717-41	401	Floristry	3	950	1300
8717-42	402	Land-based engineering	3	970	1400
8717-43	403	*Livestock production (For September 2023 cohort only)	3	940	1300
	413	*Livestock production (September 2024 onwards)	3	930	1300
8717-44	404	Ornamental and environmental horticulture and landscaping	3	1000	1500
8717-45	405	Tree and woodland management and maintenance (Arboriculture)	3	1000	1500
8717-46	406	Tree and woodland management and maintenance (Forestry)	3	1000	1500

** All candidates starting this qualification from September 2024 onwards who wish to take the Livestock Production Occupational Specialism, must register on 8717-43 and make bookings on 8717-413.*

2 Centre requirements

Approval

All eligible providers must obtain Full Provider Approval with City & Guilds prior to delivering any T Level Technical Qualification (TQ).

Provider approval is not equivalent to centre approval; any provider which is already an existing City & Guilds approved centre must still obtain Full Provider Approval in the first instance. There is no fast-track approval for these qualifications.

Once successfully approved, providers can apply for additional TQs or apply to add additional occupational specialisms (OS) during each approval window.

The approval application consists of a comprehensive set of approval criteria agreed with the Institute to ensure an eligible provider is fit and ready to deliver T Level Technical Qualifications.

These criteria seek to ensure the integrity of the qualifications for both City & Guilds and the Institute. They must be adhered to throughout the delivery of the TQ and will be reviewed at the annual self-assessment.

Criteria A Management systems
Criteria B Industry placement
Criteria C Resources
Criteria D Delivery
Criteria E Secure live assessment and administration
Criteria F Assessment and standardisation plan
Criteria G Conflicts of Interest (COI)

Please refer to our published provider approval and quality assurance information document available on our website here. This document includes information around the approval process, criteria for approval and the timeline for the relevant academic year.

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 and assessing these qualifications should be able to demonstrate that they meet the following requirements. They should:

- be occupationally competent and qualified at or above the level they are delivering
- have maths and English at Level 2 or be working towards this level of qualification
- 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 CPD
- have experience or training in the following to support the delivery of this technical qualification:
  - delivering project-based qualifications
  - preparation for examination-based assessments

Agriculture, environmental and animal care Common Core

Staff who are familiar with Level 3 Land and Animal qualifications will be able to teach the common core elements.

Occupational Specialisms specific requirements

Crop production

- Be technically competent at Level 3 or above in areas of crop production that is being delivered
- Experience of field-based and container-based crop production across the range of delivery and assessment staff
- Technical instructors must be qualified to the same level as teachers and assessors but if not, must work under the support and guidance of appropriately qualified staff
- Centres should show evidence of teachers and assessors attending manufacturers courses, continuously attending relevant CPD events that supports delivery of the qualification content such as field days, trade shows such as Cereals, LAMMA, Four Oaks etc. and subscribing to relevant technical updates and professional memberships

Floristry

- Be technically competent at Level 3 or above in Floristry
- Technical instructors must be qualified to the same level as teachers and assessors but if not, must work under the support and guidance of appropriately qualified staff
- Centres should show evidence of teachers and assessors continuously attending relevant CPD that supports the delivery of the qualification content

Land-based engineering

- Be technically competent at Level 3 or above in land-based engineering)
- Appropriate certification for the equipment and machinery
- Technical instructors must be qualified to the same level as teachers and assessors but if not, must work under the support and guidance of appropriately qualified staff
- Centres should show evidence of teachers and assessors attending manufacturers courses, continuously attending relevant CPD that supports the delivery of the qualification content and events run through the Association of Lecturers Agricultural Machinery (ALAM), The Institution

of Agricultural Engineers (IAgrE) conferences, branch meetings, trade shows such as LAMMA etc., and subscribing to relevant technical updates and professional memberships

Livestock

- Be technically competent at Level 3 or above in Livestock production
- Technical instructors must be qualified to the same level as teachers and assessors but if not, must work under the support and guidance of appropriately qualified staff
- Centres should show evidence of teachers and assessors attending manufacturers courses, continuously attending relevant CPD that support the delivery of the qualification content including events run through local veterinary practices, trade shows such as British Pig & Poultry Fair, LAMMA etc., and subscribing to relevant technical updates and professional memberships

Ornamental and environmental horticulture and landscaping

- Be technically competent at Level 3 or above in relevant Ornamental and environmental horticulture and landscaping qualification(s)
- Appropriate certification for the equipment and machinery
- Technical instructors must be qualified to the same level as teachers and assessors but if not, must work under the support and guidance of appropriately qualified staff
- Centres should show evidence of teachers and assessors attending manufacturers courses and attends relevant CPD events that supports the delivery of the qualification content

Tree and woodland management and maintenance

- Be technically competent at Level 3 or above in relevant Tree and Woodland Management and Maintenance (Forestry and/or Arboriculture)
- Appropriate certification for the equipment and machinery
- Technical instructors must be qualified to the same level as teachers and assessors but if not, must work under the support and guidance of appropriately qualified staff
- Centres should show evidence of teachers and assessors attending manufacturers courses and attends CPD events that supports the delivery of the qualification content

It is recommended that staff assessing these qualifications must meet the above requirements and hold or be working towards a relevant recognised assessor qualification such as a Level 3 Certificate in Assessing Vocational Achievement and continue to practise to that standard. Assessors who hold earlier qualifications (D32, D33 or TQFE/TQSE) should have CPD evidence that meets current standards.

Physical resources

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

Crop production

Sites:

- Field crops covering areas sufficient in size to meet the training and assessment criteria for crop establishment, management and harvesting (minimum per candidate: establishing a crop minimum of three passes and two turns; nutrient application minimum of three bouts and two turns, harvesting one full load)
- Container-based crop production facilities sufficient in size to meet the training and assessment criteria: greenhouses/polytunnels/indoor/outdoor growing environments for container-based crops, including environmental controls for covered environments (commercial greenhouse benches; training and assessment may typically require one bench per candidate for watering and feeding which could be managed on a rota)
- Suitable crop storage facilities with stored crops for training delivery and assessment tasks
- Areas for undertaking estate maintenance for training delivery and assessment tasks (hedges, walls, fences, ditches etc)

Health and safety:

- Appropriate Health & Safety signage
- Washing facilities
- Appropriate PPE must be in place to ensure safe working and compliance with legislation for all activities undertaken
- First aid facilities
- Waste disposal and storage facilities
- Spill management materials

Machinery, Equipment and Materials:
All equipment and machinery (and any accessories/attachments/PPE) must be fully compliant with the relevant legislation for all activities undertaken.

- Agricultural tractor (with or without GPS) and attachments for the crop production processes including seed drill, roller, cultivator, mower, harvesting
- Appropriate equipment for nutrient/fertiliser application for field-based and container-based crops
- Access to crop production technology including GPS, robotics, drones
- Operator instructions for all machinery and equipment, including setting up and calibration, where applicable
- Range of irrigation equipment - hose and lance, overheads, capillary beds/benches, watering cans etc.
- Range of propagation hand tools - knife, secateurs, cutting scissors etc.
- Range of containers/pots/trays and labelling materials for sowing seeds and propagation by cuttings
- Range of crop storage and packaging materials
- Weigh scales (measure in kilograms), precision scales (measure small quantities of seed)
- Manual handling and lifting aids
- Range of digging, fencing and estate maintenance tools
- Test equipment – soil sampling, soil tests, germination tests, moisture meter, temperature probe, hectolitre weigher etc.
- Selection of growing media suitable for propagation and growing on

- Seeds, crop plant materials and established crops for training delivery and as specified in assessment tasks
- Hormone rooting materials - powders, liquids, gels
- Nutrients for crops - compound, straight, dry, liquid, controlled release
- Crop production data and records, quality standards, templates and exemplars
- Sources of information for pest, disease and weed identification and control
- Cleaning materials and equipment
- Waste management and disposal facilities

Estate maintenance equipment:

- Range of digging, fencing and estate maintenance tools, including hand tools, strimmers and brushcutters
- Permanent fencing materials
- Fencing tools and equipment, including post driver, hammer, fencing pliers, straining equipment, staples
- Hedge maintenance equipment
- Stone wall maintenance equipment
- Ditch/drain maintenance equipment
- Fencing ironmongery (for gate installation)
- Wood or steel coatings

Information technology:

- PC/tablet/laptop with internet access, and word processing and spreadsheet software
- Camera, audio and video equipment

Floristry

Health and Safety:

Personal protective equipment (PPE)

Suitable space and facilities

Table and chairs of correct height

Materials, tools and equipment:

- Access to IT and software
- Sink with running water
- Selection of cleaning products
- Floristry fridge, as appropriate
- Selection of reading material, especially *The Professional Florists' Manual*
- Flower food
- Selection of buckets
- Range of tools and equipment – floristry knives, scissors, tweezers, pliers, shears or clippers, wire tighteners, watering can, sewing needle and threads, tape measure, test tube water filler, bradawl, selection of wires (non-decorative), stapler, cold glues, cellotape, pot tape, parafilm, stemtex, string, polyblast twine, bindwire, steel dress making pins (non-decorative), floral fix adhesive tack, pen and paper, mossing pins, corsage magnets, brush, clamps, cotton buds, ear plugs, stem stripper, glove stem stripper, leaf wipes, tissues, small hammer, pegs (non-decorative), kenzan/pin holders, gloves, masks, ruler, spray mister, screwdriver, small shovel, saw, small mirror, colour wheel, hammer, drill and standard drill bits, hot glue gun and glue sticks, cable ties.
- Range of fresh materials

- Selection of packaging materials
- Range of sundries to include wires, tapes and containers
- Floral foam and other mediums
- Selection of plinths, frameworks and structures
- Selection of ladders
- Access to power tools
- Selection of marking materials to include sprays, paints, pens and pencils

Information technology:
- PC/tablet/laptop with internet access, and word processing and spreadsheet software
- Camera and video equipment

Land-based engineering
Health and safety:
- Clean workspaces with appropriate Health & Safety signage, good housekeeping procedures and dress code displayed
- Appropriate PPE must be in place to ensure safe working and compliance with legislation for all activities undertaken
- Fume extraction
- Washing facilities
- Storage for boots and overalls
- Abrasive wheels controls
- First aid facilities
- Refrigeration handling and storage (for demonstration only)
- Waste disposal and storage facilities including hazardous, non-hazardous, recyclable
- Spill management materials

All tools, equipment and machinery (and any accessories/attachments/PPE) must be fully compliant with the relevant legislation for all activities undertaken.

Tools, measuring and testing equipment:
- Comprehensive sets of workshop hand tools including spanners, wrenches, sockets, screwdrivers, bits, pliers, pry bars, bearing pullers, saws, punches, chisels, reamers cutters, taps and dies, files, hammers, torque wrenches and multiplier, strap wrench, crimpers, wire strippers, electrical connector removal tools
- Bench tools including vices, anvil, gas heating equipment, oxy-acetylene equipment
- Workshop electric power tools including pneumatic, grinders, drills, circular and reciprocating saws, pillar drill, angle grinders, low voltage drills, air drills, pressure lines
- Jacks, stands, wheel chocks and hoists, lifting chains and slings
- Gantry and engine cranes
- Comprehensive set of pullers
- Thermal joining equipment and tools including MIG, MMA, gas, soldering, brazing
- Wheel and tyre safety and maintenance equipment including wheel transport/carriers
- Splitting rails
- Crawler boards
- Inspection lamps
- Drain cans, drip trays, receptacles for collecting and storing dilute chemical waste

- Cleaning equipment including degreasers, wipes, chemical cleaners, abrasives, polishes, steam cleaner, pressure washer
- A range of hand precision measuring equipment including Vernier callipers, dial test indicators and micrometers
- Electronic diagnostic equipment/Oscilloscope
- Diagnostics platform and software
- Dynamometer
- Equipment to measure values in vehicle electrical systems (including digital multimeters, digital tachometer)
- Dynamic timing equipment
- Hydraulic test equipment, including flow meters and pressure gauges
- Low-pressure measuring equipment: fuel, air and vacuum
- Temperature and revolution measuring equipment
- Engine compression tester
- Compressed air supply
- Scales/spring balance, rolling torque measuring equipment
- Graduated measuring jugs
- Hydrometer/ refractometer
- Air conditioning leak detection equipment
- Hydraulic press
- Examples of manufacturer specific tooling

Machinery, tools, equipment and parts to meet training and assessment needs (including Operator Manual/Handbook, Service Manual and Manufacturer's Specifications):

- Construction – excavators, backhoes, dumpers, materials handling
- Agriculture – soil engaging machinery, crop establishment machinery, crop care and irrigation machinery, harvesting machinery (cutting & processing), tractors (18Kw-200Kw), trailers, all-terrain vehicles, material handlers, autonomous and robotic machinery
- Outdoor power equipment/hire equipment – chainsaws, leaf blowers, strimmer, brushcutters, mowers, hedge cutters, generators, material mixing equipment, rough terrain vehicles
- Professional turf – mowers, aerators, scarifiers, sprayers, top dressers
- Forestry – chainsaws, woodchipper, all-terrain vehicles, telescopic handler
- Fixed plant – crop processing, milking parlours
- Integrated and stand-alone systems and components - Power units, gearboxes, transmissions and drivelines, hydraulic systems, electric/electronic systems, braking systems, steering systems, suspension systems, heating, ventilation and air conditioning systems

Sundries appropriate to the machinery and equipment:

- Oils, fuels, fluids, grease, electrolyte and coolant
- Rust inhibiting coatings
- Electrical wire, connectors, fuses
- Filters: air, oil, fuel and hydraulic
- Nuts, bolts, washers, rivets and cable ties
- Metal, belts, chains, cables, fuses, lamps and bulbs
- rings
- Belts
- Chains
- Seals, sealants and chemical bonding materials

Information technology:

- PC/tablet/laptop (preferably in the workshop) with internet access, and word processing and spreadsheet software
- Access to technical information including parts lists, specifications and standard procedures
- Camera, audio and video equipment

Livestock Production *(For September 2023 cohort only)

Livestock species (cattle including dairy, sheep) at a range of ages and stages of production, including access to appropriate housing facilities (where applicable).

Livestock handling and transportation:

- Cattle crush
- Sheep crate and race
- Footbath
- Rope halter
- Transport trailer/box

Livestock husbandry:

- Weigh scales/weigh band
- Thermometer
- Coloured livestock markers/sprays
- Animal identification (e.g. tags and pliers)
- Veterinary and medical equipment and treatments – topical, oral
- Calf jackets
- Calf disbudding equipment
- Tail and castration rings and pliers (lambs only)
- Sheep crutching/dagging equipment
- Milking equipment (cattle only)

Livestock housing and feeding:

- Bottles/tubes/buckets
- Diet feeding equipment/machinery
- Automatic water dispensing equipment
- Tractor, trailer, front loader/materials handler, bale spikes/grab, pallet forks
- Bales of hay or straw
- Hand tools for preparing livestock accommodation

Boundary maintenance equipment:

- Hand tools for boundary maintenance
- Temporary (electric) fencing materials
- Permanent fencing materials
- Fencing tools and equipment (e.g. post driver, hammer, fencing pliers, straining equipment, staples)
- Hedge maintenance equipment
- Stone wall maintenance equipment
- Ditch/drain maintenance equipment

- Fencing ironmongery (for gate installation)
- Wood or steel coatings
- Soil sampling equipment

Information technology:
- PC/tablet/laptop with internet access, and word processing and spreadsheet software
- Camera and video equipment

Ornamental and environmental horticulture and landscaping
Sites:
- Suitable sites for the establishment and maintenance of a range of horticultural features to meet the training and assessment criteria
- Suitable sites for the installation and maintenance of a range of hard landscape features including areas suitable for the laying of sub-bases/foundations/bedding for vertical and horizontal hard landscaping features
- Plant propagation/growing facilities sufficient in size to meet the training and assessment criteria: greenhouses/polytunnels/indoor/outdoor growing environments for plants, including environmental controls for covered environments.
- Sites featuring a range of horticultural and landscape features, plant species and characteristics to meet the training and assessment criteria

Health and safety:
- Washing facilities
- Appropriate PPE must be in place to ensure safe working and compliance with legislation for all activities undertaken
- First aid facilities
- Waste disposal and storage facilities
- Spill management materials

Equipment and machinery:
All equipment and machinery (and any accessories/attachments/PPE) must be fully compliant with the relevant legislation for all activities undertaken.
- Mechanical rotavator
- Powered hedge trimmer
- Powered cutting equipment (abrasive wheel, angle grinder etc.) with dust suppression kit.
- Mowers
- Turf laying equipment
- Equipment and materials for laying and levelling sub-bases/foundations/bedding
- Measuring and marking equipment (linear measuring tapes, paint/marking tape, string line, levelling equipment)
- Soil sampling and testing equipment (texture and structure, pH test kit including colour indicator solution, water holding capacity, measuring cylinders, timers)
- Planting equipment (range of spades, containers)
- Plant propagation tools materials and equipment (e.g. knives/secateurs/trowels/dibbers)
- Range of digging, fencing and garden maintenance tools
- Range of workshop tools e.g. saws, drills, general maintenance tools (screwdrivers, spanners etc.)
- Cable detection equipment (CAT and Genny)
- First aid kits

- Range of plant identification resources (e.g. books, keys, apps)
- Sources of information for pest, disease and weed identification and control
- Range of horticultural and landscaping reference books, resources and industry guidance documentation
- Drawing/sketching equipment

Information technology:
- PC/tablet/laptop with internet access, and word processing and spreadsheet software
- Camera and video equipment

Tree and woodland management and maintenance
Sites:
- Access to sites and facilities with sufficient space and available features, ground vegetation and trees to meet the training and assessment criteria
- Trees of diameter at felling height between 200 mm and 380 mm for chainsaw felling activities
- Trees of diameter at felling height under 200 mm for chainsaw felling and clearing saw activities
- Suitable trees for climbing/pruning activities

Health and safety:
- Washing facilities
- Appropriate PPE for all activities undertaken
- First aid facilities
- Waste disposal and storage facilities
- Spill management materials.
- Site safety signage and barrier tape

Equipment and machinery:
- Rear handled and top handled chainsaws
- Range of guide bars and chains of suitable lengths/types
- Comprehensive sets of chainsaw maintenance tools
- Relevant chainsaw operator's manuals
- Felling and lifting aids (felling levers, felling wedges, timber tongs/hooks, turning straps)
- Measuring and marking equipment (girth tapes, callipers, clinometers (analog/digital), rulers, linear measuring tapes, relascopes, compasses, paint/marking tape)
- Hand winches and accessories
- Rope-based pulling systems
- LOLER compliant climbing equipment with documented evidence
- Pulling line, tape slings
- Clearing saws, brushcutters and strimmers
- Access to a manually-fed wood chipper
- Planting equipment (range of spades, bags, etc.)
- Range of digging, fencing and estate maintenance tools
- Consumables including fuel, oil (2-stroke), chain oil, air/oil filters etc., spray paint, etc.
- First aid kits
- Range of plant identification resources (e.g. books, keys, apps)

- Range of forestry and arboriculture reference books, resources and industry guidance documentation

Information technology:

- PC/tablet/laptop with internet access, and word processing and spreadsheet software
- Camera and video equipment

Livestock Production *(For September 2024 onwards)

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

Centres must have access to at least two livestock species from cattle, sheep and pigs and have sufficient animals at a range of ages and stages of production, including access to appropriate housing facilities (where applicable) so that animal welfare standards are kept. Assessment of technical skills will be carried out against two species in the range.

Appropriate PPE must be in place to ensure safe working and compliance with legislation for all activities undertaken

	Cattle	Sheep	Pigs
Handling, restraint and transportation equipment	Could include: • crush and race • rope halter • yoke • trailer/box • hurdles.	Could include: • crush and race • crate • rope halter • crook • trailer/box • hurdles.	Could include: • crush and race • pig board, paddle • trailer/box • hurdles.
Husbandry equipment	Could include: • weigh scales/band • thermometer • foot bath • coloured livestock markers/sprays • animal identification equipment (tags, ID reader) • veterinary and medical treatment equipment (topical, oral) • battery operated clippers/shears • buckets/troughs/feed hopper • feeding machinery	Could include: • weigh scales • thermometer • foot bath • coloured livestock markers/sprays • animal identification equipment (tags, ID reader) • veterinary and medical treatment equipment (topical, oral) • battery operated crutching and dagging equipment/shears • buckets/troughs/feed hopper • feeding machinery	Could include: • weigh scales/band • thermometer • coloured livestock markers/sprays • animal identification equipment (tags, notching) • veterinary and medical treatment equipment (topical, oral) • buckets/troughs/feed hopper • feeding machinery • automatic water drinker • tractor, trailer, front loader/materials handler, bale spikes/grab, pallet forks

	• automatic water drinker • tractor, trailer, front loader/materials handler, bale spikes/grab, pallet forks • bedding and feed • hand tools (pitchforks, scrapers, power washers, shovels, brooms)	• automatic water drinker • tractor, trailer, front loader/materials handler, bale spikes/grab, pallet forks • bedding and feed • hand tools (pitchforks, scrapers, power washers, shovels, brooms)	• bedding and feed • hand tools (pitchforks, scrapers, power washers, shovels, brooms)
Farm maintenance and general equipment	Could include: • hand tools for boundary maintenance • materials for temporary (electronic) fencing • materials for permanent fencing • fencing tools and equipment (post driver, hammer, fencing pliers, straining equipment, staples, nails, plain and barbed wire, livestock wire mesh netting, posts/stakes, gates, rails, Electric wire, electric fence/stakes, electric fence, energiser, electric fence tester) • hedge maintenance equipment (hedge cutter/trimmer, bill hook, stakes, twine, planting spade, plant guards) • stone wall maintenance equipment (blocks/stones, mortar, hammer, chisel, trowel) • ditch/drain, path/roadway maintenance equipment (brush cutter/trimmer, rake, slash hook, shovel, spade, drain rods) • fencing ironmongery (hinges, hangers, latches, locks, sliding bolts) • wood or steel coatings • soil sampling and pH testing equipment • waste disposal containers/sacks • computer software with internet access, word processing and spreadsheet software • camera and video equipment		

Internal quality assurance

Internal quality assurance is key to ensuring accuracy and consistency of tutors and assessors. 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.

Supervision and authentication of candidate work

The Head of Centre is responsible for ensuring that assessment evidence is conducted in accordance with City & Guilds' requirements.

City & Guilds requires:

- candidates to sign the Declaration of authenticity form to confirm that any work submitted is their own
- tutors to confirm on the record form that the work submitted for assessment is solely that of the candidate concerned and was conducted under the conditions laid down in the assessment documentation

The tutor must be sufficiently aware of the candidate's standard and level of work to make a judgement whether the work submitted is within the expected ability and style of the candidate or whether a further investigation into the authenticity of the work is required.

If the tutor is unable to sign the authentication statement for a particular candidate, then the candidate's work cannot be accepted for assessment.

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 for this qualification.

Formal entry requirements are not set by City & Guilds, but it is expected that learners will have qualifications at Level 2 or equivalent. This may include:

- Level 2 vocational qualification or equivalent in a related subject.

3 Delivering the technical qualification

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 training needs
- support and guidance they may need when working towards their qualification
- the appropriate type and level of qualification

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

Programme delivery

The technical qualification should be delivered through approaches that meet the needs of learners. City & Guilds recommends using a variety of delivery methods, including in classrooms and real work environments. Learners may benefit from both direct instruction in more formal learning environments and taking part in investigative projects, e-learning and their own study and learning through indirect approaches to delivery.

4 Competency frameworks

The technical qualification has been developed to include competency frameworks for T Levels, which demonstrate an array of competencies across maths, English and digital skills as well as four key core skills that have been mapped on to the core content. This can be seen in the skills section for each criterion.

Core skills

In the design, delivery and assessment of the technical qualification the following core skills are fundamental in the development of the required knowledge, skills and behaviours that learners will need to use when they progress onwards from completing their T Level. These core skills have been mapped to the design of the qualification content and developed in consultation with the industry and providers. The mapping identifies opportunities where these core skills can be developed and embedded into teaching and learning. It is not expected that all criteria will develop core skills, but where these skills exist in the core content it has been referenced to support centres.

Core Skill A (CSA) Analysing

This may be evidenced through:

- analysis of qualitative and quantitative data and information
- identifying common features
- organising into types
- discerning patterns
- deconstructing
- classifying
- ordering

Core Skill B (CSB) Communication

This may be evidenced through:

- reading, writing, listening and speaking through the use of visual, oral and written methods
- demonstrating active listening
- building a rapport
- engaging an audience
- adapting style and tone to audience needs and nature of the message

Core Skill C (CSC) Critical thinking

This may be evidenced through:

- problem solving
- decision making
- researching and planning to include questioning
- evaluating pros and con
- using logic and reasoned argument
- synthesising
- concluding

Core Skill D (CSD) Decision making

This may be evidenced through:

- clarifying logical choices
- identifying likely impact

- using evidence and advice
- justifying
- substantiating
- concluding

Core Skill E (CSE) Investigating
This may be evidenced through:
- obtaining information and data including identifying potential sources
- developing search criteria/queries
- interrogating data
- designing and carrying out tests

Core Skill F (CSF) Working in a team
This may be evidenced through:
- mutual support
- open communication
- respect and honesty
- developing new ideas and interpretations
- providing support
- advice and guidance
- reflecting
- inviting and providing feedback on own and others' performances

Maths, English and digital skills

Maths, English and digital skills have been mapped across the core content and each of the Occupational Specialisms. The lists below identify the core competencies which can be found in the skills section of each performance criteria.

General English Competencies

The General English Competencies outline a framework of six General English Competences, with no prioritisation or interpretation of order intended:

- EC1. Convey technical information to different audiences
- EC2. Present information and ideas
- EC3. Create texts for different purposes and audiences
- EC4. Summarise information/ideas
- EC5. Synthesise information
- EC6. Take part in/lead discussions

General Mathematical Competencies

The General Mathematical Competencies outline a framework of ten General Mathematical Competences, with no prioritisation or interpretation of order intended:

- MC1. Measuring with precision
- MC2. Estimating, calculating and error spotting
- MC3. Working with proportion
- MC4. Using rules and formulae
- MC5. Processing data
- MC6. Understanding data and risk
- MC7. Interpreting and representing with mathematical diagrams
- MC8. Communicating using mathematics
- MC9. Costing a project
- MC10. Optimising work processes

General Digital Competencies

The following outlines a framework of six General Digital Competences, with no prioritisation or interpretation of order intended:

- DC1. Use digital technology and media effectively
- DC2. Design, create and edit documents and digital media
- DC3. Communicate and collaborate
- DC4. Process and analyse numerical data
- DC5. Be safe and responsible online
- DC6. Controlling digital functions

5 Scheme of assessment

Assessment methods

Learners must complete:

A core exam consisting of **two** externally set question papers covering knowledge from the Agriculture, Environmental and Animal Care common core and one of the following mandatory core pathways:

- Crop production, woodland and horticulture
- Land-based engineering
- Livestock
- Floristry

The exams provide sufficient sampling of the content and consist of a mixture of short answer questions (SAQs), some of which will be structured, and extended response questions (ERQs). The balance of questions in assessing across assessment objectives (AOs) 1, 2 and 3 will allow for the appropriate differentiation of performance across learners to support the reliable setting of grade boundaries.

One Employer-set project from the following:

- Crop, woodland and horticulture
- Land-based engineering
- Livestock
- Floristry

The Employer-set project will cover knowledge and core skills from the Agriculture, Environmental and Animal Care common core and the mandatory core pathway that has been chosen.

The Employer-set project will consist of a well-defined, real industry-style brief. The brief will be complex and non-routine, and will require the use of relevant maths, English and digital skills. The brief will provide a valid context for the Level 3 learner to demonstrate their knowledge and understanding of the core content and their core skills to solve occupationally relevant situations and/or problems.

And

One Occupational Specialism from the following:

- Crop production
- Floristry
- Land-based engineering
- Livestock production
- Ornamental and environmental horticulture and landscaping
- Tree and woodland management and maintenance (Arboriculture)
- Tree and woodland management and maintenance (Forestry)

This will include one assessment on the occupational specialism chosen. The assessment will feature a considerable practical element and are composed of a series of holistic practical tasks relating to the specialism at hand. They will take place over a period of time, scheduled at the provider's preference within an assessment window annually. By nature of the considerable practical elements, the tasks will generate significant ephemeral evidence and be heavily reliant on Internal Assessor observation notes and records for validation.

Grading and marking

The Agriculture, Land Management and Production core component is graded overall A*– E plus ungraded (U). On completion of the common core exam, core pathway exam and an Employer set project.

The Occupational Specialisms are graded overall Distinction, Merit, Pass and Ungraded. Each Occupational Specialism achieved will receive a grade.

Technical qualification scheme of assessment overview

Core Component – Learners must complete **the core exam** and **one Employer-set project**						
Assessment component	**Method**	**Duration**	**Marks**	**Weighting**	**Marking**	**Grading**
Core exam must include the common core (exam paper 1) paper and one core pathway option (exam paper 2)						
8717-030 Common core (Exam paper 1)	Externally set exam	2 hours	80	30%	Externally marked	
One from the core pathways below						
8717-031 Core pathway (Exam paper 2) Crop, Woodland and Horticulture	Externally set exam	2 hours	80		Externally marked	
8717-032 Core pathway (Exam paper 2) Land based engineering	Externally set exam	2 hours	80	30%	Externally marked	
8717-033 Core pathway (Exam paper 2) Livestock	Externally set exam	2 hours	80		Externally marked	A* - E
8717-034 Core pathway (Exam paper 2) Floristry	Externally set exam	2 hours	80		Externally marked	
Employer-set project						
8717-035 Crop, Woodland and Horticulture	Externally set project	17 hours	90	40%	Externally marked	
8717-036 Land-based engineering	Externally set project	17 hours	90	40%	Externally marked	
8717-037 Livestock	Externally set project	17 hours	90	40%	Externally marked	
8717-038 Floristry	Externally set project	17 hours	90	40%	Externally marked	

Occupational Specialism Component - Learners must complete **one** assessment component						
Assessment component	**Method**	**Duration**	**Marks**	**Weighting**	**Marking**	**Grading**
8717-400 Crop production	Externally set assignment	48 hours	138	100%	Externally moderated	All Occupational Specialism components will be awarded on the grade scale P, M, D
8717-401 Floristry	Externally set assignment	28.5 hours	120	100%	Externally moderated	
8717-402 Land-based engineering	Externally set assignment	24-30 hours	120	100%	Externally moderated	
8717-403 Livestock production *(For September 2023 cohort only)	Externally set assignment	39 hours	150	100%	Externally moderated	
8717-413 *Livestock production (For September 2024 cohorts onwards)	Externally set assignment	35 hours	150	100%	Externally moderated	
8717-404 Ornamental and environmental horticulture and landscaping	Externally set assignment	48.5 hours	150	100%	Externally moderated	
8717-405 Tree and woodland management and maintenance (Arboriculture)	Externally set assignment	35.5 hours	150	100%	Externally moderated	
8717-406 Tree and woodland management and maintenance (Forestry)	Externally set assignment	37 hours	150	100%	Externally moderated	

Core component scheme of assessment

The assessments for the core component consist of one core exam consisting of two question papers and an Employer-set project, which are set against a set of assessment objectives (AOs) used to promote consistency among qualifications of a similar purpose. They are designed to allow judgement of the learner to be made across a number of different categories of performance.

Each assessment 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.

AO weightings for the assessment components related to the assessments within the core component are detailed below.

Core exam

Assessment objective	Description	Assessment Objective weightings
AO1a Demonstrate knowledge	The ability to demonstrate basic recall of relevant knowledge in response to straightforward questioning e.g. material properties. In the exam, this helps to give confidence in sufficiency of coverage of the content, and recognises that not all knowledge requires further understanding e.g. terminology, number facts, etc.	10%
AO1b Demonstrate understanding	The ability to explain principles and concepts beyond recall of definitions, but in a general way – i.e. out of a particular context in response to straightforward questioning e.g. simple concepts and terms of description in agricultural contexts.	15%
AO2 Apply knowledge and understanding to different situations and context	Using and applying knowledge and understanding taking the understanding of generalities and applying them to specific situations. Questions are likely to ask for application in relation to a straightforward situation e.g. assessing the application of a single concept and the application of essential mathematical concepts. It is more granular than the more extended synthesis/creation that may respond to an analysis of a more holistic complex situation/brief.	45%
AO3a Analyse information and issues	Complex thinking that distinguishes patterns and relationships, breaking material into constituent parts, and determining how the parts are related to one another and holistically, inferring underlying assumptions/conditions/relevance/causation.	30%
AO3b Evaluate information and issues	The ability to make judgements about the value, for some purpose, of own or others' work/ideas/solutions/methods using internal or external criteria or standards relevant for the occupational area. These criteria may include e.g. quality, accuracy, effectiveness, efficiency, coherence, consistency, and may be quantitative or qualitative.	

Component	Assessment method	Description and conditions
Core exam	Externally marked test	The test is **externally set and externally marked** and will be sat through question papers provided by City & Guilds. The test is designed to assess learners' depth and breadth of understanding across the core component in the qualification at the end of the period of learning 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 The exam will be made up of different question types that include short answer questions, structured questions, and extended response questions. The level of difficulty will increase through the paper with lower demand questions at the beginning of the question paper to higher demand questions at the end of the question paper.

Component	Assessment method	Assessment overview
Core exam Common core Exam paper 1	Externally marked test	Content overview: • Health and safety • Sustainability • Working in the Agriculture, Environmental and Animal Care sector • Ethics • Business • Equality • Communication • Relationship management • Finance • Information and data
Core exam Crop, woodland and horticulture core pathway Exam paper 2	Externally marked test	• Health and safety • Sustainability • Biosecurity • Supply chain • Plant growth and development
Core exam Land-based engineering core pathway Exam paper 2	Externally marked test	• Health and safety • Sustainability • Biosecurity • Supply chain • Types of land-based equipment and machinery • Operating principles of integrated and stand-alone systems and components • Land-based equipment and machinery maintenance • Repair land-based equipment and machinery

Core exam Livestock production core pathway Exam paper 2	Externally marked test	• Health and safety • Sustainability • Biosecurity • Supply chain • Stock management ‘non feed’ • Bodily systems • Nutrition • Medicine • Technology and equipment • Data and information
Core exam Floristry core pathway Exam paper 2	Externally marked test	• Health and safety • Sustainability • Biosecurity • Supply chain • Information and data • Business • Plant biology

Employer-set project

Assessment objective	Typical evidence	*Approximate weighting
AO1 Plan approach to meeting the brief	Evidence of a planned approach to work, considered sequence of activity, evidence of prioritisation, review, and iterative working. Clearly structured response to brief, cohesive response with ordered sections, logical approach to referencing, research and use of sources, response completed meeting required parameters, sources used effectively and integrated into response, effective use of time allocation available for presentations.	13.3%
AO2 Apply core knowledge and skills as appropriate	Linking knowledge principles and ideas and applying them in context of the brief when considering compiling response use of materials, concepts etc. Applying core skills e.g. communication, planning etc. appropriately throughout tasks within project.	50%
AO3 Select relevant techniques and resources to meet the brief	Selection of techniques and resources in order to support a response to the brief; consideration of the techniques and resources that are most effective and appropriate to use, and accurate and informed use of these.	13.3%
AO4 Use maths, English and digital skills	Use of correct terminology, abbreviations, units of measurement in context, consideration of audience of brief response (technical versus non-technical wording), use of calculations/diagrams etc., appropriately, consideration of the use of ICT and digital methods both in brief response and in evidence presentation.	10%
AO5 Realise project outcome and review how well the outcome meets the brief	Considered analysis and evaluation of project outcome, response conclusion or evaluation, identification of solutions in response to brief problem with evidence of evaluation of other options and reasons for rejection of other options where not appropriate.	13.3%

*Weightings are rounded to the nearest whole number

Component	Assessment method	Description and conditions
Employer-set project	Externally marked project	This project is **externally set and externally marked** by City & Guilds and is designed to require the learner to identify and use effectively in an integrated way an appropriate selection of skills, techniques, concepts, theories and knowledge from across the whole of the Agriculture, Environmental and Animal Care core content. Projects will be released to centre staff in advance of any of the assessment windows for each task. City & Guilds will provide centres with assessment windows for centres to timetable assessment sessions within, in accordance with the assessment times prescribed in the Employer-set project centre guidance. Centres will be required to maintain the security of all live assessment materials until assessment windows are open. Projects will therefore be password-protected and released to centres through a secure method. Guidance on equipment, resources and duration will be released as appropriate to ensure centres can plan for delivery of the project in advance. Learners who fail the Employer-set project on first submission can retake in any assessment window.

Assessment Component	Assessment Method	Assessment overview
Employer-set project	Externally marked project	**Content overview:** The Employer-set project samples knowledge drawn from across the core content in relation to the specific project version context. **Assessment overview:** The Employer-set project is an assessment made up of several tasks that will take place within controlled conditions, assessing the knowledge and skills learned as part of the core element of the T Level. Each project will be developed together with employers in the industry to reflect realistic types of developments, activities and challenges. The project is made up of a number of tasks which all relate to the same Employer-set project brief: Research Report Plan Peer review Evaluate and present The project draws on the content from the core knowledge and assess the following core skills: Analysing Communicating Critical thinking Decision making Investigating Working in a team.

Scheduling of the Employer-set project assessments

The Employer-set project assessment window will occur from March to May annually. Specific dates will be released annually through the key date schedule for the following academic year.

Task	Scheduling	Task duration
1 Research	City & Guilds sets the assessment window for the centre to timetable	6 hours
2 Report	City & Guilds sets the assessment window for the centre to timetable	4 hours
3 Plan	City & Guilds sets the assessment window for the centre to timetable	4 hours
4 Peer review	City & Guilds sets the assessment window for the centre to timetable	1 hour
5 Evaluate and present	City & Guilds sets the assessment window for the centre to timetable	2 hours

A supporting document and guidance will be shared in advance of the assessment to support timetabling and planning for centres, for example outlining any required resources or conditions. This will be released to centres as part of the Key Dates Schedule.

Occupational Specialism component scheme of assessment

What is the occupational specialism component?

The Occupational Specialism assignment consists of a project brief presented as client requirements or a specification of work that is realistic to the Occupational Specialism rather than detailed instructions on what to do, to allow the learner to demonstrate that they have the knowledge required to implement the brief. There will be several high-level tasks in every version of the assessment, and these will take the form of planning and carrying out industry relevant practical tasks. Within each high-level task there will be several sub-tasks that learners will need to complete as directed within the assessment documents. The sub-tasks will reflect the project brief for that version of the assignment

How is the Occupational Specialism component marked?

Occupational Specialism assessments will be set and marked against a number of assessment themes within each performance outcome. Once learner evidence has been marked, Internal Assessors will make a holistic judgement on performance by applying the knowledge and skills that have been demonstrated to assessment themes within the marking grid.

Each learner will receive a total mark for each assessment theme. The total for each assessment theme is accumulated, giving a total mark for the assessment. Assessment themes will be common across every version of the assessment and will assess a similar range of evidence across assessment versions, ensuring comparability of demand between every version of the assessment.

Although evidence from across all tasks can be used to demonstrate performance against an assessment theme, internal assessors will be directed to specific task evidence that must be used to support judgements on performance against the assessment theme. The assessment themes will be broad enough to ensure that all the performance criteria across the specialism are assessed, supporting reliability of the assessment.

In order to ensure reliability, and consistent and accurate judgements on performance, assessment themes may consist of sub-assessment themes due to the potentially wide content coverage and to ensure that the Performance Outcome (PO) is assessed to the appropriate depth and breadth. This still allows for the appropriate base mark to be applied to the assessment theme, but also ensures that the distribution of marks within and across bands is more manageable and increases the reliability of judgements made and marks awarded. Internal assessors will give an appropriate mark in relation to the learner's performance for each individual sub-assessment theme, but this will contribute to the overall mark for that assessment theme. Internal assessors will then need to evidence the decision for the mark awarded for each assessment theme on the Candidate Record Form (CRF).

Assessment Component	Assessment method	Overview and conditions
Occupational Specialism assignment	Externally set, externally moderated	This assignment is **externally set, internally marked and externally moderated**, and is designed to require the learner to identify and use effectively in an integrated way an appropriate selection of skills, techniques, concepts, theories and knowledge from across the occupational area. Assignments will be released to centre staff towards the end of the learners' programme, usually the week before Easter each year. Centres will be required to maintain the security of all live assessment materials until assessment windows are open. Assignments will therefore be password-protected and released to centres through a secure method. Guidance on equipment, resources and duration will be released as appropriate to ensure centres can plan for delivery of practical assignments in advance. Learners who fail the occupational specialism following the first submission can retake in any assessment window. Please note that for externally set assignments City & Guilds provides guidance and support to centres on the marking process and associated marking grid in the assessment pack for the qualification, and guidance on the use of marking grids.
Crop production	Externally set, externally moderated	**Content overview** Learners will be able to: • establish crops • manage crops • harvest and store crops • maintain areas surrounding the crop production area
Livestock production	Externally set, externally moderated	**Content overview** Learners will be able to: • optimise animal breeding and production • rear and optimise livestock production • maintain areas surrounding livestock
Land-based engineering	Externally set, externally moderated	**Content overview** Learners will be able to: • maintain land-based machinery and equipment • repair land-based machinery and equipment • carry out diagnostic activities on land-based machinery and equipment • handover land-based machinery and equipment

Floristry	Externally set, externally moderated	**Content overview** Learners will be able to: • design all floral work to meet client requirements for special events • coordinate the care and conditioning of fresh floral materials and plants • assemble all commercial flower, foliage and plant arrangements. • create free-standing timber-based structures decorated with complex floral designs
Ornamental horticulture and environmental landscaping	Externally set, externally moderated	**Content overview** Learners will be able to: • establish ornamental and environmental horticultural areas • maintain ornamental and environmental horticultural areas • install landscape features • manage existing designed landscapes
Tree and woodland management and maintenance	Externally set, externally moderated	**Content overview** Learners will be able to: • use techniques to grow trees and woodlands • operate and maintain tools, equipment and machinery used in tree and woodland management and maintenance Forestry: • manage trees and woodlands • maintain woodlands • carry out forestry felling operations Arboriculture: • manage trees and tree populations • maintain trees • carry out arboriculture tree work operations

Availability of assessments

Scheduled assessment windows will be set annually for the T Level Technical Qualification in Agriculture, Land Management and Production (Level 3). Exact key dates for assessments that are externally marked (core exams and the Employer-set project) will be communicated to approved providers annually through the key date schedule.

Component	Series	Assessment type	Calendar Month/s	Assessment window/set date
Core exam 1	Summer series	Written exam	May/June	Set date
	Autumn series	Written exam	November	Set date
Core exam 2	Summer series	Written exam	May/June	Set date
	Autumn series	Written exam	November	Set date
Employer-set project	Summer series	Project	March/May	Set dates within assessment window
	Autumn series	Project	October/November	Set dates within assessment window
Occupational specialism	One series annually	Assignment	Please refer to the key date schedule for specific assessment windows for each Occupational Specialism.	

6 Technical qualification grading and result reporting

Awarding the technical qualification grade

The technical qualification components are awarded as shown below:

Component	Grading
Core	A* – E
Occupational Specialism	Pass, Merit and Distinction

Core component

Calculating the grade of the core component uses the aggregation of points from across all assessment components in the core to calculate the overall grade for the core component.

Core component grade descriptors

Component	Grade	Descriptor
Core	A	To achieve an 'A' grade a candidate will: Show clear ability to demonstrate a comprehensive understanding of the full range of principles that influence Agriculture, Environmental and Animal Care activities in routine contexts and allow successful implementation to non-routine contexts. Makes detailed and accurate links between relevant knowledge and understanding when responding to briefs/tasks/problems in a logical and methodical format. Legitimate and justified approaches are provided in response to briefs/tasks/problems. There is a meticulous approach in the selection and justification of processes, techniques, solutions, resources and health and safety considerations when planning approaches or responses to briefs or problems. Uses a broad range of communication strategies and an ability to adapt their language, style and format to respond well to audience and stakeholder needs in presenting approaches that are technically accurate to solving problems. Demonstrate a high degree of accuracy in knowledge and skills from across the core content and critically evaluate their own performance in meeting a brief, identifying areas for improvement where appropriate.

Component	Grade	Descriptor
Core	E	To achieve an 'E' grade a candidate will: Demonstrate a limited understanding some of the key principles and how they influence Agriculture, Environmental and Animal Care activities in routine contexts. Makes broader and less thorough links between knowledge and understanding when responding to briefs/tasks/problems. The response can sometimes be superficial, not evidence-based and supported by partial reasoning. Understanding is limited in the selection of processes, techniques, solutions, resources and health and safety considerations to meet the requirements of routine briefs or problems. Demonstrate a small range of communication strategies that are sometimes not suitable in language, style and format for audiences and stakeholders with technical inaccuracies to solving problems. Demonstrates some accuracy in knowledge and skills from across the core content and provides some evaluation of performance and how requirements have been met when addressing a brief, with minimal reference on how to improve.

Occupational Specialism component

Calculation of the grade for the Occupational Specialism is based on setting grade boundaries for Pass and Distinction. The setting of grade boundaries is based on judgemental evidence, against the grade descriptors for the Occupational Specialisms, review of the Guide Standard Exemplification Materials (Grade Standard Exemplification Materials after the first award) and review of statistical evidence.

Pass and Distinction grade descriptors can be found in the centre occupational assessment materials.

To successfully achieve an Occupational Specialism the learner needs to be recognised at threshold competence (Pass).

Threshold competence refers to a level of competence that:

1 signifies that a student is well placed to develop full occupational competence, with further support and development, once in employment
2 is as close to full occupational competence as can be reasonably expected of a student studying the TQ in a classroom-based setting (for example, in the classroom, workshops, simulated working and (where appropriate) supervised working environments)
3 signifies that a student has achieved at least a pass in relation to the relevant occupational specialism component

If a learner does not meet the minimum standards as determined by City & Guilds for either/both the core component and Occupational Specialism they will be issued with an unclassified (U) grade.

Occupational Specialism grade descriptors

Crop production

To achieve a pass (threshold competence), a candidate will typically be able to:

Demonstrate an adequate level of performance that meets minimum industry requirements, demonstrating sound technical skills and techniques to safely carry out work to adequate quality standards within time constraints.

Carry out practical tasks applying adequate industry knowledge and understanding of establishing, managing and harvesting field-based and container-based crops, and maintaining the surrounding area to achieve industry standards of crop yield and quality.

Work within relevant environmental and health and safety legislation and regulations, identifying potential risks and applying adequate control measures prior to commencing tasks.

Prepare machinery and equipment to an adequate standard to safely carry out tasks, applying adequate control measures during tasks.

Present information to an adequate standard in appropriate records, such as field and storage records.

Apply knowledge and understanding of financial records and information, markets, and methods of promotion to make adequate decisions.

Mostly use technical terminology accurately.

To achieve a distinction, a candidate will typically be able to:

Demonstrate excellent level of performance that fully meets industry requirements, demonstrating strong technical skills and techniques to safely carry out work to high quality standards and efficiently within time constraints.

Carry out practical tasks to a high industry standard, applying excellent knowledge and understanding of establishing, managing and harvesting field-based and container-based crops, and maintaining the surrounding area to achieve excellent standards of crop yield and quality.

Clearly identify and work within all relevant environmental and health and safety legislation and regulations, taking the initiative to identify and mitigate potential risks prior to commencing tasks.

Undertake excellent preparation of machinery and equipment to safely carry out tasks, applying comprehensive control measures during tasks.

Present detailed, relevant information in appropriate records, such as field and storage records.

Apply excellent, relevant knowledge and understanding of financial records and information, markets, and methods of promotion to make appropriate decisions.

Consistently use technical terminology accurately.

Floristry

To achieve a pass (threshold competence), a candidate will typically be able to:

Demonstrate an adequate level of performance that meets the requirement of the brief, demonstrating sound technical skills and techniques for planning, preparing and carrying out the work to commercial standards.

Prepare the work area to an adequate standard that allows safe working, acknowledging potential risks and applying appropriate control measures during tasks.

Sufficiently gather and interpret information, plans, assess risks and follow safe working practices adequately when applying practical skills to constructing designs. Produce commercially viable designs to satisfy the requirements of the client's brief.

Carry out practical tasks by applying adequate knowledge and skills with some consideration of elements and principles of design to a commercial standard, producing work that meets relevant regulations and standards and with an aesthetic appearance and finish that is fit for purpose.

Identify characteristics and features of floriculture areas applying adequate knowledge and skills in how to record, present and analyse the information to satisfy the requirements of the brief.

Produce adequate plans and costing of designs correctly in order to be commercially viable.

Mostly uses technical terminology correctly.

To achieve a distinction, a candidate will typically be able to:

Demonstrate an excellent level of performance that meets the requirement of the brief, demonstrating strong technical skills and techniques for planning, preparing and carrying out the work to high commercial standards with distinctive use of materials.

Thoroughly prepare work area to allow safe working, acknowledging potential risks and applying detailed control measures during tasks.

Focus on detail when gathering and interpreting information to plan, assess risk and follow safe working methods appropriately when applying a level of practical skills to constructing designs. Produce high quality commercially viable designs to satisfy the requirements of the client's brief.

Carry out practical tasks applying excellent knowledge and skills of principles and elements of design to a commercial standard. Produce work that meets relevant regulations and standards, with an aesthetic appearance with distinctive and intuitive use of materials and finish that is fit for purpose.

Identify characteristics and features of floriculture areas applying excellent knowledge and skills in how to record, present and analyse the information to satisfy the requirements of the brief.

Produce detailed planning and costing of designs correctly to be commercially viable.

Use technical terminology accurately.

Land-based engineering

To achieve a pass (threshold competence), a candidate will typically be able to:

Demonstrate an adequate level of performance that meets the requirements of a brief, demonstrating sound technical skills and techniques to safely carry out work to adequate quality standards within time constraints.

Identify and work within relevant legislation and regulations, identifying potential risks and applying adequate control measures.

Prepare working area to an adequate standard and select adequate tools and equipment to safely carry out the work to manufacturer's standards.

Carry out practical tasks to an adequate standard whilst applying sound knowledge and understanding of components, systems, machinery, and equipment.

Undertake assessment of the machinery and equipment to establish symptoms. Use adequate information to diagnose the cause, and undertake work based on a diagnosis.

Present adequate information in appropriate records, such as job cards and handover records.

Mostly use technical terminology accurately.

To achieve a distinction, a candidate will typically be able to:

Demonstrate excellent level of performance that fully meets the requirements of a brief, demonstrating strong technical skills and techniques to safely carry out work to high quality standards and efficiently within time constraints.

Methodically identify and work within all applicable legislation and regulations, with excellent identification of potential risks prior to commencing tasks and application of comprehensive control measures.

Undertake excellent preparation of the working area and select appropriate tools and equipment to safely carry out the work to manufacturer's standards.

Carry out practical tasks to a high standard, applying excellent knowledge and understanding of components, systems, machinery, and equipment.

Undertake comprehensive assessment of the machinery and equipment to establish symptoms. Interpret technical information to diagnose all causes and undertake rectification work based on a diagnosis, working systematically, logically, and efficiently.

Present excellent, relevant information in appropriate records, such as job cards and handover records.

Consistently use technical terminology accurately.

Livestock production

To achieve a pass (threshold competence), a candidate will typically be able to:

Demonstrate an adequate level of performance that meets the requirements of the tasks and demonstrates the sound technical skills and techniques for carrying out routine husbandry tasks associated with breeding, rearing and production of livestock to adequate standards and is able to enter the industry to begin to work in the occupational area.

Demonstrate an adequate understanding of human-animal interaction, applying safe and welfare orientated techniques when handling livestock.

Interpret technical information, plan, assess risk and follow safe working methods appropriately when applying practical skills to an adequate standard to satisfy the requirements of the tasks.

Work within relevant environmental and health and safety legislation and regulations.

Adequately prepare machinery and equipment to safely undertake tasks, applying all needed control measures during tasks.

Undertake adequate preparation of working areas to allow safe working, acknowledging potential risks and applying acceptable control measures during tasks.

Mostly use technical terminology accurately in plans, reports and documentation.

To achieve a distinction, a candidate will typically be able to:

Demonstrate an excellent performance that fully meets the requirement of the tasks, demonstrating strong technical skills and techniques for carrying out routine husbandry tasks associated with breeding, rearing and production of livestock to consistently high standards and is able to enter the industry to begin to work in the occupational area.

Demonstrate an excellent understanding of human-animal interaction, consistently applying safe and welfare orientated techniques when handling livestock.

Thoroughly interpret technical information, applying excellent technical skills to plan, assess risk and follow safe working methods to practical tasks and procedures to a high standard in response to the requirements of the brief and tasks.

Clearly identify and work within all relevant environmental and health and safety legislation and regulations, taking the initiative to identify and mitigate potential risks prior to commencing tasks.

Undertake excellent preparation of machinery and equipment to safely undertake tasks, applying detailed control measures during tasks.

Undertake excellent preparation of working area, mitigating potential risks prior to commencing tasks and consistently apply comprehensive control measures during tasks that allow safe and efficient working.

Consistently use technical terminology accurately in plans, reports and documentation.

Ornamental and environmental horticulture and landscaping

To achieve a pass (threshold competence), a candidate will typically be able to:

Demonstrate an acceptable performance that meets the requirement of the brief, applying sound technical skills and techniques for planning preparing, and carrying out the work to adequate standards including safety, establishment and aftercare of seed/plants/trees/turf, quality of finish of horticultural and landscape features.

Interpret technical information, applying sound technical knowledge and skill to plan, assess risk and follow safe working methods appropriately when applying practical skills to an adequate standard to satisfy the requirements of the brief.

Prepare working areas to allow safe working, acknowledging potential risks and applying adequate control measures during tasks.

Work safely and make adequate decisions on the selection and appropriate use of tools, materials and equipment within the working environments for establishment, maintenance and hard landscaping activities.

Carry out practical tasks to an adequate standard, producing work that meets relevant regulations and standards, with an adequate aesthetic appearance and finish that meets the brief.

Identify characteristics and features of horticultural areas and existing designed landscapes, applying sound knowledge and skills in how to record, present and analyse the information to satisfy the requirements of the brief.

Mostly use technical terminology accurately.

To achieve a distinction, a candidate will typically be able to:

Demonstrate an excellent performance that fully meets the requirements of the brief, applying strong technical skills and techniques for planning, preparing, and carrying out the work to consistently high standards including safety, establishment and aftercare of seed/plants/trees/turf, quality of finish of horticultural and landscape features.

Thoroughly interpret technical information, applying excellent technical knowledge and skill to plan, assess risk and follow safe working methods to practical tasks and procedures to a high standard in response to the requirements of the brief, working systematically, logically and efficiently.

Thoroughly prepare working area, mitigating potential risks prior to commencing tasks and consistently apply comprehensive control measures during tasks that allow safe and efficient working.

Work safely and make well founded and informed decisions on the selection and appropriate use of tools, materials and equipment within the working environments for establishment, maintenance and hard landscaping activities.

Carry out practical tasks to an excellent standard, producing an excellent quality of work that meets relevant regulations and standards, with a high quality of aesthetic appearance and finish that meets the brief.

Identify characteristics and features of horticultural areas and existing designed landscapes, applying excellent knowledge and skills in how to record, present and analyse the information to satisfy the requirements of the brief.

Consistently use technical terminology accurately.

Tree and woodland management and maintenance (Arboriculture)

To achieve a pass (threshold competence), a candidate will typically be able to:

Demonstrate an adequate performance that meets the requirements of the brief, demonstrates the adequate technical skills and techniques for planning, preparing, and carrying out the work to adequate standards, including safety and quality.

Interpret technical information, plan, assess risk and follow safe working methods appropriately when applying practical skills to an adequate standard to satisfy the requirements of the brief.

Adequately prepare working areas to allow safe working, acknowledging potential risks and applying adequate control measures during tasks.

Work safely and make adequate decisions on the selection and appropriate use of tools, materials and equipment within the working environments for establishment, management/maintenance and climbing/aerial activities.

Carry out practical tasks to an adequate standard, producing work that meets relevant regulations and standards, with an adequate standard of work.

Apply adequate knowledge and skills to identify and measure characteristics and features, and record, present and analyse the information to satisfy the requirements of the brief.

Mostly use technical terminology accurately.

To achieve a distinction, a candidate will typically be able to:

Demonstrate excellent performance that fully meets the requirements of the brief, demonstrating strong technical skills and techniques for planning, preparing, and carrying out the work to consistently high standards including safety and quality.

Competently and thoroughly interpret technical information, applying strong technical knowledge and skills to plan, assess risk and follow safe working methods for practical tasks and procedures to an excellent standard in response to the requirements of the brief, working systematically, logically and efficiently.

Thoroughly prepare working area, mitigating potential risks prior to commencing tasks and consistently apply comprehensive control measures during tasks that allow safe and efficient working.

Work safely and make well founded and informed decisions on the selection and appropriate use of tools, materials and equipment within the working environments for establishment, management/maintenance and climbing/aerial activities.

Carry out practical tasks to an excellent standard, producing an excellent quality of work that meets relevant regulations and standards.

Apply excellent knowledge and skills to identify and measure characteristics and features, and record, present and analyse the information to satisfy the requirements of the brief.

Consistently use technical terminology accurately.

Tree and woodland management and maintenance (Forestry)

To achieve a pass (threshold competence), a candidate will typically be able to:

Demonstrate an adequate performance that meets the requirements of the brief, demonstrates the adequate technical skills and techniques for planning, preparing, and carrying out the work to adequate standards, including safety and quality, and is able to enter the industry to begin work in the occupational area.

Interpret technical information, plan, assess risk and follow safe working methods appropriately when applying practical skills to an adequate standard to satisfy the requirements of the brief.

Adequately prepare working areas to allow safe working, acknowledging potential risks and applying adequate control measures during tasks.

Work safely and make adequate decisions on the selection and appropriate use of tools, materials and equipment within the working environments for establishment, management/maintenance and felling activities.

Carry out practical tasks to an adequate standard, producing work that meets relevant regulations and standards, with an adequate standard of work.

Identify and measure characteristics and features and apply adequate knowledge and skill in how to record, present and analyse information to satisfy the requirements of the brief.

Mostly use technical terminology accurately.

To achieve a distinction, a candidate will typically be able to:

Demonstrate excellent performance that fully meets the requirement of the brief, demonstrating strong technical skills and techniques for planning, preparing, and carrying out the work to consistently high standards including safety and quality, and is able to enter the industry to begin to work in the occupational area.

Competently and thoroughly interpret technical information, applying strong technical knowledge and skills to plan, assess risk and follow safe working methods for practical tasks and procedures to an excellent standard in response to the requirements of the brief, working systematically, logically and efficiently.

Thoroughly prepare working area, mitigating potential risks prior to commencing tasks and consistently apply comprehensive control measures during tasks that allow safe and efficient working.

Work safely and make well founded and informed decisions on the selection and appropriate use of tools, materials and equipment within the working environments for establishment, management/maintenance and felling activities.

Carry out practical tasks to an excellent standard, producing an excellent quality of work that meets relevant regulations and standards.

Identify and measure characteristics and features applying excellent knowledge and skills in how to record, present and analyse the information to satisfy the requirements of the brief.

Consistently use technical terminology accurately.

Awarding the T Level programme grade

To achieve a T Level Technical Qualification in Agriculture, Land Management and Production (Level 3) a learner must complete all elements of the T Level framework set by the Institute for Apprenticeships and Technical Education (IfATE). This includes the technical qualification, industry placement and other requirements set, such as a license to practice qualification.

In meeting the above requirements, the learner will be eligible to be awarded an overall qualification grade for the T Level Technical Qualification in Agriculture, Land Management and Production (Level 3). The calculation of the qualification grade will be based on performance in the core component and Occupational Specialism, as set out below.

Calculation of the T Level Qualification Grade				
	Occupational Specialism grade			
Core component grade		Distinction	Merit	Pass
	A*	Distinction*	Distinction	Merit
	A	Distinction	Distinction	Merit
	B	Distinction	Merit	Merit
	C	Distinction	Merit	Pass
	D	Distinction	Merit	Pass
	E	Merit	Pass	Pass

7 Administration

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):

1 falsification of assessment evidence or results documentation
2 plagiarism of any nature
3 collusion with others
4 copying from another candidate (including the use of ICT to aid copying), or allowing work to be copied
5 deliberate destruction of another's work
6 false declaration of authenticity in relation to assessments
7 impersonation

These actions constitute malpractice, for which a penalty (e.g. 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*.

Accessibility

In the design of the technical qualification and its assessments, the following principles have been applied:

1 In the development of content, tasks and assessments **all** learners are considered
2 Well-designed materials that do not create barriers to attainment. This will include content being presented logically and uncluttered
3 No particular characteristic or group of learners are disadvantaged by features of a qualification
4 Language is appropriate including carrier language which is presented in its simplest form for fair access to all learners
5 In the design of content and assessments the impact on learners' social, behavioural and emotional well-being will be considered
6 Physical and sensory needs of learners in accessing content and assessments are considered

Access arrangements

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: **www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library**

In the design of the technical qualification and its assessments the following principles have been applied:

1 In the development of content, tasks and assessments, **all** learners are considered
2 Materials are well designed and do not create barriers to attainment. This includes content being presented logically and in an uncluttered way
3 No particular characteristics or groups of learners are disadvantaged by features of the qualification
4 Language is appropriate and presented in its simplest form to provide fair access to all learners
5 In the design of content and assessments, the impact on learners' social, behavioural and emotional wellbeing is considered
6 Physical and sensory needs of learners in accessing content and assessments are considered

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: **www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library**

Informing candidate of pre-moderated marks

Centres are required to inform candidates of their marks **before** external moderation. It is important that candidates are informed their pre-moderated marks are provisional and to allow sufficient time for them to appeal if felt necessary while still allowing their agreed centre-marked work to be available for external moderation on time.

Centres must also provide candidates with a copy of their marked work and the centre's internal appeals procedures on request.

Internal appeals procedure

For internally marked assessments, all centres must have an internal appeals procedure for candidates, which gives them the opportunity to appeal the centre mark for their work, before moderation takes place. The procedure must ensure:

1 the person completing the appeal is competent and did not mark the work originally
2 that any marking errors are identified and corrected
3 the candidate is informed of the outcome, reason and any change in mark

The City & Guilds appeals process also covers access arrangements, special consideration and malpractice. Applications are not accepted directly from candidates, but the centre can apply on a candidate's behalf. Where relevant, centres must tell candidates how to request this. The centre can refuse to make the application to City & Guilds, but the candidate must be given the opportunity to appeal this decision. This information must be included in the centre's internal appeals procedure.

Centres must provide candidates and City & Guilds with a copy of their internal appeals procedure, on request.

Results reporting

The Institute for Apprenticeships and Technical Education (IFATE) will certificate Learners who have successfully completed all elements of the T Level Technical Qualification in Agriculture, Land Management and Production (Level 3).

T Level results will be released on the Level 3 results day in August.

Post-results services

The services available include a review of marking and review of moderation. Requests must be submitted within the specified period after the publication of results for individual assessments.

For further details of enquiries about results services, please visit the City & Guilds website at **www.cityandguilds.com**

8 Components

Content of components

The components in this qualification are written in a standard format and comprise the following:

1 City & Guilds reference number
2 Title
3 Level
4 Guided learning hours (provisional)
5 Assessment method
6 Introduction section
7 Underpinning knowledge outcome – including range and 'what learners need to learn' sections
8 Skills outcomes – including range and 'what learners need to demonstrate' sections
9 Links to maths, English and digital skills
10 Guidance for delivery
11 Suggested learning resources.

300 Agriculture, environmental and animal care common core

Level:	3
GLH:	160
Assessment method:	Externally set exam Employer-set project

What is this component about?

An introduction to Agriculture, Environmental and Animal Care.

It covers the theoretical knowledge of the Agriculture, Environmental and Animal Care industry that are common across all sectors.

Learners gain an understanding of what theoretical principles and practices integral to the industry and sector are required to work in it.

Learners will develop their knowledge and understanding of:

- working within the agriculture, environmental and animal care sectors and the professional responsibilities, attitudes and behaviours required to do so
- health and safety in the workplace
- business management required within the sector to provide a product or service with success
- project management and delivery of a project.

Learners may be introduced to this component by asking themselves questions such as:

- What are the different sectors in agriculture, environmental and animal care?
- What are the different job roles in agriculture, environmental and animal care?
- What does the future look like for this sector and where could it take me?
- How do I manage and present a project?

Underpinning knowledge outcomes

On completion of the Agriculture, Environmental and Animal Care Core, learners will understand the following from across the sector:

1. Health and safety
2. Sustainability
3. Working in the Agriculture, Environmental and Animal Care sector
4. Ethics
5. Business
6. Equality
7. Communication
8. Relationship management
9. Finance
10. Information and data

Completion of the Agriculture, Environmental and Animal Care Core will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented in the skills section of each criteria.

Content

1. Health and safety

1.1 Key requirements of **Health and safety legislation**.

Range:
Health and safety legislation – Health and Safety at Work Act 1974, Management of Health and Safety at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR), Lifting Operations and Lifting Equipment Regulations (LOLER) Control of Substances Hazardous to Health Regulations (COSHH), Provision and Use of Work Equipment Regulations (PUWER), Manual Handling Operations Regulations, Fire Safety Act 2021, Personal Protective Equipment (PPE) at Work Regulations, Working Time Regulations, Working Time (Amendment) Regulations, Supply of Machinery (Safety) Regulations, Working at Height Regulations, Control of Noise at Work Regulations.

What do learners need to learn?	**Skills**
Statutory duties of employers, employees and the self-employed, to include: Employers/self-employed: • 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 for staff • Provide suitable personal protective equipment (PPE) to all workers (including casual workers) • Take responsibility of the maintenance, storage and replacement of all PPE • Ensure equipment is checked and regularly serviced Employees/self-employed: • Take reasonable care of their own health and safety • Take reasonable care of other people who may be affected by what they do or do not do at work • Co-operate with their employer on health and safety • Not interfere with or misuse anything provided for their health, safety or welfare • Use provided PPE • Undertake training and instruction as required Techniques and methods used to comply with legislation and promote health and safety standards – Hierarchy of controls, use of PPE, systems for safe communication with lone workers, training, suitability and maintenance of equipment, signage, appropriate facilities, following RAMS (risk assessment, method statements) recording of relevant health and safety records, safe systems of work, provision of first aiders. Benefits of compliance with health and safety legislation, including protection of workforce and working environment.	CSC, CSD, CSE, CSF, EC6.

Powers of health and safety enforcement officers (inspection, investigation and guidance) and the range of enforcement actions and penalties that may be imposed (prohibition and improvement notices, intervention fee and prosecutions).	

1.2 **Consequences** of poor standards of health and safety practice.

Range:
Consequences – Financial, emotional, reputation, employees, social.

What do learners need to learn?	**Skills**
Direct and indirect consequences of poor standards of workplace health and safety practice on businesses, to include: Financial: • compensation claims • repairs/replacement of equipment • recruitment and retention/retraining of staff • increased insurance premiums • fines by HSE • legal fees Emotional: • stress. Reputation: • loss of reputation • difficulty in retaining customers • difficulty in attracting new staff • bad publicity Employees: • reduced staff morale and productivity • increased staff turnover and sickness • physical injuries to staff/ death Direct and indirect consequences of poor standards of workplace health and safety practice on individuals, to include: Financial: • compensation claims Emotional: • stress Reputation: • loss of reputation • bad publicity Employees: • reduced staff morale and productivity • increased staff turnover and sickness • physical injuries to staff/ death Social: • loss of independence • prison time	CSA, CSC, CSD, CSE, EC4, EC5.

- reduced social activity

Consequences of non-compliance of health and safety legislation, including:

- prosecution, imprisonment, fines
- legal fees
- accidents
- disablement
- death
- loss of income

1.3 Purpose of a risk assessment.

What do learners need to learn?	**Skills**
Purpose of a risk assessment – To identify hazards and risks and put appropriate measures in place to mitigate against these, to create a safer, healthier workplace. Typical structures/layout of a risk assessment and definitions of content in a risk assessment. Steps needed to manage risk: • identify hazards • assess the risks (likelihood, severity, number of people affected) • control the risks • record findings • review the controls How to read and interpret a risk assessment. How they are developed, used and dynamically updated. Implications of poor development and application: • poor working practices • higher risk of accidents resulting in long term consequences • risk of time lost in emergency situation, call out/rescue • financial impact in loss of working time, income, reputation Hierarchy of control measures: • Elimination – redesign a job or substitute a substance so that the hazard is removed or eliminated • Reduction/substitution – replace a material or process with a less hazardous one • Isolation – do not use pieces of equipment until repaired • Engineering controls – separate the hazard from operators by methods such as enclosing or guarding danger • Administration – Identify and implement policies and procedures needed to work safely such as safety/warning signage, training, certification, safe working practices and discipline • Personal protection equipment (PPE) – where risk cannot be eliminated or sufficiently controlled to a reasonably practicable level using the above measures, use protective equipment to minimise the consequences of the risk	CSA, CSB, CSC, CSD, CSE, CSF, EC1, EC2, EC3, EC4, EC5, EC6, DC2, DC3.

2. Sustainability

2.1 Key requirements of environmental **legislation** and key government **policies.**

Range:
Legislation – The Environment Act 2021.
Policies – 25 Year Environmental Plan – GOV.UK.

What do learners need to learn?	**Skills**
Purpose of legislation, associated obligations for businesses, employees and stakeholders in reference to: • improving the natural environment • waste and resource efficiency • improving air quality • improving water quality • enhancing nature and biodiversity • enhancing conservation covenants • regulation of chemicals Implications of not complying with legislation: • Increased pollution (diffuse pollution) • Environment Agency prosecution The opportunities and risks that sustainability policies bring to agriculture, environmental and animal care sector: • Opportunities – potential to target new and emerging markets through sustainable practices leading to sustainable branding, potential to utilise waste as a resource increasing profit, potential to expand goods and services into sustainability agenda, potential to develop new products to serve sustainability agenda, potential for taking advantage of government initiatives and funding for environmental services • Risks – potential of prosecution through non-compliance, potential for additional business costs during product recall, potential loss of custom through reputation damage of non-compliance The associated environmental performance measures including water and energy use, carbon capture, species targets, water, soil and air quality, mandatory reporting.	CSA, CSC, CSD, CSE, EC4, EC5.

2.2 The concept of sustainable development.

What do learners need to learn?	**Skills**
UK government definition/purpose of sustainable development – Global agreement to eradicate extreme poverty, fight inequality and injustice and leave no one behind. Types of sustainable solutions and improvements to meet development goals including social, environmental, economic and human. • Three pillars of sustainability (social, economic, environmental) • How businesses in the sector use the three pillars in action planning to meet sustainability targets Awareness of sustainable development goals nationally. • UK Commitment and Voluntary Review under Agenda 2030 Sustainable development goals (SDGs) at a macro (national and international) and micro (business) level. • Macro: SDGs most relevant to the sector (life on land, life below water, health and wellbeing, zero hunger, responsible consumption and production) • Micro: Business sustainability plans, carbon footprint, commitments to net zero, Corporate Social Responsibility Strategy (CSR) Concerns and expectations of key stakeholders (social, environmental, economic and human) that include: • potential loss of competitive advantage • potential impact economically and socially • expectations of an international level playing field	CSA, CSC, CSD, CSE, EC4, EC5.

2.3 The **causes**, **impact** and management of climate change.

Range

Causes – Burning fossil fuels to generate power, manufacturing goods, deforestation, transportation, producing food, powering buildings.

Impact – Environments, displacement of human/wildlife/flora habitation, conservation practices, fauna, sea levels, water levels(flooding), wild-fires, melting ice caps, food security and food safety.

What do learners need to learn?	**Skills**
The meaning of climate change - long term shifts in temperatures and weather patterns. Difference between weather and climate – weather relates to everyday conditions and climate relates to the weather of a particular location for a longer period. Policies and initiatives to manage these changes at national and local level. • 25 Year Environmental Plan • Climate Change Act 2008 • Environmental Improvement Plan 2023 • SDG 13 Climate Action 10 Point Plan for Green Industrial Revolution (point 2 driving the growth of low carbon hydrogen, point 8 investing in carbon capture, use and storage, point 9 protecting our natural environment).	CSA, CSC, CSD, CSE, EC4, EC5.

3. Working in the agriculture, environmental and animal care sector

3.1 Employment **rights and responsibilities** of the employer and employee.

Range:
Rights and responsibilities – Contracts of employment, anti-discrimination, working hours, rest breaks, holiday entitlements.

What do learners need to learn?	**Skills**
Different types of employment contracts – full time, part time and seasonal contracts agency contracts, self-employed, and the related benefits and limitations to employers and employees. How the rights and responsibilities apply to different employment contracts: Full time and part time: • salary and pro rata salary, hourly paid • hours, rest breaks • overtime, working time directive • statutory rights (minimum wage, holiday, pension, sickness, maternity, paternity and adoption, request flexible hours) • notice periods and redundancy pay Self-employed: • flexibility and control • adherence to health and safety policies • ownership of profit • liability of losses • absence of statutory entitlements Agency workers: • conditions of contract • flexibility Legislation that supports employment rights and responsibilities, including: • Employment Rights Act 1996 • National Minimum Wage Act 1998 Expectations of professional conduct and behaviours in the workplace: • punctuality • cleanliness • conduct • adherence to regulations • respect for own and others work and work area • respect for positions of employment • respect for the land, air, water (environment) • respect for property and belongings of others and animals, including for volunteers) How these expectations are met and demonstrated by employees: • induction outlining expectations • meeting job specification • meeting contract terms • adhering to company policies	CSB, CSC, CSD, CSE, CSF, EC4, EC5, EC6.

Typical activities that can lead to disciplinary and grievance procedures:

- failure to adhere to systems
- failure to adhere to health and safety protocols
- intimidating behaviour, aggression, use of foul language
- harassment and bullying

Role of supervisor/manager, typical disciplinary or grievance procedures.

How employers support health and wellbeing of employees:

- sick pay entitlement (including agricultural sick pay)
- support for attending medical appointments
- promotion of health and wellbeing
- promotion of social interaction

Importance of monitoring staff and colleagues for signs of slavery and people trafficking and signs of exploitation including loss of rights, for example, under Working Time Directive waivers.

- Raise awareness of modern slavery in sector
- Monitor workforce including agency staff
- Publicise Duty to Notify
- Monitor supply chains (social value in procurement)

Impact of union membership on the employer and the employee.

- Basic protections against being penalised for being, or not being, member of a trade union
- Role of trade union representatives (advocacy, agency, representation)

3.2 Effective teamwork.

What do learners need to learn?	**Skills**
Types of team (formal, informal, small, large, project, task groups, matrix, remote working). How teams are developed, including the role of the team leader: • forming • storming • norming • performing • adjourning Importance of team dynamics and behaviour and their effect on team performance: • fair allocation of workload • effective communication • clear roles and responsibilities • accountability and ownership of all team members Qualities of effective team members and team leaders and how these qualities are demonstrated: • defined goals • clear leadership • assigned roles • open communication • collaboration • trust • conflict resolution Importance of teamwork and how this impacts the team and project performance that includes: • increased productivity • increased moral • promotes creativity • brings together diverse skills to solve complex problems Techniques used by a manager/team leader to monitor and manage individual and team performance and when they should be applied: • individual and organisational goals • objective setting • SMART – set measurable goals • use of KPIs • performance management reviews – rewarding positive performance • providing constructive feedback within individual and team meetings • managing conflict including mediation	CSA, CSB, CSC, CSD, CSE, CSF, MC8, EC4, EC5, EC6, DC3.

3.3 Purpose of Continuous Professional Development (CPD) opportunities.

What do learners need to learn?	**Skills**

The benefits CPD brings to the individual and their employer:
• increase career opportunities
• increase job/career satisfaction
• improve work life balance
• career progression/talent development/skilled workforce
• improved confidence/motivation
• staff performance leading to employer performance
• staff retention
 	
Benefits of keeping up to date technically and legally (employee and employer):
• Advantages of specialisation:
  ○ achieve higher salary
  ○ access niche markets
  ○ reduce costs of external consultancy/contractors
• Role of training in certificates of competence (legal requirement)
 	
Methods of personal and professional development:
• coaching and mentoring
• volunteering
• appraisals
• independent research
• education and training courses
• industry
 	
Internal and external sources that can provide this type of support professional bodies and their suitability for achieving identified development needs:
• awarding organisations
• trade organisations
• membership organisations
• training providers
• employer
• colleagues
• peers
	CSB, CSC, CSD, CSE, CSF, MC9, MC10, EC4, EC5, EC6, DC3.

4. Ethics

4.1 **Ethical principles** and **values.**

Range:
Ethical principles – Honesty, transparency, justice, consent, privacy, confidentiality.
Values – Democracy, rule of law, individual liberty, respect and tolerance.

What do learners need to learn?	**Skills**
Definition of a moral and ethics: • Moral is being concerned with the principles of right and wrong behaviour • Ethics are principles that governs a person's behaviour or the conducting of an activity Definition of the ethical principles and how they are applied in the workplace: • Honesty – to be clear, open and truthful in all forms of communication • Transparency – providing detailed and accurate information to all employees/stakeholders • Justice – prioritise a policy that encourages and rewards diversity and inclusion. Establish policies and procedures against workplace harassment and abuse • Consent – an individual's agreement to allow a certain action to take place, a background check, disclosing of information • Privacy – the various ways of accessing, controlling, monitoring and protecting an individual's information and data • Confidentiality – information about an individual shouldn't be shared without permission of the individual Definition and purpose of whistleblowing – to eradicate unethical behaviour in the workplace. How ethical principles and values are used: • codes of conduct • employment terms and conditions • workplace policies • supply chains How ethical principles and values are represented by ethical behaviours and incorporated into business ethics using codes of conduct. What ethical principles and values impact on business operations, including interaction with stakeholders and the supply chain: • sharing of the same ethical values • non exploitation of workers/employees • non-discriminatory against personal characteristics • complying with relevant legislation	CSA, CSB, CSC, CSE, CSF, EC1, EC4, EC5, EC6, DC3, DC4, DC6.

5. Business

5.1 **Types** of business organisations.

Range:
Types – Sole trader, partnership, limited/unlimited company, state.

What do learners need to learn?	**Skills**
Advantages and disadvantages of types of business organisations: Sole trader advantages: • Simple to set up • Low level of administration responsibility. Your only requirement is to submit a self-assessment tax return • No registration fees • Keep all business profits (after tax deductions) Sole trader disadvantages: • Held personally liable for business losses, debts and negligence as the business is viewed as one entity • Increased personal risk Partnership advantages: • Easy to set up • There can be more than one business owner for support running the business Partnership disadvantages: • Increased liability on all parties. Each partner is held liable for any business or individual partners' negligence Limited company advantages: • Provided with limited liability, only liable for what you have invested into the company • Registering business on Companies House appears more legitimate to customers and stakeholders • Paying corporation tax can be more tax efficient that paying income tax in the higher tax bracket Limited company disadvantages: • Fees involved to register business • Increased administration responsibility that it likely to warrant the support of an accountant State business advantages: • Enables policy to be implemented, measured and monitored • Financially backed through government funding • Enables larger infrastructure projects and investment State business disadvantages: • Size and complexity in delivering on some policy targets Structures of business – not for profit/charity, freelance, franchise, social enterprise, public sector, private sector.	CSA, CSC, CSD, CSE, MC5, MC6, EC4, EC5, DC4.

Types of objectives and values associated with different types of business and structures including: • key performance indicators • social responsibility objectives • environmental objectives Financial, legal and commercial implications for each type of business. Typical organisational policies (health and safety, equality) and their relationship to legislation. • health and safety (Health and Safety at Work Act 1974) • procurement (Environment Act 2021) • recruitment (Equality Act 2010)	

5.2 The **principles** of enterprise skills.

Range:
Principles – Risk taking, innovation, resilience, problem solving, strategic development, market analysis, commercial awareness, decision making, prioritisation.

What do learners need to learn?	**Skills**
How the principles are applied to develop business growth and change including sales opportunities and diversification of the business. • Market analysis to support prioritisation – buying patterns, market trends, competitor offers • Potential horizontal or vertical diversification opportunities, risks and rewards • Decision making tools including SWOT analysis and decision trees Types of business risk (financial, reputational, compliance, operational, economical, security and fraud). Risk management methods and controls (insurance, diversification, risk register, strategic planning, external advice and guidance) that can be deployed.	CSA, CSC, CSD, CSE, MC5, MC6, MC7, MC8, MC10, EC4, EC5, DC4.

5.3 **Measures** that businesses use to determine success.

Range:
Measures – Key Performance Indicators (KPIs), contract terms, Service Level Agreements (SLAs), benchmarking, supply chain requirements.

What do learners need to learn?	**Skills**
Definitions of measures and how these are applied to determine success. Key Performance Indicators (KPIs) – income, revenue, productivity and customer satisfaction. Benefits of KPIs – helps business to focus on priorities, benchmarking, monitoring productivity, and motivation of staff. Typical data sets used to interpret and determine if success measures are met to support business and future budget planning: • Enquiries indicating potential for creating sales • Marketing/promotional activity engagement indicating potential in widening customer base and increasing sales (physical events, online activity) • Income, and income against predicted forecast indicating the success of the product or service and future opportunities • Quantitative data using survey results or customer feedback indicating the success/introduction of new products or service and potential repeat custom • Repeat custom indicating the potential sustainability and viability of the business through predicted future sales Importance of ISO9000 quality standard its purpose and application to organisations. Quality standards expected by internal and external stakeholders and associates. • Service level agreements or contract terms and conditions. • Consequences of not meeting quality standards (potential loss of income, potential reputation risk)	CSA, CSC, CSD, CSE, MC5, MC6, MC7, MC9, MC10, EC4, EC5, DC4.

5.4 The **principles** of project management.

Range:
Principles – Timescales, supply chain, people management, resources, budgeting, effective planning.

What do learners need to learn?	Skills
How to apply the principles of project management through the implementation of a project plan. Factors to consider in the implementation of a project plan: • purpose and scope of the project • setting clear goals and objectives (SMART technique) • defining roles and responsibilities • setting realistic milestones and constraints on cost and time	CSA, CSB, CSC, CSD, CSE, CSF, MC1, MC2, MC4, MC5, MC6, MC7, MC8, MC9, MC10, EC1, EC2, EC3, EC4, EC5, EC6, DC3, DC4.

6. Equality

6.1 **Characteristics** protected by equality legislation.

Range:
Characteristics – Age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion/belief (including lack of belief), sex, sexual orientation.

What do learners need to learn?	Skills
The purpose of current equality and diversity legislation and the protected characteristics detailed under the Equality Act 2010, Employment Rights Act 1996, Human Rights Act 1998 and trade unions, including its application in the workplace.	CSA, CSC, CSE, EC4, EC5.

6.2 **Factors** to consider when working with people from diverse backgrounds.

Range:
Factors – Equality legislation, cultural differences, religious needs, beliefs, disabilities, lifestyle, interests, behaviours, personal characteristics, age, gender, educational level, socio-economic status.

What do learners need to learn?	Skills
Define the below behaviours and how they apply in the workplace: • Prejudice – a preconceived opinion that is not based on actual experience • Bias - the act of unfairly defending or opposing a particular person or object by based on judgment that is based on personal opinion • Direct discrimination – treated unfairly because of a protected characteristic	CSA, CSB, CSC, CSD, CSE, CSF, EC1, EC4, EC5, EC6, DC3, DC5.

- Indirect discrimination – can happen when there are rules or arrangements that apply to a group of employees or job applicants, but in practice are less fair to a certain protected characteristic
- Harassment – aggressive pressure or intimidation
- Victimisation – the action of singling someone out

Consideration of factors when working with people form diverse backgrounds.

Potential consequences of negative discrimination (grievance, disciplinary, potential legal action).

How to show empathy and respect to those from different backgrounds:

- importance of communication
- risks of assumptions (stereotyping)

Methods that embrace and promote diversity and inclusion including:

- inclusive culture – curious and respectful of differences in identity, skills, experiences and perspectives
- recruitment – equal opportunity to access job roles and progression opportunities and adopting inclusive hiring practices
- products – reviewing products to ensure they are accessible, representative and inclusive

7. Communication

7.1 Types of effective **communication.**

Range:
Communication – Verbal, non-verbal, visual, written.

What do learners need to learn?	Skills
Different types of communication and their suitability for different purposes: • informal • formal Formats used for the types of formal and informal communication and their associated business conventions (how they are used): • reports • emails • letters • websites • social media • printed media • photographs and video clips • team meetings and individual meetings • face-to-face associated events Importance of communication, spoken language, body language and tone, and how each is used to convey messages to different audiences for different purposes including: • promotion of the sector/product through social media • legal records • technical reports for quality standards Use of relevant images and visual aids and how these support written text and oral presentations. Benefits and limitations of social media including risk of misuse, positive and negative effects on the business. Positive effects: • maintain and develop new relationships • share and enhance knowledge • promotes a business Negative effects: • potential for negative publicity • unclear cost: benefit analysis for time invested	CSB, CSE, CSF, MC7, MC8, EC1, EC2, EC3, EC4, EC5, EC6, DC1, DC2, DC3, DC5.

8. Relationship management

8.1 Role and purpose of customer care.

What do learners need to learn?	Skills
Importance of first impressions and accurate knowledge when representing the business and self and supporting customers. Difference between customer care and customer service and their wants and needs. Customer care goes beyond customer service because it focuses on emotional connections between brands, products and customers. Customer service focuses on providing advice to customers about the product or dealing with complaints. Methods and impacts of customer care and how they can be applied and maintained when interacting with different stakeholders, including internal customers (volunteers, employees). This includes: • be available to customers and help when you can – helps customers feel more engaged with and increases customer loyalty • personalise customer service – makes the customer feel more valued • friendly/approachable/inclusive attitude – customers feel more comfortable when interacting with products or services How to manage customer expectations and expected timescales. Benefits of customer care to the individual (increased motivation, positive feedback) and business (customer loyalty, customer confidence, increased revenue). Current legal requirements (Consumer Protection Act 1987, Consumer Rights Act 2015) when interacting with different types of customers and customer relationships including business to business (B2B). Principles of customer service and how it can be maintained: • establish customer needs/expectations • promotion of self, company, goods and services • fulfilling customer needs and expectations • complaints handling (dealing with complaints in a positive manner) and how they are applied to customers Typical procedures used to deal with customer queries, disputes and complaints, including: • responding • replacement/reservicing • escalation to relevant individuals and departments within organisations to review the effectiveness of processes and procedures Consequences of not following procedures: • reduction in customer confidence in both product and the retailer • repeat errors that can lead to reputational damage	CSA, CSB, CSC, CSD, CSE, CSF, MC5, MC8, MC10, EC1, EC2, EC3, EC4, EC5, EC6, DC1, DC2, DC3, DC4, DC5.

- if procedures are not followed it may mean that the process is ineffective/not working

Processes used to promote customer relations and to establish and monitor customer satisfaction:

- customer feedback
- customer satisfaction surveys
- customer follow-up procedures
- customer visits

8.2 Roles of different **stakeholders**.

Range:
Stakeholders – Owners, employees, customers, suppliers, contractors, investors, creditors, media, communities, trade unions, government agencies, associations.

What do learners need to learn?	**Skills**
Definitions/roles, expectations and interrelationships of stakeholders (internal and external). Impact of different stakeholders on the business: • owners • employees – work for the business • customers – purchase product/service from the business and can drive change • suppliers – supply inputs and represent a risk to the business • contractors – supply services and represent a risk to the business • investors – key influencers, drive change • creditors – key influencers, drive change • media – key influencers, drive change in customer behaviour and reputation • communities – social impact of the business • trade unions – key influencers, support the business/sector • government agencies – key influencers, drivers of change • associations – represent and support the business and sector	CSA, CSC, CSE, EC4, EC5.

9. Finance

9.1 The principles of finance.

What do learners need to learn?	Skills
Definition of profit (including net and gross) and loss, non-profit and cashflow and the significance of each to business. How profit (including net and gross) and loss are calculated, including gross profit margin. Using the components of a profit and loss statement to calculate profit (including net, gross and gross profit margin). Key components of a profit and loss statement: • Revenue • Sales • Inputs/Cost of goods sold • Expenses • Returns, discounts, refunds • Taxation Types of cost incurred by business (products, ancillary products, types of overheads, labour), their classifications (direct, indirect, fixed, variable). Measures to maximise revenue including adjustments to cost and implications to profitability, reputation and quality. Types of taxation (payroll, business, self-assessment, PAYE, VAT). Sector rates of VAT (standard, reduced, zero). Food and drink, animals, animal feed, plants & seeds. Awareness of Making Tax Digital (MTD). How costs and revenue are forecast. Types of finance (loans, grants/bursaries, income) and the difference between them. • Loans (banks, financiers) and interest rates requires repayment of the money • Governmental grant schemes that don't require repayment of the money Income: • direct sales • contracts • services	CSA, CSB, CSC, CSD, CSE, MC1, MC2, MC4, MC5, MC6, MC7, MC8, MC9, MC10, EC1, EC2, EC3, EC4, EC5, DC2, DC3, DC4.

10. Information and data

10.1 Key requirements of legislation relating to the security of information and data.

What do learners need to learn?	Skills
Types of information and data protected by legislation including personal data, client data, intellectual property. How businesses manage information and data and why these methods are used including: • staff training – to support and improve employees understanding, consistently follow and stay up to date with current policies including General Data Protection Regulation (GDPR) and procedures in handling data to protect personal and business information from the latest threats from hackers • version control – current versions are used to ensure accuracy of information and legislation • access controls – limiting the number of people that need access to sensitive data to mitigate against data breaches • indexing – allows information and data to be found easily in a timely manner • cyber security – software to protect data from illegal access (hacking) Rights of individuals regarding their own information and data. Data storage requirements in relation to security and protection and how they help to prevent common threats including: • cyberattacks • phishing • malware • trojans How to respond to security breaches: • review of policies and procedures including changing and updating passwords • update fire walls and anti-virus protection • staff training to recognise threats • reporting to the Data Protection Authority (DPA) and individuals who data has been breached Purpose of current legislation – Data Protection Act 2018, General Data Protection Regulation (GDPR) and organisational procedures that are used to manage data and increase confidentiality: • Support organisations with their lawful processing of personal data. • Protect the personalised data of individuals • Regulate how organisations process individual data • Prevent organisations form sharing/selling individual data without permission	CSA, CSC, CSD, CSE, MC2, MC5, MC6, EC1, EC3, EC4, EC5, DC1, DC3, DC4, DC5, DC6.

Data protection principles – information must be:

- used fairly, lawfully and transparently
- used for specified, explicit purposes
- used in a way that is adequate, relevant and limited to only what is necessary
- accurate and, where necessary, kept up to date
- kept for no longer than is necessary
- handled in a way that ensures appropriate security, including protection against unlawful or unauthorised processing, access, loss, destruction or damage

Guidance for delivery

The Common Core content should be delivered in the context of the Agriculture, Environmental and Animal Care sectors. A variety of active teaching and learning activities should be used to engage learners in this common core. Opportunities for visits/engagement with local industry and employers should be provided throughout the delivery of the content – where appropriate, local employers could present details of recent projects, problems faced and how they were overcome. Learners' work placement experiences could be presented to peers detailing where knowledge and skills within the content was seen in practice.

Formative assessment for the content may include verbal Q&A, presentations to peers, observation of stock control activities, etc. Reinforcement of learning can be encouraged through revisiting learning, group discussions and the establishment of a peer support system within the cohort.

Providers must ensure content is delivered in line with current, up-to-date industry practices which will require:

- current industry legislation, regulations and technical information
- teaching coverage representing the type of equipment currently available and accepted for use in the UK industry

Suggested learning resources

Websites

- HSE **http://www.hse.gov.uk**
- UN Sustainable Goals **http://www.undp.org/sustainable-development-goals**
- Types of businesses **http://www.bbc.co.uk/bitesize/guides/zqbqgdm/revision/9**
- Natural England **http://www.gov.uk/government/organisations/natural-england**
- UK legislation – **www.legislation.gov.uk/**
- Green Alliance – **https://green-alliance.org.uk/**
- National Association for Environmental Education – **https://naee.org.uk/**
- Energy Saving Trust – **https://energysavingtrust.org.uk/**
- Friends of the Earth – **https://friendsoftheearth.uk/**
- British Ecological Society – **www.britishecologicalsociety.org/**
- Ethical Consumer – **www.ethicalconsumer.org/**
- The Wildlife Trusts – **www.wildlifetrusts.org/**
- Treehugger – **www.treehugger.com/**
- Health and Safety Case in Forestry and Arboriculture: Case studies (hse.gov.uk)
- Personal protective equipment (PPE) at work regulations from 6 April 2022 (hse.gov.uk)
- What Is Climate Change? | United Nations
- Causes and Effects of Climate Change | United Nations
- Joining a trade union: Trade union membership: your employment rights - GOV.UK (www.gov.uk)
- Whistleblowing for employees: What is a whistleblower - GOV.UK (www.gov.uk)

301 Crop, woodland and horticulture core pathway

Level:	3
GLH:	210
Assessment method:	Externally-set exam Employer-set project

What is this pathway about?

An introduction to the crop, woodland and horticulture sectors, within Agriculture Land Management and Production.

It covers the common theoretical knowledge of the crop production, trees and woodland, and horticulture and landscaping industry sectors and various disciplines across all sectors that are indicative to the industry.

Learners gain an understanding of what theoretical principles and practices integral to the industry and sector are required to work in it.

Learners will develop their knowledge and understanding of:

- working within the crop production, trees and woodland, and horticulture and landscaping sectors and the professional responsibilities, attitudes and behaviours required to do so
- fundamental health and safety principles
- principles of plant growth and development
- principles and legislation related to sustainability, plant health, protected and invasive species

Learners may be introduced to this pathway by asking themselves questions such as:

- What are the different sectors within crop, woodland and horticulture?
- What are the different job roles within crop production, trees and woodland, and horticulture and landscaping?
- What does the future look like for these sectors, and where could it take me?
- How do I manage and present a project?

Underpinning knowledge outcomes

On completion of the crop, woodland and horticulture core pathway, learners will understand:

1. Health and safety
2. Sustainability
3. Biosecurity
4. Supply chain
5. Plant growth and development

Completion of the crop, woodland and horticulture core pathway will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented in the skills section of each criteria.

Content

1. Health and safety

1.1 **Hazards, risks** and **control measures** associated with working in the crop production, trees and woodland, and horticulture and landscaping sectors.

Range:

Hazards – Lone working, working at height, hazardous materials, transportation, operation and maintenance of equipment, tools and machinery, contact with machinery, manual handling.

Risks – Electrocution, cuts, crush injuries, slips or falls, muscle strains, injury from falling objects, hearing loss/damage.

Control measures – Elimination, substitution, engineering controls, administrative controls, PPE.

What do learners need to learn?	**Skills**
Typical hazards, associated risks and how they can be controlled: • Hazards – Lone working and remote locations, working at height, spillages, rough/steep/uneven terrain, hazardous materials, transportation, operation and maintenance of equipment, tools and machinery (hand-held, pedestrian, driven), contact with machinery, manual handling, location, weather, exposure to and use of chemicals, other people, falling trees and branches, flora and fauna, flying debris, flooding, water hazards, bulk storage, fire, explosion, above ground and underground services, controlled atmosphere • Risks – Fatality, ill health, electrocution, cuts, amputations, impact injuries, crush injuries, damage to vehicles, tools or buildings, sharp edge-related injuries, injuries from slips or falls, muscle strains, injury from falling objects, back injuries, hypothermia, heat exhaustion, physiological stress, psychological trauma, transmitted infections, damage to equipment or services, pollution and environmental damage, poisoning and contamination, bites, dermatitis, hearing loss/damage, hand arm vibration syndrome (HAVS)/white finger, drowning, suffocation Hierarchy of control measures that can be put in place to minimise these risks: • Elimination – Redesign a job or substitute a substance so that the hazard is removed or eliminated • Substitution – Replace a material or process with a less hazardous one such as use of different equipment/machinery, change to lower emission vehicle • Engineering controls – Separate the hazard from operators by methods such as enclosing or guarding dangerous items of machinery/equipment, directing moving machinery/vehicles (banksman), marked walkways, designated work areas • Administrative controls – Identify and implement policies and procedures needed to work safely such as safety/warning signage, training, certification, safe working practices and discipline • Personal protective equipment (PPE) – Where risk cannot be eliminated or sufficiently controlled to a reasonably practicable level using the above measures, use protective equipment to minimise the consequences of the risk	CSC, CSD, CSE.

Types of PPE used, safe working practices, fatigue and stress management for workers (including lone workers), training, certifications and notifications, first aid provision, environmental protection provision. Purpose of codes of practice, to include the 'Pesticides: Code of practice for using plant protection products'. Where to access up-to-date information and training opportunities in the sector. Manual and mechanical handling equipment and techniques, implications of safe and unsafe lifting and loading.	

1.2 Procedures to follow when dealing with **emergency situations**.

Range:

Emergency situations – Accidents causing injury, falls from working at height, accidents involving vehicles, tools, machinery and equipment, spillage of hazardous substances, flooding, fire, medical issues, accidents in remote/restricted access locations, weather-related emergencies, above ground and underground services.

What do learners need to learn?	**Skills**
Correct procedures to follow when encountering an accident, incident or medical emergency including communication, following emergency plan, ensuring safety of self and others in area. Emergency situations that can lead to health and safety risks and the associated control measures that should be applied. Correct procedures to follow to protect the environment when encountering spillages and pollution incidents. Importance of accident and incident reporting in accordance with the current Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR).	CSB, CSC, CSD, CSE, CSF.

2. Sustainability

2.1 **Waste** management **principles** in the crop production, trees and woodland, and horticulture and landscaping sectors.

Range:

Principles – The 5 Rs of waste management, waste management hierarchy.

Waste types – Metal, wood, arisings, glass, plastics, paper, electronics, fuels, oils, chemicals and substrates, asbestos, crop residues, bulky organic material.

Waste classifications - Controlled, hazardous, non-hazardous, recyclable, non-recyclable.

What do learners need to learn?	**Skills**
Areas within the sector where waste arises. Importance of safe and efficient waste disposal in the sector area. Importance of keeping records. Benefits and implications of waste management. • Financial – potential of waste products for generating income, potential financial penalties for poor waste management • Environmental - potential damage due to poor waste management, potential benefits due to good waste management • Legal – potential prosecution for breaches of legislation Application of methods for managing waste using waste management principles: • The 5 Rs of waste management: Refuse, reduce, reuse, repurpose, recycle • Waste management hierarchy: Prevention, preparing for re-use, recycling, other recovery, disposal Key requirements of current associated legislation: • Environmental Protection Act 1990 (as amended) • Environment Act 1995 • Environment Act 2021 • Controlled Waste (England and Wales) Regulations • Control of Substances Hazardous to Health Regulations (COSHH). • Classification Labelling and Packaging of Substances and Mixtures (CLP) Regulation • Code of practice for using plant protection products • Measures that can be put in place by the sector and organisations to meet legislative requirements Considerations, actions and requirements for managing the different types and classifications of waste materials: • Identification – why identification is important, stock take • Handling – managing risk (risk assessments), contingencies, PPE requirements • Storage – containers and storage facilities, stock control, labelling • Transfer – licenced carriers, suitability of container/storage, safety, risk assessment, contingencies • Disposal/recycling – licenced contractors • Record keeping – waste transfer notes, stock take	CSA, CSC, CSD, CSE, EC4, EC5.

2.2 Legislation on protected plant species.

What do learners need to learn?	**Skills**

Legislation that protects plant species, and where to find it.
• Protection given to plants specifically listed as protected species under Wildlife and Countryside Act (WCA) 1981 (schedule 8)
• Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) – Purpose in protecting flora and how to find further information
• National bodies that enforce legislation and provide information
  ○ Department for Environment, Food & Rural Affairs (DEFRA)
  ○ Environment Agency
  ○ Natural England
• Potential penalties for breaking the law:
  ○ fine
  ○ prison sentence
	CSA, CSC, CSD, CSE, EC4, EC5.

2.3 Common invasive plant **species** and associated **legislation.**

Range:

Species – *Reynoutria japonica* (Japanese knotweed), *Impatiens glandulifera* (Himalayan balsam), *Heracleum mantegazzianum* (Giant hogweed), *Rhododendron ponticum* (Rhododendron), *Hydrocotyle ranunculoides* (Floating pennywort).

Legislation – Wildlife and Countryside Act (WCA) 1981 (schedule 9), Natural Environment and Rural Communities Act (NERC) 2006, Invasive non-native (alien) plant species: Rules in England and Wales.

What do learners need to learn?	**Skills**

Identification of invasive plant species commonly found in the UK.
Where to find information on which plant species are designated as invasive
• Wildlife and Countryside Act (WCA) 1981, schedule 9
 	
National bodies that enforce legislation and provide information and guidance related to invasive plants:
• Department for Environment, Food & Rural Affairs (DEFRA)
• Environment Agency
• Natural England
• GB Non-native Species Secretariat
 	
Implications of finding invasive species in an environment.
• How to manage invasive species in an environment:
  ○ guidance and legislation
  ○ role and use of specialist contractors
  ○ duties under legislation
  ○ hygiene and containment
  ○ control measures
• Potential penalties for breaking the law:
  ○ warning
  ○ being served with a compliance or restoration notice
  ○ fine
  ○ loss of permit/licence (if held)
  ○ prison sentence
	CSA, CSC, CSD, CSE, EC4, EC5.

3. Biosecurity

3.1 **Principles** of biosecurity in the crop production, trees and woodland, and horticulture and landscaping sectors.

Range:
Principles – Definitions, risks, the range of measures that can be put in place at the national, key or local level to protect against the introduction and spread of new pests and diseases, and measures to effectively deal with them should they arrive (inspection, monitoring, regulation, plant passports, movement control, isolation, quarantine).

What do learners need to learn?	**Skills**
Key principles of biosecurity in the sector. Roles of: • The Department for Environment, Food and Rural Affairs (DEFRA) • Plant Health and Seeds Inspectorate (PHSI) • The Forestry Commission • Animal and Plant Health Agency (APHA) The purpose of codes of practice and industry guidance. Implications of not following codes of practice and industry guidance. Current biosecurity issues within the sector, including the introduction of pests and diseases through imports. Import substitution and its implications for the sector. Factors influencing future biosecurity: • national/international trade • new technologies • disease outbreak • disease control • outbreak management and implications Need for, and benefits of, public education on biosecurity. Methods for public education on biosecurity.	CSA, CSC, CSD, CSE, EC4, EC5.

3.2 Key responsibilities under plant health **legislation** and **regulations**.

Range:
Legislation – Plant Health Act 1967 (as amended).
Regulations – The Official Controls (Plant Health and Genetically Modified Organisms) (England) Regulations.

What do learners need to learn?	**Skills**
Key responsibilities under current plant health legislation and regulations relating to: • the sourcing of plants/seed • establishment • maintenance • harvesting	CSA, CSC, CSD, CSE, EC4, EC5.

- movement, sale and disposal of plant and organic material

4. Supply chain

4.1 **Principles** of supply chains in the crop production, trees and woodland, and horticulture and landscaping sectors.

Range:

Principles – How a supply chain works in this sector by the transformation of natural resources, raw materials and components into a finished product and delivering to the end customer. Interconnection of links in the chain, external factors which influence flow of products and future technologies.

What do learners need to learn?	**Skills**

Principles:
• Transformation of natural resources, raw materials and components into a finished product within the sector
• Different types of organisations involved, and their role in the sector.
  ○ suppliers
  ○ growers/producers/landowners
  ○ distributors/hauliers
  ○ retailers
  ○ customers
• Importance of efficiency and interdependency in a supply chain, considering the following – suppliers, distributors, customers, supply chain assurance, ethics
• External influences – political, economic, socio-cultural, technological, legislative and environmental
 	
Operation:
• Different ways in which a supply chain is sequenced and operates.
• Types of procurement (competitive bidding, direct purchase) and their suitability for different situations
• Implications of failing to meet supply chain demands, to include quantity and quality
• Environmental and ethical impact of the supply chain including whole life cycle of a product
• Potential for used products re-entering the supply chain at any point where residual value is recyclable
 	
Customer base:
• Number, type, characteristics, market segments, market share
• Size of example markets relevant to the sector – the concepts of value of sales, number of customers, product mix
• Methods for establishing customer information (existing and new customers, surveys, analysis of records/data) to increase market share (identification of opportunities in existing and new markets), and consideration of the implications of General Data Protection Regulations (GDPR)
 	
Competitors:
• Competitor analysis – direct and indirect business competitors (definition, differences, products and services)
	CSA, CSB, CSC, CSD, CSE, MC1, MC2, MC5, MC6, MC7, MC8, MC10, EC4, EC5, EC6, DC4.

4.2 **Principles** of **stock** management in the crop production, trees and woodland, and horticulture and landscaping sectors.

Range:

Stock – Plants/seed, plant protection products, fertilisers, composts and growing media, fuels, oils, chemicals, tools, machinery and equipment, maintenance items/materials, PPE.

Principles – Requirement for and benefits of inventories and stock rotation, storage requirements of stock, efficient monitoring, maintaining stock levels to meet supply and demand, dealing with deliveries and dispatches, maintaining records, use of technology for tracking and management.

What do learners need to learn?	**Skills**
How the principles of stock management are applied in different types of business within this sector and for different purposes (retail and wholesale sales, production activities, maintenance activities and equipment/machinery supply): • Implications to businesses of effective and ineffective processes • Cost-effective methods for monitoring, ordering (alternative sources and products such as buying components/parts), financing (purchasing, leasing, hiring), and using stock to meet supply and demand, including basic calculations required, and how to decide what approach to take • Methods of storing relevant products, to include perishable and non-perishable items, stock rotation, safety, security, minimising wastage, compliance with relevant legislation and guidelines (Control of Substances Hazardous to Health Regulations (COSHH), Code of Practice for Using Plant Protection Products, Plant Protection Products (Sustainable Use) Regulations) • Methods for restocking and replacement of stock • Use of technologies (barcodes, radio frequency identification (RFID), tracking devices) for increasing efficiency of systems in use within the sector • Importance of regular auditing of stock	CSA, CSB, CSC, CSD, CSE, MC1, MC2, MC3, MC4, MC5, MC6, MC7, MC8, MC9, MC10, EC4, EC5, EC6, DC4.

5. Plant growth and development

5.1 The physical **structures** of plants and their **functions**.

Range:

Structures – Internal: cell structure (cytoplasm, organelles), parenchyma, collenchyma, sclerenchyma, xylem tissue, phloem tissue, cambium, epidermis, guard cells and stomata. External: roots, shoots, stem, leaves, buds, bulbs, tubers, flowers, fruit and seeds.

Functions – Photosynthesis, reproduction, support, transport, anchorage, absorption, storage, defence, attraction, gaseous exchange, respiration, transpiration, division, perennation.

What do learners need to learn?	Skills
Major internal and external structures of plants. Function and morphology (structure) of the major plant structures. How the major plant structures interact to support the plant's growth. Implications for plant growth from dysfunction in plant parts and processes.	CSA, CSC, CSD, CSE, EC4, EC5.

5.2 Physical **processes** involved in plant growth.

Range:

Processes - Physical processes – Germination, primary growth elongation, secondary growth/thickening, pollination, fertilisation, seed dispersal.

Physiological processes – Photosynthesis, respiration (aerobic and anaerobic), water movement (osmosis, diffusion, transpiration) and translocation.

Tropisms – Geotropism (response to gravity), hydrotropism (response to water), heliotropism (response to the sun), phototropism (response to light), thigmotropism (response to touch).

What do learners need to learn?	Skills
Principles of the physical processes (physical, physiological and tropisms) involved in plant growth: • How these affect the morphology (structure) and physiology of plants and their establishment, growth and development • Methods to control, mitigate or enhance these processes (mulch, protection, heat, light, humidity management, irrigation, nutrition) • Purpose, process and equation for photosynthesis and chloroplasts, function of chlorophyll, functionality of guard cells and stomata, factors influencing the rate of photosynthesis (light, chlorophyll, temperature, carbon dioxide, water, leaf colour) and the impact of reduced photosynthesis (etiolation) • Definition and purpose of aerobic and anaerobic respiration, equation for aerobic respiration, factors influencing the rate of respiration (temperature, water availability, seasonal growth) • Uptake, transport and loss of water and nutrients – the purpose and process of osmosis, diffusion, evaporation, transpiration, factors influencing transpiration (temperature, humidity, air movement, water supply, light, stomata) and translocation • Tropisms – a plan's natural response to stimuli. Including the difference between positive tropism, the movement towards a stimuli and negative tropism, the movement away from a stimuli.	CSA, CSC, CSD, CSE, EC4, EC5.

5.3 The **life cycle** of plants.

Range:
Life cycle – Life cycle types - ephemeral, annual, biennial, perennial.
Types of germination – epigeal, hypogeal.
Types of reproduction – sexual reproduction, asexual reproduction.

What do learners need to learn?	**Skills**

Characteristics of different types of plant life cycle.
Process, stages and types of germination.
Types of reproduction:
• sexual reproduction
  ○ flower structures
  ○ pollination and fertilisation
  ○ seed production
  ○ dispersal.
• asexual reproduction
  ○ vegetative propagation
  ○ parthenogenesis
	CSA, CSC, CSD, CSE, EC4, EC5.

5.4 Growth and development of plants.

What do learners need to learn?	
How plants grow and develop, through a knowledge of their structure and physiology. • Cell division, cell expansion, cell differentiation, apical meristems, lateral meristems, formation of roots, shoots, leaves and buds • Difference between decurrent and excurrent growth • Apical growth, secondary growth Requirements for plant growth and development to achieve high quality and yield: • nutrients (macro, micro, NPK) • water • light • temperature • growing media (soil, compost, substitutes)	CSA, CSC, CSD, CSE, EC4, EC5.

Guidance for delivery

The content within this Core Pathway should be delivered in the context of the Crop, Woodland and Horticulture sectors. A variety of active teaching and learning activities should be used to engage learners in this common core. Opportunities for visits/engagement with local industry and employers should be provided throughout the delivery of the content – where appropriate, local employers could present details of recent projects, problems faced and how they were overcome. Learners' work placement experiences could be presented to peers detailing where knowledge and skills within the content was seen in practice.

Formative assessment for the content may include verbal Q&A, presentations to peers, observation of stock control activities, etc. Reinforcement of learning can be encouraged through revisiting learning, group discussions and the establishment of a peer support system within the cohort.

Providers must ensure content is delivered in line with current, up-to-date industry practices which will require:

- current industry legislation, regulations and technical information
- teaching coverage representing the type of equipment currently available and accepted for use in the UK industry

Suggested learning resources

Websites

- The Soil Association – **www.soilassociation.org**
- Department for Environment Food and Rural Affairs (DEFRA) – **www.gov.uk/government/organisations/department-for-environment-food-rural-affairs**
- DEFRA Plant Health Portal – **https://planthealthportal.defra.gov.uk**
- Environment Agency – **www.gov.uk/government/organisations/environment-agency**
- Health and Safety Executive – **www.hse.gov.uk**
- IdentiPest British Crop Protection Council (BCPC) – **www.identipest.co.uk**
- Farming Community Network – **www.fcn.org.uk, www.farmwell.org.uk**
- Royal Horticultural Society – **www.rhs.org.uk**
- Health and Safety Executive – **www.hse.gov.uk**
- Arboricultural Association (AA) – **www.trees.org.uk**
- Confor – **www.confor.org.uk**
- Forestry Commission – **www.gov.uk/government/organisations/forestry-commission**
- Forestry England – **www.forestryengland.uk**
- UK Woodland Assurance Standard – **www.ukwas.org.uk**
- UK Forestry Standard – **www.gov.uk/government/publications/the-uk-forestry-standard**

302 Land-based engineering core pathway

Level:	3
GLH:	270
Assessment method:	Externally-set exam Employer-set project

What is this pathway about?

An introduction to land-based engineering. It covers the related and practical knowledge of the industry across various land-based engineering occupations.

Learners will gain an understanding of operating principles and applications integral to the industry.

Learners will develop their knowledge and understanding of:

- health and safety
- sustainability
- biosecurity
- supply chain
- types of land-based equipment and machinery
- operating principles of land-based equipment and machinery, and their systems and components

Learners may be introduced to this pathway by asking themselves questions such as:

- What are the different sectors in land-based engineering?
- What are the different job roles in land-based engineering?
- What are the career opportunities in this industry?

Underpinning knowledge outcomes

On completion of the land-based engineering core pathway, learners will understand:

1. Health and safety
2. Sustainability
3. Biosecurity
4. Supply chain
5. Land-based equipment and machinery
6. Operating principles of integrated and stand-alone systems and components
7. Land-based equipment and machinery maintenance
8. Repair land-based machinery and equipment

Completion of the land-based engineering core pathway will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented in the skills section of each criteria.

Content

1. Health and safety

1.1 **Hazards, risks** and **control measures** associated with working in the land-based engineering sector.

Range:

Hazards – Engineering processes, machinery and equipment, workplace.

Risks – Electrocution, cuts, crush injuries, slips or falls, injury from falling objects, hearing loss/damage.

Control measures – Elimination/mitigation, substitution, engineering controls, administrative controls, biosecurity requirements, personal protective equipment (PPE).

What do learners need to learn?	**Skills**
The difference between hazards, risks and control measures. Identify hazards, risks and control measures in land-based engineering activities: Hazards: • Engineering processes – Grinding and cutting processes (powered tool, oxy acetylene/propane gas), joining processes (thermal and non-thermal fusion, adhesive/chemical bonding), effects of temperature, electrical and electronic equipment, hazardous materials, spillages, toxic and acidic substances, irritants, liquids, gases and fumes, contaminated products (oils, chemicals), use of hand and powered tools, equipment and special tools, emerging technologies (alternative fuels and vehicle power sources), fire, explosion, electric shock • Machinery, equipment and tools – Stored energy, manual handling, hydraulic jacking, lifting, supporting and moving loads, moving vehicles • Workplace – Diseases/ infections (Weils, tetanus, sepsis), working near animals/livestock, lone working, working with colleagues, other people and members of the public, indoor and outdoor working environments, locations and conditions (on site, weather, effects of temperature, working at height, confined spaces) Risks: • Fatality, ill health, life-changing injury, suffocation, drowning, electrocution, burns, entanglement, amputations, ejection of fluids and components, impact injuries, crush injuries, damage to vehicles or buildings, sharp edge related injuries, injuries from slips, trips or falls, muscle strains, back injuries, transmitted infections, damage to equipment or services, malfunction of equipment and machinery, incorrect use of equipment and machinery, pollution and environmental damage, poisoning and contamination, dermatitis, hearing damage and loss, hand arm vibration syndrome (HAVS)/white finger Hierarchy of control measures that can be put in place to minimise these risks, including codes of practice and procedures: • Elimination – Modify/redesign a job or substitute materials, substances or equipment, restrict access, follow best practice to remove or eliminate hazards, mechanical supports, training	CSA, CSC, CSD, CSE, EC4, EC5.

• Substitution – Replace a material or process with a less hazardous one, repair or replace faulty tooling and equipment • Engineering controls – Separate the hazard from operators by methods such as enclosing or guarding dangerous items of machinery/equipment, isolation from hazards/others, directing moving machinery/vehicles (banksman), marked walkways, designated work areas • Administrative controls – Identify and implement policies and procedures needed to work safely such as safety/warning signage, lone working procedures, training, certification, fatigue and stress management, safe working practices and discipline. Certification of machinery and equipment, and fit for purpose • Personal protective equipment (PPE) – Where risk cannot be eliminated or sufficiently controlled to a reasonably practicable level using the above measures, use protective equipment to minimise the consequences of the risk. Replacing PPE as required. Biosecurity requirements – For on-and off-site work locations Hazard and warning symbols and signs, their categories, meanings and features – colours and shapes of: • prohibitory signs • warning signs • mandatory signs • emergency escape signs Key statistics for agriculture: • Rates of workplace diseases, accidents and disorders - work-related ill health, non-fatal and fatal injuries, musculoskeletal disorders • Their implications – Economic costs, moral, social, mobility, earning potential, legal and financial issues, enforcement notices and prosecutions	

1.2 Procedures to follow when dealing with **emergency situations**.

Range:

Emergency situations – Fire, explosion, spillages, accidents, release of hazardous liquids, contaminants and gases, first aid, security (intruder, malicious attack), workplace security, emergency communication, lone working procedures.

What do learners need to learn?	**Skills**
Correct procedures to be followed in emergency situations, including communication, following emergency plan, ensuring safety of self and others in area. Emergency situations that can lead to health and safety risks and the associated control measures that should be applied. Importance of accident and incident reporting in accordance with the current Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR). Employer and work site induction process, to highlight specific working procedures and policies (evacuation, emergency stop, environmental and emergency situations). Types of fire extinguisher, their uses and how to identify them.	CSB, CSC, CSD, CSE, CSF, EC5.

1.3 Specific health and safety **legislation** in land-based engineering.

Range:
Legislation – Health and Safety at Work Act 1974, Road Traffic Act 1988.
Current regulations:

- Management of Health and Safety at Work Regulations
- Workplace Health Safety and Welfare Regulations
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR)
- Display Screen Regulations
- Personal Protective Equipment at Work (Amendment) Regulations
- Provision and Use of Work Equipment Regulations (PUWER)
- Manual Handling Operations Regulations
- Health and Safety (First Aid) Regulations
- The Control of Noise at Work Regulations
- Electricity at Work Regulations
- Lifting Operations and Lifting Equipment Regulations (LOLER)
- Working at Height Regulations
- The Confined Space Regulations
- Control of Substances Hazardous to Health Regulations (COSHH)
- Classification Labelling and Packaging of Substances and Mixtures (CLP) Regulation
- Supply of Machinery (Safety) Regulations
- Health and Safety (Signs and Signals) Regulations

What do learners need to learn?	**Skills**

Key requirements and application of current key legislation within the land-based engineering industry:
• Why there is a need for the legislation
• That there is legislation to cover every aspect of the workplace
• How the legislation keeps them safe in the workplace
• Who is responsible for compliance with current regulations and legislation
• Where to access information about workplace legislation.
• Health and safety culture, training and information.
Employee and employer responsibilities under key legislation relating to health, safety and welfare within the land-based engineering workplace, including:
• Responsibility for maintaining and continuous improvement of standards in health and safety.
• Application of relevant legislation, Codes of Practice and Standards in the workplace through:
  ○ written guidance
  ○ policies, such as workplace inspection regimes
  ○ procedures, such as accident and near-miss reporting procedures
  ○ training
  ○ signage
  ○ record keeping and reporting
	CSA, CSC, CSD, CSE.

2. Sustainability

2.1 Environmental **legislation**, regulations, codes of practice and organisational policies.

Range:
Legislation – Environmental Protection Act 1990 (as amended), Control of Pollution Act 1974, Environment Act 1995, Environment Act 2021.

What do learners need to learn?	**Skills**
Key requirements of environmental legislation, regulations, codes of practice, duty of care (Environmental Protection Act: Section 34) and organisational policies and how they are applied to land-based engineering operations. Employees' responsibilities. Employer's responsibilities. Purpose of environmental legislation within the land-based engineering industry: • Why there is a need for the legislation • How the legislation protects the environment and health • Who is responsible for compliance with current regulations and legislation Key government environmental policies and initiatives. How actions taken can influence sustainability: measures that can be taken in the land-based engineering sector to reduce carbon footprint, energy and water consumption and associated environmental performance measures. Application of relevant legislation, Codes of Practice and Standards in the land-based engineering workplace through: • written guidance • policies, such as environmental inspection regimes • procedures, such as spillage management • training • signage • record keeping and reporting	CSA, CSC, CSD, CSE, EC5.

2.2 **Waste** management **principles**.

Range:
Principles – The 5 Rs of waste management, waste management hierarchy.
Waste types – Metal, wood, glass, plastics, paper/cardboard, tyres, waste electrical and electronic equipment (WEEE), fluids (chemicals, fuels, lubricants, coolant), crop residues, organic material, batteries, pressurised containers (bottles, canisters), gases.
Waste classifications – Controlled, hazardous (including poisonous waste), non-hazardous, recyclable, non-recyclable.

What do learners need to learn?	**Skills**
Areas within the sector where waste arises. Importance of safe and efficient waste disposal in the sector area. Importance of keeping records.	CSA, CSC, CSD, CSE, EC4, EC5.

Benefits and implications of waste management:

- Financial – potential of waste products for generating income, potential financial penalties for poor waste management
- Environmental - potential damage due to poor waste management, potential benefits due to good waste management
- Legal – potential prosecution for breaches of legislation

Application of methods for managing waste using waste management principles:

- The 5 R principles of waste management: Refuse, reduce, reuse, repurpose, recycle
- Waste management hierarchy: Prevention, preparing for re-use, recycling, other recovery, disposal

Key requirements of current associated legislation:

- Environmental Protection Act 1990 (as amended)
- Controlled Waste (England and Wales) Regulations
- Control of Substances Hazardous to Health Regulation (COSHH)
- Classification Labelling and Packaging of Substances and Mixtures (CLP) Regulation
- Measures that can be put in place by the sector and organisations to meet legislative requirements

Considerations, actions and requirements for managing the different types and classifications of waste materials:

- Identification – why identification is important, stock take
- Handling – risk assessment, PPE requirements
- Storage – containers and storage facilities, stock control, labelling, separating waste
- Transfer – licenced carriers, suitability of container/storage, safety, risk assessment, contingencies
- Disposal/recycling – registered/licenced contractors
- Record keeping – audit trail, waste transfer notes, stock take

3. Biosecurity

3.1 Biosecurity **requirements** and organisational policies.

Range:
Requirements – Contamination and disease risk control measures.

What do learners need to learn?	**Skills**

Key principles:
• Definition of biosecurity and its importance in maintaining health, production and safe working environment
• Risk factors associated with biosecurity – national/international trade, disease outbreak
• Biosecurity control measures:
  ○ Inspection, monitoring, regulation, isolation
  ○ Hygiene practices – Machinery and equipment hygiene, vermin control, use of PPE, security of environment, preventing contamination
• Requirements - codes of practice, standards and organisational policies and how they are applied to the maintenance of the working environment: control of visitors and staff, isolation of products, cleansing vehicles and machinery, pest control, appropriate PPE, actions to take following contamination
	CSA, CSC, CSD, CSE, EC4, EC5.

4. Supply chain

4.1 The **supply chain**.

Range:

Supply chain – Organisations – Manufacturers, suppliers, distributors, customers.

Products – Land-based machinery and equipment, parts (original equipment manufacturer, non-genuine), sundries (fixings, washers, seals, gaskets), fuels, oils, chemicals, coolants, gases, tooling, PPE, services (on/off-site maintenance, repair, installation, testing).

What do learners need to learn?	Skills
Importance of efficiency and interdependency in a supply chain considering the following – suppliers, distributors, customers, supply chain assurance, ethics. Different types of organisations involved and their role. Different ways in which the supply chain is sequenced and operates. Implications of failing to meet supply chain demands to include quantity and quality. Environmental and ethical impact of the supply chain including whole life cycle of a product. Size of market – value of sales, number of customers, product mix. External influences and how they disrupt the supply chain, including: • political – country to country hostility, sanctions • economic – industrial action, inflation • socio-cultural – health pandemics • technological – failure of technology • environment – natural disaster and extremes of weather (earthquake, flooding, heatwave), scarcity of resources Customer base – number, type, characteristics, market segments. Competitor analysis – direct and indirect competitors. Types of procurement (competitive bidding, direct purchase) and their suitability for different situations. Terms of business. Application of relevant Codes of Practice and Standards.	CSA, CSB, CSC, CSD, CSE, MC1, MC2, MC5, MC6, MC7, MC8, MC10, EC4, EC5, EC6, DC4.

4.2 **Principles** of **stock** management.

Range:

Principles – Stock rotation, obsolescence, supersession, storage requirements, monitoring and maintaining stock levels to meet supply and demand, dealing with deliveries, maintaining records.

Stock – Tools, equipment, PPE, parts, sundries (fixings, washers, seals, gaskets), fuels, oils, chemicals, coolant, gases.

What do learners need to learn?	Skills
Types of stock in a land-based engineering business. How the principles of stock management are applied in different types of business. Implications to businesses of ineffective processes. Factors which influence demand – season, weather, high use/wear parts,	CSA, CSB, CSC, CSD, CSE, MC1, MC2, MC3, MC4, MC5, MC6, MC7,

economics, change in customer business trends. How to order and use stock and non-stock items to meet supply and demand of slow- and fast-moving items. Methods of storing products to include hazardous substances, security, minimising wastage, compliance with relevant legislation and guidelines (Control of Substances Hazardous to Health Regulations (COSHH), Classification Labelling and Packaging of Substances and Mixtures (CLP) Regulation, Health and Safety (Signs and Signals) Regulations).	MC8, MC9, MC10, EC4, EC5, EC6, DC4.

5. Land-based equipment and machinery

5.1 Types of **land-based equipment and machinery**.

Range:
Land-based equipment and machinery used in construction, agriculture, outdoor power equipment/hire equipment, professional turf management, forestry, fixed plant.

What do learners need to learn?	**Skills**
Identify (visually recognise) land-based equipment and machinery: • Construction – Excavators, crushers, scrapers, levellers, backhoes, dumpers, materials handling, material processing, cranes, compactors, drainage equipment • Agriculture – Soil engaging machinery, crop establishment machinery, crop care and irrigation machinery, harvesting machinery (cutting & processing), tractors (18Kw-200Kw), trailers, all-terrain vehicles, rough-terrain material handlers, material handlers, autonomous and robotic machinery • Outdoor power equipment/hire equipment – Chainsaws, leaf blowers, strimmers, brushcutters, augers, mowers (ride-on, pedestrian and robotic), hedge trimmers and cutters, generators, material mixing equipment, rough terrain vehicles, golf carts and buggies • Professional turf management – Mowers, aerators, scarifiers, sprayers, top dressers • Forestry – Chainsaws, woodchippers, forwarders, harvesters, skidders, skylines • Fixed plant – Crop processing, milking parlours, grading equipment, storage facilities, conveyors, augers, elevators, grain driers Function of land-based equipment and machinery in relation to applications and crops: • the purpose of the equipment and machinery • what the main assemblies are, such as power unit, transmission, crop processing units, chain drive in a chainsaw, potato processing parts • understand how the assemblies support the equipment and machinery's function Conformity to relevant health & safety legislation and standards including UK Conformity Assessed (UKCA) marking, highway compliant, environmental standards.	EC5.

6. Operating principles of integrated and stand-alone systems and components

6.1 Operating principles of **power units** and associated **integrated and stand-alone systems.**

Range:
Power units – 4-stroke and 2-stroke cycles. Compression ignition and spark ignition engines. Electric motors (high-voltage and low-voltage).
Integrated and stand-alone systems – Air intake systems, fuel injection and fuel systems, filtration systems, cooling systems, lubrication systems, control and monitoring systems, emissions control systems.

What do learners need to learn?	**Skills**
Operating principles of power units, and their applications in machinery. Operating principles of integrated and stand-alone systems, and their applications in machinery: • Air intake systems – Turbocharging, intercooling, air cleaning systems, filter restriction indicators • Fuel injection and fuel systems – Diesel (mechanical, electronic, cold-start devices), petrol (carburettors, electronic injection), alternative fuels (methane/CNG) • Filtration systems – Fuel, air, coolant, lubricant • Cooling systems – Liquid cooling systems, air cooling systems, thermostats, radiators, cooling pumps, ducting systems, fans (fixed/thermo-viscous/electric/hydraulic) • Lubrication systems – Splash, force feed, pressure, non-pressure, 2-stroke and 4-stroke engine lubrication • Control and monitoring systems – Operational control, performance and monitoring control, programmable • Emissions control systems to meet TIER/STAGE emission control legislation - exhaust gas recirculation (EGR), selective catalytic reduction (SCR), diesel exhaust fluid (DEF) systems, after-treatment systems (diesel particulate filter (DPF), diesel oxidation catalysts (DOC)), catalytic converters Identification of power unit and systems components. Function of components required to support those operating principles. How components and systems interrelate and affect each other. Systems testing standards. Methods of monitoring and testing system performance and operation (conformity tests and typical readings/findings, possible causes of component failure).	EC5, MC5.

6.2 Operating principles of **gearboxes, transmissions and drivelines,** and associated **sub-assemblies, components** and **traction**.

Range:
Gearboxes, transmissions and drivelines – Mechanical, hydrostatic, full/semi-powershift, constantly/infinitely variable transmissions (CVT/IVT), electric drives, hydro-mechanical
Sub-assemblies – Axles, reduction and final drives, clutches, types of gears and engagement systems.
Components – Universal joints (wide angle, hooke, constant velocity/non-constant velocity), couplings (rigid, flexible), shafts, protection devices (overrun, torque-limiting, shear), chains (precision, non-precision), belts (profiles, sections, materials), pulleys (fixed, variable), bearings

(axial, radial), bushes, seals (dynamic, static), gaskets, sealants (dynamic, static, anaerobic), driveline guarding, drive component fastening devices (roll pins, circlips, split pins, taper locks, snap rings, keys and keyways, splines).
Traction – Wheels, tyres, tracks – construction, treads, ballasting, ground pressure, removal and refitting, different uses, soil compaction, stability, weight transference, maximum load capacities, interaxle ratios.

What do learners need to learn?	**Skills**
Operating principles of transmission systems, and their applications in machinery. Operating principles of their sub-assemblies, and their applications in machinery: • Axles, reduction and final drives – Reduction, amplification, epicyclic • Clutches – Single, dual, multi-plate, vibration dampers, fluid flywheels and torque converters, electric clutches, clutch activation (mechanical, hydraulic, electro-hydraulic) • Types of gears and engagement systems – Teeth profile, tooth contact, synchronisation, selection, interlocking mechanisms, torque, speed, ratio, direction Operating principles of their components, and their applications in machinery. Operating principles and applications of traction in machinery. How to identify transmission systems, their sub-assemblies and components. Function of components required to support the operating principles. Setting of transmission components (pre-load, end float, rolling resistance, pinion protrusion, tooth contact, alignment/run out, adjusting torque limiting devices). How transmissions, their sub-assemblies, components and traction interrelate and affect each other. Timing, ratios and balance. Systems testing procedures. Methods of monitoring and testing system performance and operation (conformity tests and typical readings/findings, possible causes of component failure).	EC5, MC4, MC5.

6.3 Operating principles of **hydraulic systems** and **components.**

Range:
Hydraulic systems – Open centre, closed centre, load sensing.
Components – Reservoirs, pumps and motors (fixed displacement, variable displacement), valves (pressure relief, by-pass valves, pressure maintaining, anti-cavitation, shock, control, flow dividers, priority valves, solenoid, proportional, directional control), auxiliary valves, QR couplings, trailer braking valves, restrictors, accumulators, cylinders, pipes and hoses, fittings, filters, strainers, coolers, sensors and switches, hydraulic fluids.

What do learners need to learn?	**Skills**
Operating principles of hydraulic systems and their components. Applications of hydraulic systems and their components in machinery. Identification of hydraulic systems and their components. Function and operation of hydraulic systems and their components. How hydraulic systems and components interrelate and affect each other. How to recognise, understand, and interpret hydraulic circuit schematic diagrams (DIN and ISO standard hydraulic symbols).	EC5, MC4, MC5, MC7, MC8.

Types of contamination and methods of filtration. Control mechanism: mechanical, pilot, electronic. Pressure ratings of components. Systems testing (pressure, flow, force). Methods of monitoring and testing system performance and operation (conformity tests and typical readings/findings, possible causes of component failure).	

6.4 Operating **principles** of electric/electronic **systems** and **components**.

Range

Principles – Basic principles of electricity and electronics, electric circuit theories, DC circuit networks, signals.

Systems – Starting, charging, lighting, performance monitoring, CAN bus, ISO bus, telematics, control systems (vehicle management, headland management, GPS, automatic guidance), ignition.

Components – Batteries (wet, dry), alternators, switches, transducers, potentiometers, resistors, diodes, capacitors, inductors, transistors, motors and fans, electro-magnetic devices, solenoids, relays, sensors, cold-start devices, wiring, connectors, bulbs, LEDs, fuses, fusible links, electronic control units and instrumentation (engine, hydraulic, transmission, suspension, steering).

What do learners need to learn?	**Skills**
Operating principles of electric/electronic systems and their components: • Basic principles of electricity and electronics – Flow of electrons, charges, energy, power, force, current, capacitance, waves, conduction, magnetism, electromagnetism, inductance, measurements of electrical quantities in electrical systems (standard units and equipment used to measure electrical values, multimeters) • Electric circuit theories – Voltage, current (alternating current (AC), direct current (DC)), power, resistance, potential difference and dividers, basic electrical elements, Ohm's law (series, parallel and combination circuits), protection systems (residual current devices (RCD), thermal) • DC circuit networks – Resistors, capacitors and inductors in series, parallel, and combined circuits, semiconductors (forward and reverse bias, N-type and P-type), hierarchical design • Signals – Types (analogue, digital, wireless), waveforms, signal processing (generation, communication, actuation) Applications of electric/electronic systems and their components in machinery. Identification of electric/electronic systems and their components. Function and operation of electric/electronic systems and their components. How electric/electronic systems and components interrelate and affect each other. How to recognise, understand, and interpret circuit diagrams and current flow diagrams (DIN and ISO standard symbols). Physical principles underpinning electrical and electronic systems and devices. Basic properties and principles of magnetism and electromagnetism and their common applications.	EC4, EC5, MC4, MC5, MC7, MC8.

Definitions of terms used in electric circuit theory and their applications. The use of Ohm's law and electric circuit theories to calculate values in circuits, such as voltage, current and resistance. Characteristics of analogue and digital systems, including their waveforms, signals, the transmission and storage of electronic data and its applications. Characteristics of DC circuits comprising resistors, capacitors and inductors in various arrangements. Relationship between voltage, current, resistance and power in circuits and how they are represented in graphs. Properties and applications of semiconductor diodes and transistors. Methods of screening electrical interference. Methods of monitoring and testing system performance and operation (conformity tests and typical readings/findings, possible causes of component failure).	

6.5 Operating principles of **braking systems** and **components**.

Range:
Braking systems – Prime mover, trailed equipment, two wheel, four wheel, multiple axle, independent, drum brakes, wet and dry disc brakes, load-compensating braking systems, ABS (anti-lock braking system), EBS (electronic braking system), parking brakes.
Components – Drum brakes (drum, shoe, lining, cam, spring, methods of adjustment, etc.), wet and dry disc brakes (hub, disc/rotor, pad, actuators, piston, calliper, etc.).

What do learners need to learn?	**Skills**
Operating principles of braking systems and their components. Applications of braking systems and their components in machinery. Identification of braking systems and components. Function and operation of braking systems and components. How braking systems and components interrelate and affect each other. Control mechanisms and their components: mechanical, electronic, pneumatic, hydraulic, emergency break-away. Systems testing procedures. Methods of monitoring and testing system performance and operation (conformity tests and typical readings/findings, possible causes of component failure, including vapour lock, glazing, distortion, overheating, wear and tear, operator induced failures). Application of relevant Codes of Practice and Standards – highway compliant, braking weight.	EC5.

6.6 Operating principles of **steering systems** and **components**.

Range:
Steering systems – Manual, power-assisted, hydrostatic, centre-pivot (articulated chassis), front-wheel, rear-wheel, 4-wheel, skid steer.
Components – Manual steering (steering box, drag link, track rod, ball joint, steering arm).
Power-assisted steering (hydraulic pump, reservoir, hydraulic ram/cylinder, control valve, etc.)
Hydrostatic steering (hydraulic pump, reservoir, hydraulic ram/cylinder, control valve, etc.)

What do learners need to learn?	Skills
Operating principles of steering systems and their components. Applications of steering systems and their components in machinery. Identification of steering systems and their components. Function and operation of steering systems and components. How steering components and systems interrelate and affect each other. Systems testing. How to identify and rectify steering faults. Lubrication and maintenance procedures. Methods of alignment: toe-in/toe-out, caster and camber. Methods of monitoring and testing system performance and operation (Conformity tests and typical readings/findings, possible causes of component failure).	EC5.

6.7 Operating principles of **suspension systems** and **components**.

Range:
Suspension systems – Front/rear axle suspension, hydraulic, pneumatic, self-levelling systems (tractors and trailed), cab suspension (seat suspension), trailer suspension (mechanical, hydraulic, pneumatic), drawbar suspension.
Components – Polymer bushes, coil/leaf springs, hydro-pneumatic accumulator, torsion bar, beam axle, front/rear/independent suspension, air bags, suspension dampers and ISO mounts.

What do learners need to learn?	Skills
Operating principles of suspension systems and their components. Applications of suspension systems and their components in machinery. Identification of suspension systems and their components. Function and operation of suspension systems and components. How suspension components and systems interrelate and affect each other. Methods of monitoring and testing system performance and operation (Conformity tests and typical readings/findings, possible causes of component failure).	EC5.

6.8 Operating principles of heating, ventilation and air conditioning systems and **components**.

Range:
Components – Compressors, condensers, receiver dryers, valves, expansion valves, evaporator, suction accumulator, fixed orifice tube (FOT), thermal expansion valve (TXV), refrigerants (R12, R134a, 1234YF), hoses, connectors, service ports, sensors, switches, lubricants, climate control units, fans, filters, heater matrix, pipework.

What do learners need to learn?	Skills
Operating principles of heating, ventilation and air conditioning systems and their components. Applications of heating, ventilation and air conditioning systems and their components in machinery, including for operator and animal welfare, and crop processing and storage. Identification of heating, ventilation and air conditioning systems and their components.	EC5.

Function and operation of heating, ventilation and air conditioning systems and components. How heating, ventilation and air conditioning components and systems interrelate and affect each other. Interaction with cooling system: heat exchange, air to air, water to air. How to maintain the integrity of an air conditioning system. Dealing with condensation in air conditioning systems. Application of relevant Codes of Practice and Standards – Fluorinated gases (F Gas). Procedures for recovery, recycling and recharging system refrigerants (including legislation and qualifications). How to handle, store and dispose of refrigerants (including legislation and qualifications). Systems testing standards. Methods of monitoring and testing system performance and operation (Conformity tests, leak detection and typical readings/findings, possible causes of component failure).	

6.9 Types of **fluids**.

Range:
Fluids – Fuels, coolants, oils, lubricants, gases.

What do learners need to learn?	**Skills**
Different types of fluids used in land-based machinery and equipment, including: • characteristics of hydraulic fluids • their applications • the specification and properties of different coolants, lubricants and gases • mixing of different types of lubricants • how these properties affect their application • the effect of fluids on machinery performance • how contamination of fluids occurs • how fluids and lubricants affect engineering activities • application of relevant Codes of Practice and Standards (storage and disposal)	EC5.

6.10 **Scientific laws** used in land-based engineering.

Range:
Scientific laws – Electrics: Ohm's law.
Power: Torque calculations.
Hydraulics: Pascal's law.
Friction: Friction calculations.
Gases: Boyle's law.

What do learners need to learn?	**Skills**
Scientific laws relating to electrics, power, hydraulics and friction. How these scientific laws are used in land-based engineering.	EC1, EC4, MC1, MC2,

Understand and work with mathematical and scientific principles and formulae, and how they are applied to land-based engineering. Use formulae and mathematical principles to confirm and forecast performance, and diagnose problems: • Calculations required to ensure scientific laws are applied effectively to achieve optimum performance of land-based machinery and equipment • Standard units of measurement • Mathematical principles and formulas (volumes, areas, ratios, speed, fuel consumption) • Formulas for scientific laws (Ohms law, torque, Pascal's law, friction, Boyle's law) • Conversion calculations (metric–imperial, imperial–metric) • Presenting and interpreting data in graphical form	MC3, MC4, MC5, MC7, MC8.

7. Land-based equipment and machinery maintenance

7.1 **Causes**, **effect** and **prevention** of corrosion.

Range:
Causes – Weather and environmental conditions (humidity), chemicals (prilled, granular and liquid fertilisers), loss/compromise of protective coating, inadequate/inappropriate cleaning/maintenance methods.
Effects – Loss of material integrity, friction between components, surface damage, seizure, impaired performance, increased electrical resistance, overheating of connections and fire, component failure, shortened service life, higher operational costs and decreased residual value.
Prevention – Regular post-use care and maintenance, application/care of protective coatings, correct cleaning and storage, using different materials.

What do learners need to learn?	**Skills**
Causes of corrosion. Effects of corrosion. Materials which are vulnerable to corrosion (ferrous metals, non-ferrous metals). Methods of preventing and repairing damage from corrosion.	EC5.

8. Repair land-based machinery and equipment

8.1 Types of specialist hand, power and diagnostic **tools** used for repair activities.

Range:
Tools – precision measuring equipment, taps, dies and reamers, air compressors, pullers**,** hydraulic press, compression testing tools, battery chargers, trolley and bottle jacks, stands, engine cranes, splitting rails, gantry, slings, straps and chains, dynamometer, tachometer, digital thermometer, static and dynamic timing equipment, diagnostic platform, hydraulic high and low pressure tester and flowmeter, multi-meter, oscilloscope, manufacturer specific tools (jigs, centralising, alignment, locating and preload tools).

What do learners need to learn?	Skills
How to select, use, maintain and store hand, power and diagnostic tooling used in repair and verification activities. The application of special tooling and service tools.	EC5.

8.2 **Costs** associated with land-based engineering **operations**.

Range:
Costs – Parts, labour, travel, recovery, collection and delivery costs, surcharges and carriage costs, sundries/consumables, environmental/disposal surcharge, specialist costs (sub-contracting, coded welding, crack detection, specialist machining), credit charges, value added tax.
Operations – Maintenance, repair, diagnostics, handover of machinery and equipment.

What do learners need to learn?	Skills
Costs associated with different operations within land-based engineering. Importance of accurate records. How costings are calculated and what they include. Difference between quotations (fixed price which can be accurately budgeted for, only valid for a fixed period) and estimates (estimated price subject to additional unforeseen costs, less accurate budgeting), including content and purpose. How to compile quotations, estimates and invoices. Financial risks to the business; higher for a quotation which must cover costs, an estimate can have flexibility to cover additional costs.	EC5, MC9.

Guidance for delivery

The content within this Core Pathway should be delivered in the context of the Land-based Engineering sector. A variety of active teaching and learning activities should be used to engage learners in this common core. Opportunities for visits/engagement with local industry and employers should be provided throughout the delivery of the content – where appropriate, local employers could present details of recent projects, problems faced and how they were overcome. Learners' work placement experiences could be presented to peers detailing where knowledge and skills within the content was seen in practice.

Formative assessment for the content may include verbal Q&A, presentations to peers, observation of stock control activities, etc. Reinforcement of learning can be encouraged through revisiting learning, group discussions and the establishment of a peer support system within the cohort.

Providers must ensure content is delivered in line with current, up-to-date industry practices which will require:

- current industry legislation, regulations and technical information
- teaching coverage representing the type of equipment currently available and accepted for use in the UK industry

Suggested learning resources

Books

- Operator manuals
- Service manuals
- Bell, B. (2016) Farm Machinery. (6th edn). London: Old Pond Publishing.
- Davies, A. C. (2008) The Science and Practice of Welding. Cambridge: Cambridge University Press

Websites:

- Manufacturers' Online support facilities.
- The Institution of Agricultural Engineers (IAgrE)– **www.iagre.org**
- Health & Safety Executive – **www.hse.gov.uk**
- British Agricultural & Garden Machinery Association – **www.bagma.com**
- Agricultural Engineers Association – **www.aea.uk.com**
- Land-based Engineering Training and Education Committee Limited (LE-TEC) - **www.landbasedengineering.com**

303 Livestock core pathway

Level:	3
GLH:	270
Assessment method:	Externally-set exam Employer-set project

What is this pathway about?

An introduction to Agriculture, Land Management and Production designed to help learners choose a specific pathway and specialism once the common core is delivered.

It covers the theoretical knowledge of the Agriculture, Land Management and Production industry and various disciplines across all sectors that are indicative to the industry.

Learners gain an understanding of what theoretical principles and practices integral to the industry and sector are required to work in it.

Learners will develop their knowledge and understanding of:

- working within the agriculture, environmental and livestock sectors and the **professional responsibilities, attitudes and behaviours required to do so**
- fundamental health and safety principles
- business management required within the sector to provide a product or service with success

Learners may be introduced to this pathway by asking themselves questions such as:

- What are the different sectors in agriculture, environmental and livestock?
- What are the different job roles in agriculture, environmental and livestock?
- What does the future look like for this sector and where could it take me?

Underpinning knowledge outcomes

On completion of the livestock core pathway content, learners will understand:

1. Health and safety
2. Sustainability
3. Biosecurity
4. Supply chain
5. Anatomy and physiology
6. Diseases, disorders and health plans
7. Nutrition
8. Medicine
9. Technology and equipment
10. Data and information

Completion of the Livestock Core Pathway Content will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented in the skills section of each criteria.

Content

1. Health and safety

1.1 **Hazards, risks** and **control measures** associated with working in the livestock industry.

Range:

Hazards – Lone working, livestock, hazardous materials (slurry, gases), machinery and equipment, zoonotic disease, biohazards, working at height, septic tanks.

Risks – Zoonosis, crushing, kicking, biting, contamination or asphyxiation by hazardous materials, contact with machinery and equipment, slips, trips and falls, drowning.

Control measures – Agreed contact times, carrying mobile phone/radio, carry out a risk assessment for lone working, ensure awareness of location of work, ensure awareness of expected time of return, biosecurity, vaccination of livestock, animal isolation, appropriate handling and restraint techniques and equipment, personal hygiene, safe means of access, personal protective equipment (PPE), guarding of machinery and equipment, safe stop procedures followed.

What do learners need to learn?	**Skills**
Typical hazards and associated risks associated with working in the livestock sector and how they can be controlled. Hierarchy of control measures that can be put in place to minimise these risks: • Elimination – Redesign a job or substitute a substance so that the hazard is removed or eliminated • Substitution – Replace a material or process with a less hazardous one such as use of different equipment/machinery • Engineering controls – Separate the hazard from operators by methods such as enclosing or guarding dangerous items of machinery/equipment, directing moving machinery/vehicles, marked walkways, designated work areas • Administrative controls – Identify and implement policies and procedures needed to work safely such as safety/warning signage, training, certification, safe working practices and discipline • Personal protective equipment (PPE) – Where risk cannot be eliminated or sufficiently controlled to a reasonably practicable level using the above measures, use protective equipment to minimise the consequences of the risk Types of PPE used, safe working practices, fatigue and stress management for workers (including lone workers), training, certifications and notifications, first aid provision, environmental protection provision. PPE where risk cannot be eliminated or sufficiently controlled to a reasonably practicable level using the above measures, use protective equipment to minimise the consequences of the risk. Consequences to the livestock, business and stockperson of not having sufficient control measures in place. Risks associated with establishing conditions for livestock breeding, rearing from birth to production and optimising livestock production.	CSB, EC4, EC5, MC2, MC10

1.2 Principles of safe manual handling.

What do learners need to learn?	**Skills**
Principles of safe manual handling and their application when working in the livestock production environment. This must include: • Differences between employee and employer responsibilities. • How to apply safe lifting techniques. • How to select and use appropriate lifting/moving aids • Importance of taking into account individual capability when manually lifting objects. • When to summon assistance to move objects/loads, including machinery.	CSB, CSC, CSF, EC4, EC5, EC6, MC6

1.3 Procedures and **plans** for **emergency situations** in the livestock sector.

Range:

Emergency situations - Spillage of hazardous substances, fire, contact with electricity, gas and water supply, communications cables, medical, livestock injury, livestock escape, extreme weather (drought, flooding, wind, snow), activist activity, accidents causing injury, accidents involving vehicles tools, machinery and equipment, accidents in remote/restricted access locations.

Contingency and emergency plans – Personnel, welfare of livestock, food safety, environment.

What do learners need to learn?	**Skills**
Emergency situations that can lead to health and safety risks and the associated control measures that should be applied. Correct procedures to follow when encountering an accident, incident or medical emergency (communication, following emergency action plan, ensuring safety of self and others in area). The importance of having appropriate contingency and emergency plans in place for health and safety-related incidents. Content included within contingency and emergency plan (location, evacuation procedure, escape routes). The consequences to the business, livestock and individuals if these plans are not in place (loss or production, loss of life, prosecution, loss of assurance status). Requirements for staff training (first aid, fire safety). Importance of accident and incident reporting in accordance with the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013.	CSB, CSC, CSF, EC4, EC5, EC6, MC6

2. Sustainability

2.1 Waste management **principles** in the livestock sector.

Range:
Principles – The 5 Rs of waste management: Refuse, reduce, reuse, repurpose, recycle.

What do learners need to learn?	Skills
Key requirements of current associated legislation – Controlled Waste (England and Wales) Regulations 2012, Nitrate Vulnerable Zones (NVZ), Environment Agency rules and associated derogations, The Animal By-Products (Enforcement) (England) Regulations 2013. How the principles of waste management impact the livestock production environment. Importance of safe and efficient waste disposal procedures and implications if they are not followed in the sector area. Correct measures in place to manage sources of waste found in a livestock production environment for example: • manure and slurry • contaminated feed • veterinary medicine and equipment • maintenance materials (wire, wood, scrap metal, plastic, oil and fuel) • waste produce (milk, eggs) • fallen stock The purpose and benefits of waste management plans for a livestock production environment including financial implications of ineffective waste management. The benefits of applying waste to farmland: • financial • organic matter • source of nutrients and availability • reduced impact on the environment Different classifications of waste products and how they are managed and processed. These must include: • organic • inorganic • hazardous • non-hazardous Consequences of non-compliance with legal and regulatory requirements when managing waste: • financial implications • prosecution • public perception	CSA, CSE, EC4, EC5, MC5, MC6, MC10, DC4

- harm to livestock
- harm to farm staff
- loss of assurance status

3. Biosecurity

3.1 Security and biosecurity **measures** in the livestock sector to prevent the spread of disease.

What do learners need to learn?	**Skills**
Key requirements of biosecurity measures: • restricted access • onsite PPE • visitors book • exclusion times • livestock management (movements on the holding and off the holding) • purchasing livestock with known health status source • vaccination programmes • feed and water • slurry management • disinfection • Staff working across multiple sites Reasons why biosecurity measures are implemented amongst livestock species: • prevent the spread of disease within the herd/flock • prevent spread to other herds/flocks • prevent spread to/from humans (zoonotic disease) • prevent spread to wild animals and habitats Implications of the spread of disease in livestock production environments for livestock and humans to include: • risk to the wider community • non-compliance and loss of farm assurance status • reduction in livestock performance reducing productivity • reduction in business/enterprise performance • financial viability of business/enterprise • results in staff absences impacting income for staff, wellbeing and performance due to additional work Codes of practice and industry guidance (Code of Recommendations for the Welfare of Livestock, farm assurance requirements). Implications of not following codes of practice and industry guidance and the impacts of poor biosecurity on a business (fines, loss in revenue, reputation). Current biosecurity issues within the sector, including the introduction of pests and diseases through imports. Factors that influence the future biosecurity: • national/international trade • new technologies • disease outbreak • disease control • outbreak management and implications	CSA, CSC, EC1, EC4, EC5, MC2, MC4, DC2

Recognise the value of breeding and newly bred livestock to a business, through different types and purposes of security measures in livestock production environments and how they are operated:

- maintaining fences and boundaries
- keep feed stores covered and shut
- preventing unauthorised access to accommodation
- locking medicine cabinets
- security of fallen stock pending disposal
- restricted access to vehicles
- staff and visitors

The suitability of security measures in different livestock production environments.

4. Supply chain

4.1 Principles of **supply chains** in the livestock production industry.

Range:
Supply chain: Organisations, operation, customer base, competitors.

What do learners need to learn?	Skills
Principles: Different types of organisations involved in the livestock production supply chain. Contracts or terms of business found in the livestock production supply chain. Importance of efficiency and interdependency in a supply chain that includes: • suppliers • distributors • customers • supply chain assurance • ethics External influences on the supply chain: • political (trade agreements) • economic (price of raw materials, interest rates) • socio-cultural (dietary preferences and trends) • technological (automated operational procedures) • legislative (amendments to use of restricted goods/products) • environmental, carbon footprint, climate change **Operation:** Different ways in which the supply chain is sequenced and operates including responding to market changes, supplier influence and buying groups. Implications of failing to meet product supply chain demands on a business to include: • undersupply • oversupply • quality Environmental and ethical impact of the supply chain including public perception: • safety of food • treatment of livestock • use of chemicals • sustainability • environmental impact of farm practice	CSB, CSC, CSE, EC4, EC5, MC2, MC6

How ethical issues are resolved, including expectations and requirements of the wider supply chain (the public, supermarkets).

Types of procurement (direct purchase, bulk ordering, automated buying, auction mart) and their suitability for different situations.

Advantages of different types of procurement:

- use of one supplier ensures good service, support and known quality
- bulk ordering usually means best price and terms are obtained
- automated buying based on historic usage or technological: sensors on food bins, avoids over/undersupply of goods and excess waste
- auction mart procurement ensures good visibility of stock prior to purchase

Disadvantages of different types of procurement:

- use of one supplier limits access to best price and terms as well as limited choice of product
- bulk ordering impacts on cashflow
- automated buying based on historic could be inaccurate leading to over/undersupply of goods
- action mart procurement can be higher risk price fluctuation, disease risk, stock availability not guaranteed

Customer base:

Size of market – value of sales, number of customers, product mix.

Type of market – organic, conventional, free range, provenance (local, regional, breed).

Customer base – number, type, characteristics, market segments, provenance.

Competitors:

Competitor analysis – direct and indirect competitors.

4.2 Principles of **stock** management in the livestock production industries.

Range:

Stock – Feed, bedding, veterinary medicines and equipment, livestock, husbandry equipment, maintenance materials, fertilisers and pesticides.

What do learners need to learn?	**Skills**
How the principles and procedures of stock management are applied within this sector and for different purposes (stock rotation, storage requirements, monitoring and maintaining stock levels to meet supply and demand, dealing with deliveries, maintaining records, feeding charts). Implications to businesses of effective and ineffective processes. Cost-effective methods for monitoring, ordering, financing (purchasing, leasing, hiring), and using stock to meet supply and demand, including basic calculations required.	CSB, CSC, CSE, EC4, EC5, MC2, MC6, MC10

Methods of storing products, to include:

- perishable and non-perishable items
- temperature-controlled storage
- security
- minimising wastage
- absence of pests
- compliance with relevant legislation and guidelines (veterinary medicines: safe use by farmers and other animal handlers (HSE AS31), farm assurance, Code of Practice for Using Plant Protection Products, Plant Protection Products (Sustainable Use) Regulations 2012)

Methods of ordering (manual and automated) and using stock to meet supply and demand.

Use of technologies (tagging, pedometer, collars, robotics, computer systems) for increasing efficiency of systems in use within the sector.

Importance of regular auditing of stock.

Consequences of non-compliance with legislation and guidelines.

- Loss of assurance status
- Fines, litigation, prosecution

5. Anatomy and physiology

5.1 **Anatomy and physiology systems** of **livestock.**

Range:
Anatomical and physiological systems: Respiratory, digestive, endocrine, excretory, nervous, cardio-vascular system.
Livestock: Cattle, sheep, pigs and poultry.

What do learners need to learn?	**Skills**
Features and functions of different anatomical and physiological systems in livestock: • Respiratory: nasal cavity, larynx, trachea, lungs, bronchi, bronchioles, alveoli, air sacs • Digestive: ruminant, monogastric, avian, herbivores, omnivores • Endocrine: pituitary gland, thymus, thyroid, pancreas, adrenals, pineal gland (melatonin), ovary, testes, hormones, hypothalamus • Excretory: kidneys (ultrafiltration and reabsorption), ureters, bladder, urethra, urea, uric acid • Nervous: central nervous system: brain, spinal cord, peripheral nervous system: nerves, neurons • Cardio-vascular systems: blood, blood vessels (capillaries, veins and arteries), heart (four chambers, aorta, vena cava, pulmonary vein, pulmonary artery) How the different elements of anatomy and physiology interrelate to ensure they function effectively. How the anatomy and physiology develops during different life stages (rearing to production) of livestock and how this affects production quality and yield. How the anatomy and physiology changes in response to diet at different life stages. How the digestive system changes during the weaning process. How the anatomical and physiological systems vary between livestock species.	EC4, EC5

5.2 Key functions and features of the **reproductive system** in livestock.

Range:
Reproductive system: Male, female.

What do learners need to learn?	**Skills**
Recognise how different indicators suggest the suitability for breeding (health status, behaviour, mobility, growth rates, quality of produce, size, weight, pedigree, breeding cycle). The location, structure and function of reproductive systems of male livestock: penis, prepuce, urethra, bulbus glandus, epididymis, vas deferens, testis (testosterone, oestrogen) and prostate gland, cloaca.	CSA, CSB, CSE, EC4, EC5.

The location, structure and function of reproductive systems of female livestock, including: vulva, vagina, cervix, uterus, oviduct and ovaries, infundibulum, magnum, isthmus and shell gland. The role and function of oestrus in livestock including the stages of cycle, hormonal control (oestrogen, progesterone, LH and FSH), ovulation, corpus luteum, photoperiod, sexual reproduction, signs of oestrus, copulation, fertilisation, implantation. Gestation in livestock: length of gestation, parturition (prolactin and oxytocin), egg production, hatching.	

5.3 **Methods** and **techniques** used in breeding.

Range:

Methods – Embryo transfer, hormone manipulation, natural insemination, artificial insemination, selective breeding, line breeding, cross breeding, pedigree breeding.

Techniques – Cessation of heat, pregnancy diagnosis, pregnancy scanning, candling of eggs.

What do learners need to learn?	**Skills**
Recognising the signs (behavioural, physiological, social) of heat in the livestock species. Management of natural mating and methods of artificial insemination including the use of sexed semen. Suitability, benefits and limitations of natural mating and artificial insemination. Advantages and disadvantages of natural mating and artificial insemination in different situations (breed, business targets). How to check that mating has been successful (palpation, ultrasound, progesterone testing).	CSA, CSB, CSE, EC4, EC5, MC2.

5.4 Characteristics of farmed **livestock** breeds and hybrids.

Range:

Livestock

Cattle - Milk, beef, dual purpose

Sheep – Meat, breeding

Pigs – indoor, outdoor, meat, breeding

Poultry – meat, laying

What do learners need to learn?	**Skills**
Importance of different types of livestock breeds and hybrids and how they are suited to the different production requirements and management systems (intensive, extensive). How the characteristics (temperament, heritage, provenance) of male and female livestock breeds and hybrids ensure they are suitable for different environments.	CSA, CSB, CSE, EC4, EC5.

How to evaluate alternative production systems for intensive and extensive management. Importance of non-meat-based products including milk, wool and eggs.	

6. Diseases, disorders and health plans

6.1 **Diseases, disorders, parasites**, **ailments** and notifiable diseases that can affect livestock in all stages of production.

Range:
Diseases: fungal, viral, bacterial, prions, notifiable and zoonotic.
Disorders: physical and metabolic.
Parasites: internal and external.

What do learners need to learn?	Skills
Process for managing diseases, disorders, parasites, and ailments and their routes of transmission. Physical and behavioural indicators of diseases, disorders, parasites, and ailments (condition of coat, skin, clean condition of mouth, condition of eyes, ears, nose, condition of head, body and limbs including feet, hooves, udder, beak, wings, colour of mucous membranes, general mood, behaviour, group interaction, gait, movement, feeding and drinking behaviour, respiration, temperature, urine, faeces (amounts, consistency and effects on production). Impact of diseases, disorders, parasites, and ailments on successful rearing and production (loss of animal, growth rates, breeding, performance, products (milk, meat, egg), cost). Action required to prevent and mitigate the symptoms and impact of diseases, disorders, parasites, and ailments and how they can be treated (confirming the outbreak, timeliness of informing relevant authorities, isolating relevant livestock, implementing biosecurity). Importance and methods of monitoring diseases, disorders, parasites, and ailments (observation, veterinary diagnosis, on farm diagnosis, record keeping). Diseases that are fungal (ringworm) Diseases that are viral (Bluetongue, Foot and Mouth Disease (FMD), Avian Influenza, Swine Influenza, Swine Fever, Orf, Aujeskys Disease, Newcastle Disease, Bovine Viral Diarrhoea (BVD) Diseases that are bacterial (Mastitis, Bovine Tuberculosis (bTB), Salmonella, E.coli, Camplylobacter, Leptospirosis, Brucellosis, Chlamydia abortus (enzootic abortion of ewes - EAE) Clostridium spp, Johne's Disease, Anthrax. Prions - Bovine Spongiform Encephalopathy (BSE), Scrapie Diseases that are notifiable (Tuberculosis, Bluetongue, Foot and Mouth Disease, Avian Influenzas, Swine Fever, Swine Influenza, Sheep Scab, Aujeskys Disease, Newcastle Disease, Bovine Tuberculosis (bTB), Anthrax, bovine spongiform encephalopathy (BSE)) and actions to be taken when identified.	CSA, CSB, CSE, EC4, EC5.

Diseases that are zoonotic (Ringworm, Salmonella, Campylobacter, Leptospirosis, Toxoplasmosis, Avian Influenzas, Swine Influenza, Bovine Tuberculosis (bTB), E.coli, Chlamydia abortus (enzootic abortion of ewes - EAE), Bovine Spongiform Encephalopathy (BSE)). Physical disorders (lameness, displaced abomasum, hardware disease, egg binding) Metabolic disorders (diabetes mellitus, rumination disorder, milk fever/hypocalcaemia, nutritional deficiency, hypomagnesaemia, fatty liver, ketosis, acidosis) Parasitic - endoparasites (roundworm, tapeworm, flukes) ectoparasites (ticks, mites, lice) Importance, content and processes involved in the development, implementation and review of herd and flock health plans.	

7. Nutrition

7.1 **Nutrients, feed sources** and food safety and hygiene requirements of **livestock species**.

Range:
Livestock species: cattle, sheep, pigs and poultry.
Nutrients: water, protein, carbohydrate, lipids, minerals, vitamins.
Feed sources: seeds, roots, grasses, legumes, fruits and vegetables.

What do learners need to learn?	**Skills**
Nutrition and feed requirements of different livestock species during all stages of production (age, size, health status, life stage (juvenile, gestation, lactation), environment, productivity). Feed ingredients with high energy for all species: • barley • wheat • maize Feed ingredients with high protein for all species: • soya bean • clover • oil seed rape Implications for not having the appropriate nutrition and feed requirements of different farmed livestock: • growth rates • health status • behaviour • fertility • financial • yield of produce • quality of produce Sources of nutrients (colostrum, milk, concentrates, roughage) including related supplements required for all stages of production (breeding stages: pre-conception, pregnancy). Benefits of nutrients for all stages of production for all species (colostrum, yolk sac, milk, concentrates, roughage, forage). How different nutrients affect health, behaviour, development and production. Food safety and hygiene requirements when handling foodstuffs.	EC4, EC5, MC5

8. Medicine

8.1 **Veterinary medicine** and **health supplements** and their uses in supporting livestock during all **stages of production.**

Range:
Veterinary medicines: Antibiotics, ectoparasiticides, endoparasiticides, vaccines, anaesthetics, anti-inflammatories.
Health supplements: Trace elements, vitamins, minerals.
Stages of production: Breeding, rearing, production.

What do learners need to learn?	**Skills**
Different types of veterinary medicines and other animal health-related products required to support livestock at all stages of production. The use of vaccinations within a livestock health programme. Benefits and limitations of the use of veterinary medicines (protection, prevention, cure, diagnostic). Process involved in managing veterinary medicines and other health-related products (stock levels, stock ordering, storage, recording). The suitability of veterinary medicines for different purposes and the different veterinary medicine administration methods: • in feed and water • injection (intramuscular, subcutaneous, intra dermal) • orally • topical (surface treatment, pour on, eye ointment) • inhalation • per vagina or rectum (enema, pessaries) • intra-mammary infusion (antibiotics for mastitis treatment and drying off, teat sealant) The reasons different medicine administration methods are used. Implications of incorrect administration/dosage of veterinary medicines (extending withdrawal dates, harm to the animal, ineffective treatment, resistance, toxicity, breach of legislation, loss of assurance, contamination of products). Legal requirements for carrying out medical procedures that can be undertaken by the stockperson. Consequences for non-compliance with legal requirements for carrying out medical procedures (breach of legislation, loss of assurance, contamination of products)	EC4, EC5, MC5, MC10

9. Technology and equipment

9.1 How **technology** and **equipment** is used effectively in supporting the management of livestock at different **stages of production.**

Range:
Technology and Equipment: automatic and manual.
Stages of production: breeding, rearing and production.

What do learners need to learn?	**Skills**
Purpose of different types of technology and equipment used to support effective management of livestock during all stages of production: Breeding: • incubators (automated), candling equipment, artificial insemination equipment, scanners, storage, computer, applications, automatic identification (Auto ID) Rearing and production: • Storage, handling equipment, readers, computer, applications, automatic identification (Auto ID), collars, pedometers, transponders, product testing equipment, weight scales, automatic dosing) Advantages and disadvantages of different types of technology used to support effective management of livestock: Advantages: • labour and time saving • automation • operator safety • accurate processes and record keeping • production management Disadvantages: • initial cost • damages and service and maintenance • complacency • system faults and down time • operator error Procedures and techniques involved in supporting and monitoring eggs to hatch. Factors that affect suitability of eggs for incubation and hatching: • damaged egg • shell thickness • age of egg • storage temperature • cleanliness	CSA, CSE, EC4. EC5, MC2, MC3, MC5

10. Data and information

10.1 How **data** and information is used in the **process** of managing livestock breeding and production.

Range:
Breeding data: Recording of heat, mating data, pregnancy diagnosis, estimated parturition date recording.
Production Data: Yield, quality, cost, performance records, feed conversion rates, mortality, environmental conditions and impact.
Process: Manage and secure data – manual and digital, software programs, passwords, secure data storage.

What do learners need to learn?	**Skills**
Types of data and information created, managed and communicated at all stages of livestock breeding and production. Processes used to manage information, data and data security. Techniques used to interpret information and data (comparisons with past data, performance monitoring). How information and data is used to organise schedules: • calving and lambing timing • piglet weaning • seasonal requirements How breeding information and data is used to enhance, support and manage livestock enterprises: • management of mating • management of parturition groups • management of feeding • health status • livestock retention/culling • housing How production information and data is used to enhance, support and manage livestock enterprises: • management of production groups • management of feeding • health status • livestock retention/culling • housing • environment • performance Implications of misinterpretation and misuse of data and information: • impact on business • effect on processes • nutrition planning • dates of compliance	CSA, CSC, CSD, EC3, EC4, EC5, MC2, MC4, MC5, DC4

- medication

Guidance for delivery

The content within this Core Pathway should be delivered in the context of the Livestock Production sector. A variety of active teaching and learning activities should be used to engage learners in this common core. Opportunities for visits/engagement with local industry and employers should be provided throughout the delivery of the content – where appropriate, local employers could present details of recent projects, problems faced and how they were overcome. Learners' work placement experiences could be presented to peers detailing where knowledge and skills within the content was seen in practice.

Formative assessment for the content may include verbal Q&A, presentations to peers, observation of stock control activities, etc. Reinforcement of learning can be encouraged through revisiting learning, group discussions and the establishment of a peer support system within the cohort.

Providers must ensure content is delivered in line with current, up-to-date industry practices which will require:

- current industry legislation, regulations and technical information
- teaching coverage representing the type of equipment currently available and accepted for use in the UK industry.

Suggested learning resources

Books

Anatomy and Physiology of Farm Animals - Google Books

Fertiliser Manual (RB209)

- Section 1 Principles of Nutrient Management and Fertiliser Use
- Section 2 Organic Materials
- Section 3 Grass and Forage Crops

XLVets Factsheets

- Colostrum Management
- Calf Pneumonia
- Dairy Cow Lameness
- The Oestrus Cycle
- Managing the Periparturient Cow
  Ovine Abortion

Websites

Welfare codes as published by DEFRA:

- Cattle code of recommendations and animal welfare guide: **https://www.gov.uk/government/publications/code-of-recommendations-for-the-welfare-of-livestock-cattle**
- Sheep and goats codes of recommendations and animal welfare guides: **https://www.gov.uk/government/publications/code-of-recommendations-for-the-welfare-of-livestock-sheep**
- Codes of recommendations and animal welfare guides for laying hens, broiler (meat) chickens, ducks and turkeys: **https://www.gov.uk/government/publications/poultry-on-farm-welfare**
- Pigs code of recommendations and animal welfare guide: **https://www.gov.uk/government/publications/pigs-on-farm-welfare**

Red Tractor Standards: **https://redtractor.org.uk/our-standards/**

- Poultry: **https://redtractor.org.uk/our-standards/poultry/**
- Dairy Cattle: **https://redtractor.org.uk/our-standards/dairy/**
- Beef and Lamb: **https://redtractor.org.uk/our-standards/beef-lamb/**
- Pork: **https://redtractor.org.uk/our-standards/pork/**

Agriculture and Horticulture Development Board: **https://ahdb.org.uk/**
Keeping farmed animals detailed information: **www.gov.uk/topic/keeping-farmed-animals**
Farm animals: looking after their welfare - **https://www.gov.uk/guidance/farm-animals-looking-after-their-welfare**
Health and Safety Executive **- www.hse.gov.uk**
https://britishpoultry.org.uk/
National Statistics Chapter 8: Livestock - GOV.UK (www.gov.uk)
National Animal Disease Information Service: NADIS - National Animal Disease Information Service
TB Hub TB hub - Bovine TB Advice & Tuberculosis Information for Cattle Farmers

AHDB Better Returns Series:

- Reducing Lameness
- Optimising sheep systems
- Growing and Finishing Lambs
- Managing Ewes
- Improving Ewe Nutrition
- Healthy Grassland Soils
- Dairy Beef production Systems
- Feeding Growing and Finishing Cattle
- Husbandry and Welfare of Pigs Husbandry and welfare of pigs | AHDB
- Dairy Lameness in dairy cows | AHDB
- Fertility Fertility in dairy cows | AHDB
- Breeding Dairy breeding and genetics | AHDB
- Dairy Markets Dairy markets | AHDB
- Mastitis Mastitis in dairy cows | AHDB
- Dairy Calf Management Dairy calf management | AHDB
- GREATsoils | AHDB
- Slurry Storage: Slurry storage | AHDB
- Carbon: Carbon: a glossary of terms | AHDB
- Controlled Environment for Livestock: Controlled Environment for Livestock WEB (windows.net)
- Wheat Growth Guide Wheat growth guide | AHDB
- Barley Growth Guide Barley growth guide | AHDB

304 Floristry core pathway

Level:	3
GLH:	210
Assessment method:	Externally-set exam Employer-set project

What is this pathway about?

An introduction to the Floristry industry within Agriculture, Land Management and Production. It covers the theoretical knowledge and principles that apply to the floristry industry.

Learners will develop their knowledge and understanding of:

- fundamental health and safety principles
- the impact of waste management principles and the environmental requirements of a floristry business
- key sales opportunities in the floristry industry
- business management required within the sector to provide a product or service with success
- how the supply chain in the floristry industry works

Learners may be introduced to this pathway by asking themselves questions such as:

- What are the different types of projects can I expect to work on in this industry?
- What are the different types of floral designs will I be able to do on entering industry?
- What are the career opportunities in this industry?

Underpinning knowledge outcomes

On completion of the floristry core pathway, learners will understand

1. Health and safety
2. Sustainability
3. Biosecurity
4. Supply chain
5. Data and documentation
6. Business
7. Plant biology

Completion of the floristry core pathway will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented in the skills section of each criteria.

Content

1. Health and safety

1.1 **Hazards, risks** and **control measures** associated with working in the floristry industry.

Range:
Hazards - Lone working, hazardous materials, equipment (tools), location, weather, chemicals, other people, botanical materials, working at height, manual handling
Risks – slips, trips and falls, skin reactions, cuts
Control measures - Elimination, substitution, engineering controls, administrative controls, PPE

What do learners need to learn?	**Skills**

Common hazards which could result in serious harm to self or others (visitors, colleagues, members of the public).
Hazards include:
• use of tools (including power tools)
• manual handling (lifting moving heavy/unstable items)
• working on uneven surfaces
• chemicals (cleaning chemicals and flower/plant food)
• special characteristics of botanical materials:
  ○ poisonous or irritant materials – as specified in the British Floristry Association (BFA) harmful plants and flowers code of practice for all florists
  ○ sharp material – e.g. Rosa thorns, Ilex
 	
Control measures used to minimise associated risks:
• CPD/training specific to work activities including working on scaffolding
• Adhere to risk assessment
• Wearing correct PPE
• Cordoning off work areas
• Correct use of signage
• Tools and equipment are in correct working order and comply with legislation (PAT testing)
 	
Understand how to undertake a detailed risk assessment, following the Health and Safety Executive 'Five Steps to Risk Assessment,' to include:
• identification of the hazards
• identification of risks (who might be harmed and how)
• 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
 	
How the hierarchy of controls is used in the floristry industry:
• elimination
	CSC, CSD, CSE.

○ check sundries and remove anything that is broken or damaged, remove accordingly ○ move any irritant or poisonous materials away from customer spaces • substitution ○ replace floral sprays with water based sprays ○ replace irritant or poisonous materials for non-irritant or poisonous materials • engineering controls ○ store sharp tools securely away from customers ○ clearly label and store toxic chemicals away from staff and customers • administrative controls ○ make sure staff use equipment such as floristry knives safely ○ Make sure staff clean the floor at regular intervals, especially when conditioning stock • personal and respiratory protective equipment (PPE) ○ provide workers with gloves when using sharp floristry equipment ○ provide workers with aprons when conditioning stock	

1.2 Procedures to follow when dealing with **emergency situations**.

Range:

Emergency situations – Accidents causing injury, falls from height, accidents involving vehicles, tools and equipment, spillage of hazardous substances, flooding, fire, medical issues, accidents in remote/restricted access locations, weather-related emergencies, poisonous and irritant plants.

What do learners need to learn?	**Skills**
Importance of emergency planning, especially for lone or isolated working. Responsibilities of the business to provide equipment and training for first aid, and the responsibilities of a first aider. Minimum requirements for first aid at work and be able to identify supplementary arrangements which may be appropriate for their workplace. Procedures to follow when encountering an accident, incident or medical emergency. Importance of accident and incident reporting in accordance with the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013. How to check the incident site to minimise risk to themselves and others, assess the situation, and how and when to contact the emergency services and how to prioritise activities. Types, use and colours of fire extinguishers, to include: • water • dry powder • foam • CO2 Importance of acknowledging the plant hazard. Procedures to follow if a fire is discovered in the work environment and how to recognise own limitations in managing a fire in the workplace.	CSB, CSC, CSD, CSE, CSF.

1.3 The working environmental **requirements** for a floristry business.

Range:
Requirements – Ventilation, lighting, space, working area, storage facilities, temperatures.

What do learners need to learn?
How the environmental requirements of a floristry business can impact the effective operations of a business, including:

- ensuring conditions are suitable for the fresh materials being stored and sold
- how controlling light and temperature can impact the senescence of botanical materials
- managing the working and customer-facing areas independently
- ensuring ventilation is sufficient

1.4 The environmental **requirements** for staff in the floristry industry.

Range:
Requirements – Ventilation, lighting, space.

What do learners need to learn?
How to ensure the environmental requirements for staff are provided and maintained in a range of working locations, including:

- within the business premises (on-site)
- outside the business premises (off-site)
- outdoors

Control measures/equipment which can be utilised if optimum conditions are not available:

- lighting (site/mobile lights, head torches, handheld torches)
- PPE
- additional temporary shelter/work areas (gazebos, temporary tables)
- basic necessities (toilets, water, food, water, temperature)
- availability of equipment and tools for the job
- assessing non-optimum area for risk
- ensuring free access to the site
- ensure emergency contacts are available
- minimise lone working where possible
- ensure deliveries can be made where required

2. Sustainability

2.1 Impact of waste management **principles.**

Range:
Principles – Reduce, reuse, recycle, compost, responsibility, disposal.

What do learners need to learn?	**Skills**

Types of waste generated in the industry:
• packaging:
  ○ plastic (including cellophane and water tubes)
  ○ cardboard
  ○ paper
  ○ polystyrene
• botanical/green waste
• sundries
 	
How application of effective planning techniques can reduce waste, including:
• making informed buying decisions, based on orders and upcoming events (including peak periods)
• assessing how botanical materials can be best utilised across the needs of the business to combine and reduce buying requirements
• managing delivery schedules and logistics to optimise the maturity level of botanical materials
 	
Methods to sort and dispose of waste appropriately, including:
• use of separate storage bins
• recyclable and non-recyclable waste
• identifying items that can be re-purposed/re-used
• identifying botanical waste that can be composted
• local authority waste management schemes/initiatives
 	
Implications of poor waste management, including:
• environmental impacts
• ethical impacts
• financial impacts (including fines)
• reputational damage – personal and industry
 	
How to identify products which contribute excessive waste and how to source alternative products to reduce waste and work without single use plastics.
 	
Methods and their benefits for repurposing surplus materials, including:
• transfer to other parts of the business (e.g. from events to general retail)
• storage of sundry items for future events
• repurpose of sundries for packaging for transport
• donations to local charities/good causes
 	
Sustainable and ethical practices, including:
	CSA, CSC, CSD, CSE, EC4, EC5.

- sourcing alternative bio-degradable and environmentally friendly products
- sourcing ethical products
- effective buying decisions to minimise waste and increase profit
- using certified growers for low social impact
- best use of botanical materials (open flowers for funerals)
- managing delivery schedules and logistics more efficiently
- beneficial impact on the reputation of the business
- increase in profitability because of a unique selling point (USP)

3. Biosecurity

3.1 **Principles** of biosecurity within floristry.

Range:
Principles – General hygiene, protection of botanical materials, prevention of loss, checks controls.

What do learners need to learn?	**Skills**

How to prevent cross contamination through implementation of hygiene procedures, including:
• cleaning tools
• general house keeping
• appropriate storage of botanical materials
• cleaning and preparing of buckets/vases/containers
 	
How risk factors are minimised and control checks carried out at various stages of the supply chain, including:
• Growers/producers:
  ○ use of pesticides and fungicides
  ○ visual inspection
  ○ environmental controls (temperature, light, water, humidity)
  ○ packaging and storage
• Auction house and wholesalers:
  ○ visual inspection
  ○ random sampling
  ○ environmental controls (temperature, light, water, humidity)
• Retailers
  ○ visual inspection
  ○ storage and environmental controls
  ○ care and conditioning of botanical materials
 	
Procurement of botanical materials via trusted sources, including:
• responsible growers
• plant passports (where required) for imported materials
• possible consequences of buying from untrusted sources:
  ○ possible prosecution if untrusted source has gained materials illegally
  ○ reputational damage
  ○ spread of pests and/or diseases
  ○ environmental damage, such as introduction of invasive species to the local environment
	CSA, CSC, CSD, CSE, EC4, EC5.

3.2 Different types of **pests** and **diseases.**

Range:
Pests – Aphids (white fly, green fly, black fly), mealy bug, mites, ants, caterpillars.
Diseases – Botrytis, black spot, sooty mould, stem/head rot, rust.

What do learners need to learn?
Different types of pests and diseases which can affect botanical materials, including:

- possible causes (e.g. environmental factors)
- common indictors
- action that should be taken after discovering pests and diseases, including when unpacking a delivery of fresh materials
- control measures that can be implemented
- roles and responsibilities for reporting and managing pests and diseases

4. Supply chain

4.1 The supply chain in the floristry industry.

What do learners need to learn?	Skills
The importance of efficiency and interdependency in a supply chain considering the following: • growers • suppliers • distributors • customers • ethics Different types of organisations involved and their role, including: • national and international producers/growers • auction house • wholesaler • retailer/florist • corporate client/customer Different ways the supply chain is sequenced from growers/producers to customers, including advantages and disadvantages of: • grower/producer direct to florist • wholesaler to florist • auction house to florist Implications of disruptions within the supply chain process: • quantity • quality • timescales • cost implications • customer implications Environmental and ethical impact of the supply chain, considering the whole life cycle of a product, including: • fairtrade • use of chemicals • water usage • transport • storage • waste management External influences on the market, including: • political • economic • socio-cultural • technological Types of procurement and their suitability for different situations, including: • competitive bidding (first bid wins auctions) • direct purchase • pre-order	CSA, CSB, CSC, CSD, CSE, MC1, MC2, MC5, MC6, MC7, MC8, MC10, EC4, EC5, EC6, DC4.

• available stock purchase Limitations of the supply chain: • time constraints • adverse weather conditions • logistical restrictions How the supply chain affects: • pricing • ordering requirements • delivery schedules	

4.2 **Principles** of stock management.

Range:
Principles – Stock rotation, storage requirements, monitoring and maintaining stock levels to meet supply and demand, ordering stock, processing deliveries, maintaining records, repurposing of materials, controlling maturity and senescence of fresh materials.

What do learners need to learn?	**Skills**

How the principles of stock management are applied in the floristry industry.
 	
Implications to businesses of ineffective processes and stock management issues (such as late deliveries and receiving incorrect stock), including:
• financial costs e.g. refunds, higher costs for last minute orders
• excess waste
• reputational damage from affected orders
• insufficient quantity of materials
• poor quality botanical materials
 	
How to monitor, order and use stock to meet supply and demand, including:
• Timescales:
  ○ wholesaler delivery schedule (when supplies/deliveries will be available)
  ○ expected lifespan of botanical materials
  ○ supply chain e.g. global issues, border control checks
• Planning ahead:
  ○ upcoming orders
  ○ predicted sales – including what may cause increases and decreases in sales
  ○ identify and allocate materials and sundries appropriate for specific requirements
 	
Methods of storing and controlling botanical materials, including:
• cold storage
• warm storage
• suspended animation (dormancy)hydration
• light levels
 	
How stock management may change depending on:
• type of material
  ○ fresh
	CSA, CSB, CSC, CSD, CSE, MC1, MC2, MC3, MC4, MC5, MC6, MC7, MC8, MC9, MC10, EC4, EC5, EC6, DC4.

- dried
- artificial

- local environment
- upcoming events
- required maturity of the materials
- intended purpose of the materials
- material availability

Implications when these principles are not applied effectively:
Implications when these principles are applied effectively and ineffectively

- cost
- time
- reputation
- wastage
- meeting customer requirements

5. Data and documents

5.1 Types of **data.**

Range:
Data – Customer information, financial information, orders and invoices.

What do learners need to learn?	Skills
How to record and store data accurately in accordance with organisational and legal requirements, in line with General Data Protection Regulations (GDPR) and protected characteristics, including: • what data can/should be stored • where it can be stored • how long it can be stored for • when/if permission is required to store data • ceasing to collect/removal of data The importance of ensuring data is stored securely and used appropriately, and the implications of failing to do this, including: • loss of data • providing opportunities for criminal activities • reputational damage • prosecution • financial implications (including fines) How data can be formatted, presented, interpreted and used to inform business decisions, including: • use of previous sales data to predict upcoming sales • use of client data to develop targeted marketing strategies. How to use relevant IT software to store, format and present data, including: • tables/charts • graphs and diagrams • spreadsheets	CSE. EC5, MC5

5.2 **Documentation** and record keeping.

Range:
Documentation – Design plans, designs/sketches, site visit information, photographs, buying lists, work plans, delivery schedules and records, communications (e.g. emails), invoices, contracts, payment records.

What do learners need to learn?	Skills
The different types of documents and records which need to be maintained within the floristry industry, including: • the purpose of the documents and how/why they are important to the business • the content of each document and the information which should be included • appropriate formats which can be used to record keep • how they are stored/organised and maintained Legal requirements for safe and correct usage, storage and disposal of	CSA, MC5, MC6

client data in line with the General Data Protection Regulation (GDPR).

Importance of ensuring documentation and records are accurate and up to date and how they can be used to inform decisions:

- Using previous orders and invoices to help predict future costs
- Using site visit information across several orders to reduce time required
- Using photographs to help with marketing activities

The implications of failing to keep accurate and up-to-date records, including:

- financial implications
- reputational damage
- missed or incorrect orders
- legal action

6. Business

6.1 Key **sales opportunities** within the floristry industry.

Range:
Sales opportunities – Peak periods (Valentine's Day, Mother's Day, Christmas), weddings, funerals, cultural events, parties/celebrations, general retail/gifting.

What do learners need to learn?	Skills

How to adapt business activities to maximise profitability, considering:
• marketing and promotion
• themed displays
• trade shows/fairs
• corporate contract opportunities
Demographics that can influence the events market, including age, gender, culture, economy, location (urban/rural), education.
How demographic factors influence floristry event work, including:
• design requirements
• local growers
• limitations that may need to be considered
• how these may change over time
• additional sales opportunities
 	
How changing demographics can impact the business.
 	
Additional factors which could impact key sales opportunities, including:
• Financial factors:
  ○ client budgets
  ○ cash flow
  ○ cost of living
  ○ resource costs
  ○ supply and demand
  ○ global markets
• Seasonality:
  ○ availability of resources
  ○ supply and demand
• Resource availability:
  ○ personnel
  ○ botanical materials
  ○ sundry materials
  ○ transport/vehicles
• Logistics:
  ○ stock deliveries
  ○ client deliveries
  ○ delivery schedules/plans
• Peak periods:
  ○ financial implications
  ○ workload
  ○ material availability
• Work schedules/staffing:
  ○ required skill sets
	CSA, CSD, CSE, MC9

○ staff availability ○ workload • External factors: ○ weather ○ force majeure events ○ local issues (e.g. road works/closures) Opportunities to increase the value of a transaction, including: • add-on sales: ○ chocolates ○ balloons ○ vases • packaging/gift wrapping • delivery services	

6.2 **Techniques** used to maximise sales.

Range:
Techniques – Advertising (including website and social media), consumer focused events (e.g. wedding fairs/exhibitions), site visits with clients, corporate and venue contracts, media publications (newspapers, magazine), promotions and special offers, displays, add-on sales.

What do learners need to learn?	**Skills**
Advantages and disadvantages of different techniques used to maximise sales, with consideration of: • time limitations/restrictions • resource availability • health and safety • relevant legislation • financial implications Considerations when planning a display: • seasonality • events • elements and principles of design • colour associations • stock rotation • store layout • quality checks • cleanliness • price displays • add-on sales	CSE, EC4

6.3 The types of sales **techniques** used in the industry.

Range:
Techniques – Developing rapport, identifying client requirements, effective communication, presenting product or service information, offering alternative solutions where required.

What do learners need to learn?	Skills
Sales techniques and the resources that support the sales process, including: • design services, including the use of mood boards and sketches • client presentations • portfolios of previous work • photo shoots • customer reviews/recommendations Sales processes for taking customer orders: • identify needs • provide advice and guidance on products • respond to feedback • opportunities for upselling and add-on sales • clarification of sales and customer details • documentation • taking payment	CSB, EC2, EC3

6.4 **Factors** to consider when working as part of a team.

Range:
Factors – Respect, team dynamics, behaviour, language, legislation.

What do learners need to learn?
How to work as part of team to ensure success through: • effective communication • hiring of additional staff/freelancers • respect for others • open approach and frame of mind • embracing diversity • strengths and weaknesses of team members

6.5 **Financial** planning.

Range:
Financial – Calculating costs, budgets, wholesale costs, retail prices, additional expenses, taxation, quotations.

What do learners need to learn?	Skills
How profitability is ensured when planning for a range of activities, including: • retail activities • events • marketing/promotion • corporate work • contract work Process for calculating the retail price for designs using different methods, including: • costing up • costing down Process for planning designs to meet a client's budget.	MC2, MC9

Appropriate considerations when costing designs for events, including:

- wholesale and retail costs
- installation and staging
- floral materials
- ancillary products
- labour costs
- taxation/VAT
- overheads
- additional expenses (e.g. accommodation, travel, insurance)

6.6 Different types of **security measures** in the floristry industry.

Range:
Security measures – Use of passwords, security software, suitable locks on buildings and equipment, personal data stored securely.

What do learners need to learn?
Importance and appropriate application of a range of security measures, including:

- their purpose and functionality
- suitability for different situations
- how they are operated and maintained

Implications of failing to utilise appropriate security measures, including:

- financial loss
- legal including fines and prosecution
- reputational damage
- loss of physical and digital resources

6.7 **Factors** that affect decision-making when allocating and prioritising tasks.

Range:
Factors – Business aims, nature of business, skills, knowledge and experience of staff, sales trends, stock and deliveries, planned use for designs, workload, time constraints, corporate image, finance, seasonality and availability of products, dependencies (does this task need to be complete to allow other tasks to begin).

What do learners need to learn?
Techniques to allocate and prioritise tasks using factors that affect decision-making and prioritisation of tasks.

- Allocate and prioritise tasks using the 4Ds of time management
  - Do the task now
  - Defer the task to a later time
  - Delegate the task to someone else
  - Delete the task from your list
- Order tasks dependant on priorities
  - Identify the tasks and determine the order of priority using factors which affect decision-making and prioritisation of tasks
  - Develop a set of viable solutions to complete the tasks

Skills
CSD

    - Select the most suitable solutions
    - Implement the tasks
- Review the impact of the decisions
- Amend any course of action as required

Implications of allocating and prioritising tasks efficiently and inefficiently

- deadlines
- corporate image
- wastage
- stock acquisition
- logistics
- product quality
- finance
- staff morale

7. Plant biology

7.1 **Botanical nomenclature** of fresh flowers, foliage and plants.

Range:
Botanical nomenclature – Genus, species, variety or cultivar.

What do learners need to learn?
Reasons for using botanical nomenclature, including:

- its use as a universal global language
- to reduce chances of misunderstandings when dealing with several people/businesses
- demonstrating professional knowledge

Importance of knowing the differences between botanical nomenclature and common names when communicating with others, including:

- variation of common names within different regions or places
- the impact on providing high quality customer service

Implications of any misunderstandings, including:

- incorrect materials purchased/supplied
- financial loss
- client disappointment
- reputational damage

7.2 The **physical structure** of plants.

Range:
Physical structure – Roots, stem, leaves, flowers, vascular system, reproductive system.

What do learners need to learn?
Plant parts, their characteristics and functions:

- Roots – Absorb water and nutrients and anchor the plant
- Stem – Supports the leaves and flowers while conducting water
- Leaves – Produces food for the plant
- Flowers – Attracts pollinators as part of the reproductive process
- Vascular system – Transports water and nutrient around the plant
- Reproductive system – Allows the plant to produce seeds to grow new plants

7.3 Plant **processes.**

Range:
Processes – Photosynthesis, transpiration, diffusion, respiration, evaporation, osmosis, etiolation and tropisms.

What do learners need to learn?
Plant processes, including:

- photosynthesis – converting carbon dioxide, water and light into glucose (food for the plant) and oxygen (waste product)
- transpiration – the movement of water and nutrients through the plant

- diffusion – a random movement of substance from a region of high concentration to a region of low concentration, occurs without a semi-permeable membrane and does not occur in the roots
- respiration – using the glucose produced through photosynthesis to turn it into energy for growth, reproduction and other life processes
- evaporation – water loss through the surface of the plant
- osmosis – the movement of solvent molecules from an area of high concentration to low concentration through a semi-permeable membrane (absorption of nutrients into the roots). The movement of water from an area of low concentration to high concentration through a semi-permeable membrane (absorption of water into the roots)
- etiolation – when plants are growing with partial or complete absence of light, long yellow stems and foliage form as the plant is deprived of sunlight
- tropism – a plant's natural response to stimuli. Including the differences between positive tropism, the movement towards a stimuli and negative tropism, the movement away from a stimuli
- tropisms:
    - geotropism – response to gravity
    - hydrotropism – response to water
    - heliotropism – response to the sun
    - phototropism – response to light
    - thigmotropism – response to touch

Factors which may affect plant processes, where they occur in plants and how maintenance is adapted to support healthy plant growth:

- natural and artificial light
- water
- temperature
- humidity
- ventilation
- cleaning
- nutrients
- ethylene gas.

Guidance for delivery

The content within this Core Pathway should be delivered in the context of the Floristry sector. A variety of active teaching and learning activities should be used to engage learners in this common core. Opportunities for visits/engagement with local industry and employers should be provided throughout the delivery of the content – where appropriate, local employers could present details of recent projects, problems faced and how they were overcome. Learners' work placement experiences could be presented to peers detailing where knowledge and skills within the content was seen in practice.

Formative assessment for the content may include verbal Q&A, presentations to peers, observation of stock control activities, etc. Reinforcement of learning can be encouraged through revisiting learning, group discussions and the establishment of a peer support system within the cohort.

Providers must ensure content is delivered in line with current, up-to-date industry practices which will require:

- current industry legislation, regulations and technical information
- teaching coverage representing the type of equipment currently available and accepted for use in the UK industry.

Books

- Owen, L. (2014) The Professional Florists Manual. Worksop: British Florist Association
- Diligent, S. and Mazuch, W. (2020) A Guide to Floral Mechanics. Diligent & Mazuch
- Whale, S. (2011). Cut Flowers. Birmingham: Jago Publishing Ltd
- Whale, S. (2019) Houseplants. Birmingham: Jago Publishing Ltd
- Whale, S. (2021) Cut Foliage. Birmingham: Jago Publishing Ltd

Websites

- The British Floristry Association – **www.britishfloristassociation.org**
- UK Floristry Judges Guild – **www.floristryjudgesguild.co.uk**
- Floristry Trade Club – **www.floristrytradeclub.co.uk/florist-magazine-editors-blog**
- Interflora Trade Club – **www.floristrytradeclub.co.uk**
- Fleur Creatif – **https://fleurcreatif.com**

400 Crop production

Level:	3
GLH:	1000
Assessment method:	Practical assignment

What is this Occupational Specialism about?

The purpose of this specialism is for learners to know and undertake the optimisation of crop production in field-and container-based systems throughout the crop production cycle and maintain areas surrounding the crop production environment. Learners will have the opportunity to plan, perform and evaluate their work while utilising a range of techniques, methods and resources.

Learners will develop their knowledge and understanding of, and skills in:

- Knowledge of the conditions required for optimal crop yield and quality
- Knowledge of the tools, equipment and materials used in crop production
- Knowledge of processes and methods used in managing crop production and the surrounding areas
- Skills in establishing crops
- Skills in managing crops
- Skills in harvesting and storage of crops
- Skills in maintaining areas surrounding the crop production area

Learners may be introduced to this specialism by asking themselves questions such as:

- What are the different stages of crop production and how are they managed?
- What do crop technicians do on a daily basis?
- What areas of the crop production industry do crop technicians work in?

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

1. Crop production knowledge criteria.

Performance Outcomes

On completion of this specialism, learners will be able to:

2. Establish crops in field- and container-based systems for optimum yield and quality

3. Manage crops in field- and container-based systems to optimise yield and quality

4. Harvest crops for commercial markets

5. Maintain the areas surrounding the crop production environment

Completion of this specialism will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented at the end of the specification.

Underpinning knowledge

Common knowledge criteria

Health and safety

1.1 Health and safety **legislation** and **codes of practice** for crop production.

Range:
Legislation – Management of Health and Safety at Work Regulations, Lifting Operations and Lifting Equipment Regulations (LOLER), Provision and Use of Work Equipment Regulations (PUWER), Control of Substances Hazardous to Health Regulations (COSHH), The Personal Protective Equipment at Work Regulations, Control of Noise at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR), The Health and Safety (First Aid) Regulations, Manual Handling Operations Regulations.
Codes of practice – Pesticides: Code of Practice for using plant protection products, Sustainable Use Directive.

What do learners need to learn?	**Skills**

Key requirements of health and safety legislation and codes of practice and how to access them.
How they are applied during crop production activities in the workplace (machinery, equipment, tools, fertiliser and plant protection products):
• That there is legislation and codes of practice to cover every aspect of the workplace
• Why there is a need for the legislation and codes of practice
• How the legislation and code of practice keeps them safe in the workplace
• Who is responsible for compliance with current regulations and legislation:
  ○ employer - implementing policies and procedures
  ○ employee - following policies and procedures
• Health and safety culture, age limits, training and information
	EC5.

1.2 Health and safety related **incidents** and **hazards** involved in crop production.

Range:
Incidents – Electrocution, entanglement, crushing, drowning, poisoning, fire, falls from height.
Hazards – Contact with power lines and utilities (overhead and underground), entanglement with moving parts, crushing by machinery, drowning (irrigation source, slurry pits), chemical poisoning, falls from machinery.

What do learners need to learn?	**Skills**
Typical hazards involved in crop production including lone working and controls in place to mitigate for these. Risks associated with utilities in areas surrounding the production environment and appropriate control measures. Principles of safe manual handling and their application. Purpose, use and content of risk assessments. Contingency including dynamic risk assessments, COSHH assessments and emergency plans required for health and safety related incidents involved in crop production in different systems.	EC3, EC4, EC5.

Environment

1.3 **Environmental impacts** and **malpractices** arising from crop production activities.

Range:
Environmental impacts – Positive impacts: Increasing biodiversity (flora and fauna), increasing soil organic matter, enhancing natural capital, carbon sequestration.
Negative impacts: Soil erosion, reduction in soil organic matter, pollution, eutrophication, refuse disposal, soil structural damage, loss of biodiversity (flora and fauna).
Malpractices – Use of unapproved or expired plant protection products, application of nutrients within closed periods, exceeding nutrient application limits where appropriate, pollution incidents, not observing buffer zones and environmental strips, use of untrained or non-certified operators.

What do learners need to learn?	**Skills**
Positive and negative environmental impacts of crop production activities: • nutrient application • use of plant protection products Examples of malpractices (unethical, inefficient, illegal) when undertaking crop production activities and the potential implications to the business and the production environment.	EC5.

1.4 **Environmental** legislation, regulations, codes of practice and organisational policies.

Range:

Environmental – Legislation/regulations: Environmental Protection Act 1990 (as amended), Food and Environment Protection Act 1985, Wildlife and Countryside Act 1981, Sustainable Use Directive (SUD), Nitrate Vulnerable Zones (NVZ), Control of Pollution Act 1974, The Weeds Act 1959, Countryside Rights of Way Act 2000, current Climate Change legislation.

Codes of practice: Code of Practice for using plant protection products, Protecting our Water Soil and Air, Good Agricultural and Environmental Conditions (GAECs) 1–7 inclusive.

What do learners need to learn?	**Skills**
Key requirements of environmental legislation and implications for crop production. Principles of water, soil, air, energy and pollution codes of practice and the implications of these for crop production. Requirements of waste legislation (Environmental Protection Act), regulations and codes of practice and how they are applied. Key government environmental policies and initiatives. Opportunities and risks they bring to the agriculture, environmental and animal care sector. Associated environmental performance measures (water and energy use).	EC5.

1.5 **Biosecurity measures, hygiene practices** and their application in crop production.

Range:

Biosecurity measures – Inspection, monitoring, regulation, plant passports, movement control, isolation, quarantine.

Hygiene practices – Machinery and equipment hygiene, vermin control, use of PPE, security of environment.

What do learners need to learn?	**Skills**
Biosecurity measures and their importance in maintaining healthy production and service environments, including personal responsibility. Application of biosecurity measures when producing crops in field-based and container-based systems. How hygiene practices are used to ensure biosecurity in crop production. Biosecurity risk factors in different types of crop production situations.	EC4, EC5.

1.6 **Nutrients** and phytohormones required by different **types of crops**.

Range:

Nutrients – Macronutrients, micronutrients.

Types of crops – Combinable crops (cereals, pulses, oilseeds), forage (maize, grass), roots (potato, sugar beet), vegetables, salad, fruits, nuts, legumes, ornamentals (trees, shrubs, bedding plants).

What do learners need to learn?	Skills
Nutrients, phytohormones (including rooting hormones) required by different types of crops: • How they support crop establishment, growth and development • How deficiencies/excesses/interactions are managed in different crops and implications for yield and quality • Their sources (organic and inorganic) • Appropriate uses of phytohormones	EC5.

Information and data

1.7 Types of **crop production records** and how they are managed in the workplace.

Range:

Crop production records – Soil analysis records, application and storage records (seed, fertiliser, pesticide), yield projections, quality issues, crop yields.

What do learners need to learn?	Skills
Types of crop production records produced and how they are managed in the workplace: • paper-based • digital • required durations for retention for different records Key requirements of legislation relating to information and data: • Pesticide storage and application records • Fertiliser application records • Seed declarations (British Society of Plant Breeders (BSPB) requirements) • Crop inspection for seed and propagated crops How to maintain information and data digitally including the use of spreadsheet software and related applications.	EC1, EC4, EC5, MC1, MC3, MC4, MC5, MC8, DC1, DC4.

1.8 Types and **sources** of **information and data** required to support crop production decisions.

Range:
Information and data – Soil type, soil condition and structure, weather conditions, timing of operation, operator certification requirements, previous crop, pest disease and weed forecasting.
Sources of information – Nutrient Management Guide (RB209), professional advice (agronomist, Agriculture and Horticulture Development Board, National Institute of Agricultural Botany, TAG, Rothamsted Research, Institute of Biological Environmental and Rural Sciences).

What do learners need to learn?	Skills
Types of information and data required to support crop production decisions: • Sources of information • How this is collected and measured • Equipment required and how equipment is operated • How data is recorded, presented and interpreted • How data is used to inform decision making	EC1, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

Business

1.9 The crop production supply chain.

What do learners need to learn?	Skills
Different types of organisations involved and their role in procurement and sales. Different ways the supply chain operates for different types of crop production (organic, non-organic, types of crop). Types of contracts provided for procurement and sales (specification, price, timing). Associated quality standards and quality assurance requirements (audits, traceability).	EC4, EC5, MC5, DC4.

1.10 **Financial information** associated with crop production.

Range:
Financial information – Outputs, variable costs, fixed costs, gross margin, net margin, yield, loss from damage.

What do learners need to learn?	**Skills**
Financial information associated with crop production: • How profit is calculated • How costs are optimised to support profitable outcomes • Typical profit margins (historic, industry benchmarks, KPIs) • Types of financial records produced and how they are managed in the workplace How financial records can be used to influence decision making when growing the crop and the processes, techniques and systems used. Importance of yield and quality to a commercial business and how they are forecast and measured. Performance targets and how they are developed and applied in different situations.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

1.11 **Audit processes** involved in confirming compliance with requirements.

Range:
Audit processes – Crop inspection by buyer/processor, industry quality standards and assurances.

What do learners need to learn?	**Skills**
Audit processes involved in confirming compliance with requirements of customers, buyers, processors, industry quality standards and assurance schemes (Red Tractor, Organic farm certification schemes, regulatory bodies). Implications of these requirements and audits to commercial businesses (non-compliance, access to markets through compliance, input costs, premium sale price).	EC1, EC4, EC5, MC5, DC4.

Specific knowledge criteria for performance outcomes

Establish crops in field-and container-based systems for optimum yield and quality (PO2)

Machinery, equipment and technology

1.12 Suitability of crop establishment **machinery, equipment and technology** in different situations and **developments in technology** for establishing crops.

Range:
Machinery, equipment and technology – Tractors, cultivators, drills, rollers, spreaders, sprayers, robotics, GPS, hand tools, loading equipment.
Developments in technology – Application accuracy, variable rate technology, automation of machinery and processes, autonomous vehicles, genetic engineering, satellite imagery, hydroponics.

What do learners need to learn?	Skills
Suitability of crop establishment machinery, equipment and technology in different situations and environments. Factors affecting their suitability, including: • capabilities • limitations • financial • efficiency • environmental impact Developments in technology to support crop establishment and how they can be used to establish crops and optimise their yield and quality.	EC5.

1.13 **Operating principles** of crop establishment **machinery, equipment and technology**.

Range:
Operating principles – Accuracy, efficiency, minimising damage to soil structure, minimising environmental impact.
Machinery, equipment and technology – Tractors, cultivators, drills, rollers, spreaders, sprayers, robotics (automated seed sowing, automated transplanting, potting machines), GPS, loading equipment.

What do learners need to learn?	Skills
Operating principles of field-based and container-based crop establishment machinery, equipment and technology: • How to prepare, set up and calibrate crop establishment machinery and equipment for use • How good preparation optimises crop yield and quality • How machinery is operated safely and efficiently	EC5, MC1.

1.14 How to maintain crop establishment machinery and equipment and deal with **common faults**.

Range:

Common faults – Excessively worn/damaged components, calibration faults, blockages, loss of signal, electrical, hydraulic and pneumatic failures, operator error.

What do learners need to learn?	Skills
How to maintain crop establishment machinery and equipment: • cleaning requirements • service intervals • storage requirements Common faults in crop establishment machinery, equipment and technology, including: • symptoms and typical causes • how their occurrence is minimised • how issues can be rectified Benefits of following manufacturer specifications, machinery handbooks and user manuals to inform efficient operation and servicing of machinery and equipment.	EC5.

1.15 The relationship between machinery and soil structure.

What do learners need to learn?	Skills
Relationship between crop establishment machinery and soil structure: Potential damage: • compaction • drainage issues • run-off • soil erosion • poor infiltration Potential benefits: • moisture retention • root penetration • movement/incorporation of nutrients • improved soil-seed contact • improved establishment of crop	EC5.

Crop science

1.16 Different **types of crops**.

Range:

Types of crops – Combinable crops (cereals, pulses, oilseeds), forage (maize, grass), roots (potato, sugar beet), vegetables, salad, fruits, nuts, legumes, ornamentals (trees, shrubs, bedding plants).

What do learners need to learn?	**Skills**
Characteristics of different types of crops, including: • their uses, including industrial • their lifecycles • planting specifications (seedbed, timing, required plant population, depth, spacing, consolidation) • optimum conditions for establishment (soil temperature, daylight hours, moisture content, topography)	EC5, MC1, MC2, MC4.

1.17 The principles of crop rotation.

What do learners need to learn?	**Skills**
Principles of crop rotation: • weeds, pests and diseases • fertility • market requirements Suitability of different approaches to meet specific objectives: • market • timing of operations for management purposes • soil types • topography • machinery availability • weather conditions • integration with non-crop enterprises (such as producing feed for livestock)	EC5, MC5, MC8, DC4.

1.18 Types of **planting material**.

Range:
Planting material – Seeds, seedlings, bulbs, tubers, saplings, corms, rhizomes, cuttings, microplants.

What do learners need to learn?	Skills

Types of planting material available:
• Quality characteristics required for planting and transplanting to support healthy growth:
  ○ pest and disease free
  ○ root condition
  ○ certification standards
  ○ germination
  ○ uniformity/specification
	EC5.

1.19 **Growing media** and **soil types**.

Range:
Growing media – Soil, loam, peat/peat substitutes, coir, composted bark, green waste, vermiculite, perlite, nutrient solutions for hydroponics.
Soil types – Sand, silt, clay.

What do learners need to learn?	Skills
Understand growing media and soil types, including: • their characteristics – pH, nutrient availability and cation exchange, drainage and water holding capacity, ease of cultivation, existing pollutants, horizons • techniques used to take a soil sample: the W method • techniques used to determine soil characteristics – texture testing, soil type, pH testing, digging a profile pit • soil structures • how soil and growing media characteristics can affect crop establishment for high yield and quality in different environments • legislation/regulations in relation to the use and sale of peat in both amateur and professional horticulture	EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

1.20 The **origins** of different types of **growing media**.

Range:
Origins – Recycling centres, peat bog, by-products, specialist producers.
Growing media – Soil, loam, peat, coir, composted bark, green waste, vermiculite, perlite, rockwool, nutrient solutions for hydroponics.

What do learners need to learn?	Skills
Origins of different types of growing media. Potential impacts on the environment from their extraction, movement and use in crop production.	EC5.

1.21 Preparation **techniques** for the growing area.

Range:
Techniques – Preparation: cultivation, ploughing, levelling, de-stoning, ridging, bed forming, applying nutrients, mixing and dispensing composted material.
Improving soil structure: controlled traffic, avoidance of compaction, non-inversion techniques, cover cropping, catch cropping, applying organic matter.

What do learners need to learn?	Skills
Techniques used to improve soil structure and how they are applied. Seed bed preparation techniques and how they are applied. Preparation techniques for container-based crops and how they are applied.	EC5.

Propagation

1.22 The **conditions** and **environments and facilities** required for plant propagation.

Range:
Conditions – Light, sterility, humidity, irrigation, heat, ventilation.
Environments and facilities – Outdoors, polytunnels, glasshouses, cold frames, mists/fogging units, polythene covers, weaning facilities, shade houses, micro propagation laboratories, repurposed buildings.

What do learners need to learn?	Skills
Conditions required for plant propagation. Types of facilities, their characteristics, benefits and limitations for different purposes. Techniques and equipment used to monitor and adapt conditions to support establishment in protected environments. Techniques and equipment used to monitor for pests and diseases.	EC5.

1.23 Techniques for propagation by **seed**, including seed **treatments** and **aftercare requirements** for container-based systems.

Range:
Seed – Small, medium, large.
Treatments – Stratification, scarification, pelleted, pesticide treated seed.
Aftercare requirements – Heated benches, closed box propagators, irrigation, transplanting.

What do learners need to learn?	Skills
Required environmental conditions. Suitability of seed propagation for a range of crops. Timings of propagation by seed including seasons and germination times. Seed treatments (stratification, scarification), their purpose, their suitability for different seeds, their application.	EC5, MC5, DC4.

Techniques for sowing seeds (including small, medium and large seed) in containers and their application, including by mechanical means. Aftercare requirements for sown seeds for different types of seeds (including irrigation, shade) to support germination and their application.	

1.24 Techniques for **propagation** by vegetative means, including **aftercare requirements**.

Range:

Propagation – Cuttings (soft tip, semi-ripe, leaf, hardwood), ground layering, grafting/budding, division, micro propagation.

Aftercare requirements – Mist/fogging units, heat application, shade.

What do learners need to learn?	**Skills**
Suitability of the types of vegetative propagation for a range of crops. Techniques for different vegetative propagation methods and their application including growing media. Required environmental conditions. Timings of propagation by vegetative means, including appropriate time of year and rooting periods. Types of propagation material and factors that influence the selection including maturity and provenance. Aftercare requirements of vegetative propagation.	EC5, MC5, DC4.

1.25 Different **forms of crop plant material** used for establishment.

Range:

Forms of crop plant material – Bulb, seed, seedling, plantlet or propagule, sapling, vine, root, tuber, corm, rhizome.

What do learners need to learn?	**Skills**
Different forms of crop that can be used for establishment, including: • techniques used to plant and transplant these forms in different growing media • suitability of the different forms and techniques for the crop and growing area to be used for establishment • how the techniques and forms of crop impact on yield and quality	EC5.

1.26 Methods of crop **irrigation**.

Range:

Irrigation equipment – Rain guns, boom irrigation, sprinklers, pumps and control systems, hose, overhead, capillary tubes and matting, flood benches, drip lines/seep hose, manual (watering can and fine rose).

What do learners need to learn?	Skills
Methods of crop irrigation and their suitability for different growing media and environments and their effect on crop establishment. Machinery and equipment required. Water abstraction legislation.	EC5.

1.27 **Types of aftercare** used to support crop establishment.

Range:
Types of aftercare – Temperature manipulation, irrigation, formative pruning, staking/support, pest and disease management.

What do learners need to learn?	Skills
Types of aftercare used to support crop establishment after planting and transplanting in different growing media and environments, including: • how they encourage independence in the landscape, growth and development • their implications for management, yield and quality • factors affecting their application (aspect, crop type and end-use) • how they are applied after planting and transplanting Time allocation and programming for the range of activities required to establish crops: • soil preparation • planting	EC5.

1.28 **Environmental controls**.

Range:
Environmental controls – Temperature, humidity, light levels, control of air movement.

What do learners need to learn?	Skills
How environmental controls are applied in establishing crops and implications for optimising yield and quality. Applications for glasshouses, polytunnels, shade houses, fleece, plastic, straw. Equipment, including: • heating and cooling systems • shade systems • lighting systems • ventilation systems • CO2 enrichment	EC5, MC1, MC2, MC4, MC5, MC8, DC4.

Manage crops in field-and container-based systems to optimise yield and quality (PO3)

Machinery, equipment and technology

1.29 Suitability of crop management **machinery, equipment and technology** in different situations and **developments in technology** for managing crops.

Range:

Machinery, equipment and technology – Tractors, inter-row cultivators, spreaders, sprayers drones, robotics, GPS, irrigation systems, lifting equipment.

Developments in technology – Application accuracy, variable rate technology, automation of machinery and processes, autonomous vehicles and equipment, satellite imagery.

What do learners need to learn?	Skills
Suitability of crop management machinery, equipment and technology in different situations. Factors affecting their suitability: • capabilities • limitations • financial • efficiency • environmental impact Developments in technology to support crop management and how they can be used to manage crops and optimise their yield and quality. Relationship between crop management machinery and soil structure: Potential damage: • compaction • drainage issues • run-off Potential benefits: • soil consolidation (roller) • movement/incorporation of nutrients	EC5.

1.30 **Operating principles** of crop management **machinery, equipment and technology**.

Range:

Operating principles – Accuracy, efficiency, minimising damage to soil structure, minimising environmental impact.

Machinery, equipment and technology – Tractors, inter-row cultivators, spreaders, sprayers drones, robotics, GPS, irrigation systems, lifting and handling equipment.

What do learners need to learn?	Skills
The operating principles of crop management machinery, equipment and technology and how they are operated safely and efficiently. • How to prepare, set up and calibrate crop management machinery and equipment for use • How good preparation optimises crop yield and quality • How machinery and equipment is operated safely and efficiently	EC5, MC1.

1.31 How to maintain crop management machinery and equipment and deal with **common faults**.

Range:
Common faults – Excessively worn/damaged components, calibration faults, blockages, fuel, loss of signal, electrical, hydraulic and pneumatic failures, operator error.

What do learners need to learn?	Skills
How to maintain crop management machinery and equipment: • cleaning requirements • service intervals • storage requirements Common faults in crop management machinery, equipment and technology, including: • symptoms and typical causes • how their occurrence is minimised • how issues can be rectified Benefits of following manufacturer specifications, machinery handbooks and user manuals to inform efficient operation and servicing of machinery and equipment.	EC5.

Crop science

1.32 Different **types of crops**.

Range:
Types of crops – Combinable crops (cereals, pulses, oilseeds), forage (maize, grass), roots (potato, sugar beet), vegetables, salad, fruits, nuts, legumes, ornamentals (trees, shrubs, bedding plants).

What do learners need to learn?	Skills
Characteristics of different types of crops, including: • their uses, including industrial • their lifecycles • growing specifications (management tasks during the growing stage to meet market requirements) • optimum conditions for growth (soil temperature, daylight hours, moisture content, topography, free from weeds, pests and disease, nutrient availability, correct soil pH)	EC5, MC5, MC8, DC4.

1.33 **Quality characteristics** of healthy plants.

Range:
Quality characteristics – Vigour, form, balance, root condition, soil condition, turgidity, freedom from weeds pests and diseases, conformity to specification/standards.

What do learners need to learn?	Skills
Methods used to identify characteristics of plant health (observation, records).	EC5, MC5, MC8, DC4.

Methods used to assess plant health (freedom from weeds, pests and diseases). Methods used to assess crop conformity to specification/standards (dry matter/moisture, protein, germination, oil content, size, maturity, growth stage, colour, damage, appearance). Methods used to determine readiness for harvest/dispatch (dry matter/moisture, size, maturity). How quality affects management decisions.	

1.34 **Practices** used to manipulate crop growth and quality.

Range:
Practices – Mechanical and biological processes to promote tillering, light manipulation, application of plant nutrients, application of plant growth regulators, removal of excessive foliage, training of plants to specific shapes/sizes, irrigation, application of desiccants, cold storage.

What do learners need to learn?	**Skills**
Practices used to manipulate crop growth and quality, and how they are applied to optimise yield, including: • their suitability for different growing media and environments • their effect on yield and quality	EC5, MC5, MC8, DC4.

1.35 The effect of on plant protection methods and crop growth.

Range:
Environmental conditions – Heat, cold, wet, dry, wind, light.

What do learners need to learn?	**Skills**
Impact of different environmental conditions on crop growth. Impact of environmental conditions on the selection, application and timing of plant protection methods. Impact of environmental conditions on effectiveness of different plant protection methods.	EC5, MC5, MC8, DC4.

1.36 **Activities** required to manage crops.

Range:
Activities – Crop monitoring, nutrient application, plant protection product application, cultural/physical control methods, Integrated Pest Management (IPM).

What do learners need to learn?	**Skills**
Time allocation for the range of activities required to manage crops. Resources required for the range of activities required to manage crops. Skills, including qualifications/licences, for the range of activities required to manage crops.	EC5.

1.37 Common **pests, weeds and diseases**.

Range:
Pests, weeds and diseases – for combinable crops, forage crops, covered container-based crops (two-spotted mite, aphid, vine weevil, spotted wing drosophila, rodents, western flower thrip; powdery mildew, downy mildew, botrytis, virus diseases; hairy bittercress, sedge, groundsel).

What do learners need to learn?	Skills
Examples of common pests, weeds, diseases and disorders associated with different crops that can occur in an environment: • Their characteristics, symptoms and causes • Techniques used to quantify their presence • The causes and processes leading to disease resistance and related control options • Pathological implications to the crops • Potential impact on crop establishment and management optimising yield, quality and the environment • How they are controlled including physical, chemical, cultural and biological methods • The factors considered to determine methods of control	EC5, MC2, MC5, MC8, DC4.

1.38 The **principles** of Integrated Pest Management (IPM).

Range:
Principles – Monitoring, variety selection (resistant/tolerant cultivars), crop rotations, stale seed beds, planting dates, companion cropping, biological control methods (natural predators, grazing), physical control, thresholds.

What do learners need to learn?	Skills
Principles of Integrated Pest Management (IPM). How IPM principles are applied within the crop production cycle.	EC5, MC5, MC8, DC4.

Harvest crops for commercial markets (PO4)

Environment

1.39 Management of common **pests and problems** associated with different crops in storage.

Range:
Pests – Insects, birds, rodents.
Problems – Moisture, temperature, contaminants.

What do learners need to learn?	Skills
Common pests and problems associated with different crops in storage, including: • their characteristics, symptoms and causes • potential impact on stored crop quality • how they are controlled, including physical, chemical, cultural and biological methods • the factors considered to determine methods of control, including Integrated Pest Management	EC5, MC1, MC2, MC4.

1.40 **Crop storage** methods, facilities and **packaging**.

Range:
Crop storage – Boxed, climate-controlled store, bulk store (barn, silo, clamp, ag bag), wrapped bales, chemical treatment (sprouting regulators).
Packaging – Crates, pallets, boxes, nets, bags, punnets, trays, sleeves.

What do learners need to learn?	Skills
Characteristics of different types of storage methods and facilities, including: • their suitability for different types of crops and storage periods (temporary, long term) • contractual requirements • the implications of poor crop segregation at storage • how effective storage is monitored How different types of crops should be handled when harvested, including different types of packaging and their suitability in relation to storage and transportation.	EC5.

Information and data

1.41 Types of **data required to support crop harvesting decisions** including **harvest records** and **storage records**.

Range:

Data required to support crop harvesting decisions – End user/processor requirements, physical measurement (fruit size, firmness, starch, acidity, height), growth stage, moisture content, sugar levels, harvest intervals, maturity, weather data.

Harvest records – Yield, quality, dry matters, moisture content, harvest losses.

Storage records – Source field/location, dates, environmental conditions, storage temperature, moisture content, pest monitoring records, pesticide application records.

What do learners need to learn?	**Skills**
Types of data required to support crop harvesting decisions, including: • how this is collected and measured • equipment required and how equipment it is operated • how data is recorded, presented and interpreted • how data is used to inform decision-making Sources of information used to support decision making: • industry guidance • end user/processor requirements • market requirements • weather forecasting • historical data • availability of resources (labour, equipment) Types of harvest records and storage records produced and how they are managed in the workplace. How to maintain information and data digitally including the use of spreadsheet software and related applications.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

Machinery, equipment and technology

1.42 Suitability of crop harvesting and storage **machinery, equipment** and **technology** in different situations.

Range:

Machinery and equipment – Tractors, trailers, harvesting equipment, forage equipment, vegetable harvesters, swather, loading equipment, storage and conditioning equipment, GPS, hand tools, mechanical equipment, robotics.

Technology – Automation of machinery and processes, autonomous vehicles and equipment, GPS, yield monitoring/mapping, colour/gravity/size sorting.

What do learners need to learn?	**Skills**
Suitability of crop harvesting and storage machinery, equipment and technology in different situations and environments. Factors affecting their suitability: • capabilities • limitations • financial • efficiency • environmental impact Developments in technology and how they can be used to support efficient and effective crop harvesting and storage.	EC5, MC1.

1.43 **Operating principles** of crop harvesting and storage **machinery, equipment and technology**.

Range:

Operating principles – Accuracy, efficiency, minimising damage to soil structure, minimising environmental impact.

Machinery, equipment and technology – Tractors, trailers, harvesting equipment, forage equipment, vegetable harvesters, swather, loading equipment, storage and conditioning equipment, GPS, hand tools, mechanical equipment, robotics**.**

What do learners need to learn?	**Skills**
Operating principles of field-based and container-based crop harvesting and storage machinery, equipment and technology: • How to prepare, set up and calibrate crop harvesting and storage machinery and equipment for use • How good preparation optimises crop quality and yield and minimises waste • How machinery and equipment is operated safely and efficiently	EC5, MC1.

1.44 How to maintain crop harvesting and storage machinery and equipment and deal with **common faults**.

Range:
Common faults – Excessively worn/damaged components, calibration faults, blockages, fuels, loss of signal, electrical, hydraulic and pneumatic failures, operator error.

What do learners need to learn?	**Skills**
How to maintain crop harvesting and storage machinery and equipment, including: • cleaning requirements • service intervals • storage requirements Common faults in crop harvesting and storage machinery, equipment and technology, including: • symptoms and typical causes • how their occurrence is minimised • how issues can be rectified Benefits of following manufacturer specifications, machinery handbooks and user manuals to inform efficient operation and servicing of machinery and equipment.	EC5, MC1.

1.45 The relationship between machinery and soil structure.

What do learners need to learn?	**Skills**
The relationship between harvesting machinery and soil structure: Potential damage: • compaction • broken/blocked drainage systems • soil erosion/ loss through transfer • poor infiltration How reducing damage during harvesting will benefit future field use: • minimal damage (wheel marks, soil structure) to rectify prior to sowing following crop • reduced tillage for following crop Methods which can reduce damage including: • appropriate machinery set-up • low pressure tyres/tracks • reduced tillage • controlled traffic farming • use of GPS technology • operating in suitable weather/ground conditions	EC5.

Crop science

1.46 Harvesting different **types of crops**.

Range:
Types of crops – Combinable crops (cereals, pulses, oilseeds), forage (maize, grass), roots (potato, sugar beet), vegetables, salad, fruits, nuts, legumes, ornamentals (trees, shrubs, bedding plants).

What do learners need to learn?	Skills
Different types of crops including: • their uses, including industrial • uses of crop residues (straw, pea haulm, sugar beet tops, aftermath) • their lifecycles and harvest timing for different crops • quality standards/specifications for harvesting • implications of harvesting on following crops (soil damage, residues, delayed establishment of following crop, weed pest and disease pressure)	EC5.

1.47 The effect of **growing media** on harvesting.

Range:
Growing media – Soil.
Types of soil – Sand, silt, clay.
Characteristics of soil – Texture, structure, weight.

What do learners need to learn?	Skills
Different types of growing media and how they affect efficient harvesting. Soil conditions (wet, dry, stony) and their implications for efficient harvesting. Types and characteristics of growing media and their implications for efficient harvesting.	EC5.

1.48 **Environmental controls**.

Range:
Environmental controls – Moisture, temperature, humidity, light levels, controlled atmospheric conditions.

What do learners need to learn?	Skills
How environmental controls are applied in harvesting, storing, packaging and transporting crops and implications for optimising yield and quality.	EC5, MC5, MC8, DC4.

1.49 **Activities** required to harvest and store crops.

Range:
Activities – Preparation and planning, harvesting, packaging, storage.

What do learners need to learn?	Skills
How much time to allow for each activity involved when harvesting different types of crops. Resources required for the range of activities required to harvest and store crops. Skills, including qualifications/licences, for the range of activities required to harvest and store crops, and crop residues if applicable.	EC5, MC2, MC5, MC8, DC4.

Business

1.50 Principles of **stock management systems**.

Range:
Stock management systems – Stock rotation, storage conditions, monitoring stock levels, maintaining records.

What do learners need to learn?	Skills
Principles and the application of stock management systems, including: • how they are applied to harvesting of crops • the implications of failing to apply these principles when harvesting crops	EC1, EC4, EC5, MC5, MC8, DC4.

1.51 Types of **financial records and information**.

Range:
Financial records and information – Output, variable costs, gross margin, fixed costs, net margin, yield, loss from damage.

What do learners need to learn?	Skills
How financial information can be used to influence decision making when harvesting and storing the crop and the processes, techniques and systems used.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, MC9, DC4.

1.52 Industry **quality standards**, assurances and **audit processes**.

Range:
Audit processes – Internal: Crop inspections, storage inspection. External: Crop inspection, storage inspection (by buyer/processor/assurance schemes).
Quality standards – Specific Marketing Standard (SMS) and classifications of products.

What do learners need to learn?	**Skills**
The internal and external audit processes involved in confirming compliance with requirements of consumers, buyers, processors, industry quality standards and assurance schemes.	EC1, EC4, EC5, MC5, DC4.

Maintain the areas surrounding the crop production environment (PO5)

Business

1.53 **Costs** and **revenues** associated with maintaining areas surrounding production environments.

Range:
Types of costs – Variable costs, fixed costs, taxation, fines/penalties.
Sources of revenue – Grants, environmental stewardship, local/national incentives, sale of by-products.

What do learners need to learn?	Skills
Costs of maintenance of areas surrounding production environment and implications for profitability and business success. Relationship between costs, revenue and profit to a business, including: • the different types of costs involved • sources of revenue – opportunities for use of areas surrounding the production environment for financial benefit • how to price a product or service • how to maintain revenue records • how to conduct a cost/benefit analysis (partial budgets) • how to calculate profits (gross margin, net margin) Performance targets and how they are developed and applied in different situations.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, MC9, DC4.

1.54 Actual and potential markets and **methods of promotion**.

Range:
Methods of promotion – Through social media, weekly/monthly publications, open days, education (industry and customers).

What do learners need to learn?	Skills
Concepts of the actual and potential market including competition, how markets are identified and targeted, and methods of promotion that could be used by crop production businesses. How crop production organisations can diversify the types of crops produced and techniques, systems and media used within the space available. Positive and negative perceptions people may have of the business and the wider industry and methods of promotion of the positive aspects.	EC5, MC2, MC5, MC8, MC9, DC4.

Estate management

1.55 Standards for maintenance of areas surrounding the production environment set by different **standards setting bodies** and **implications for non-compliance**.

Range:

Standards setting bodies – Red Tractor, Organic certification schemes, countryside management schemes, regulatory bodies.

Implications for non-compliance – Loss of assurance status, negative public perception, loss of market, financial penalties.

What do learners need to learn?	Skills
Standards for maintenance of areas surrounding the production environment set by different standards setting bodies and implications for non-compliance.	EC4, EC5, MC5, DC4.

1.56 Types of **boundaries, structures** and **surfaces** in estates.

Range:

Boundaries – Hedges, fences, gates, cattle grids, walls, ditches, watercourses, woodland/trees, stewardship areas.

Structures – Buildings: timber, masonry, steel, glazed, plastic.

Surfaces – Roads, tracks, pedestrian routes, public rights of way, yards, gravel, hardcore, rail sleepers, woodchip, slabs.

What do learners need to learn?	Skills
Types of boundaries, structures and surfaces in estates. Construction techniques used to maintain and repair boundaries, structures and surfaces.	EC4, EC5, MC1, MC2, MC4, MC9.

1.57 The importance of **habitat management** and **techniques** applied to achieve these.

Range:

Habitat management – Promotion of beneficial species of plants and wildlife, removal of unwanted vegetation, clearance of waterways, protection and enhancement of boundaries, control of weeds including invasive species.

Techniques – Habitat surveys, manual techniques, mechanical techniques.

What do learners need to learn?	Skills
Habitat surveys to identify the range of plant and wildlife species. Importance of habitats and management techniques applied to improve these.	EC4, EC5, MC1, MC2, MC9.

1.58 Potential **risks** arising from production activities and their impact on the wider environment.

Range:
Risks – Biosecurity breaches, pollution, environmental damage, damage to boundaries, structures, surfaces and equipment.

What do learners need to learn?	Skills
Potential risks arising from production activities. Their impact on the wider environment. Potential consequences: • increased maintenance requirements • increased maintenance costs • financial penalties • legal action/prosecution • loss of reputation	EC4, EC5.

Machinery and equipment

1.59 The **operating principles** of maintenance **machinery and equipment**.

Range:
Operating principles – Safety, accuracy, efficiency, minimising damage to growing crop and soil structure.
Machinery and equipment – Tractors, excavators, hedge trimmers, mechanical fencing equipment, sprayers, lifting equipment, power tools (mowers, strimmers), hand tools, cleaning devices, monitoring equipment.

What do learners need to learn?	Skills
Required pre-start checks. Operating principles of maintenance machinery and equipment, and how they are operated safely and efficiently. Operator safety and protection including personal protective equipment (PPE).	EC5, MC1.

1.60 **Common faults** in **machinery and equipment** used for estate maintenance.

Range:
Common faults – Excessively worn/damaged components, calibration faults, blockages, fuel, loss of signal, electrical, hydraulic and pneumatic failures, operator error.
Machinery and equipment – Tractors, excavators, hedge trimmers, mechanical fencing equipment, sprayers, lifting equipment, power tools, hand tools, cleaning devices, survey/monitoring equipment.

What do learners need to learn?	Skills
Common faults found in machinery and equipment. Symptoms and typical causes. How issues can be prevented and/or rectified.	EC5.

1.61 Techniques used to maintain equipment and machinery.

What do learners need to learn?	**Skills**
Techniques used to maintain equipment and machinery, including: • set-up • calibration • pre-use checks • routine and non-routine maintenance • cleaning • storage	EC5, MC1.

Performance outcome 2

2. Establish crops in field- and container-based systems for optimum yield and quality

Learners must demonstrate skills by establishing two different crops: one in field-based and one in container-based systems. Skills should be demonstrated in environments that reflect commercial crop establishment.

Skills applicable to both systems

2.1 Carry out a site-specific risk assessment.

What do learners need to demonstrate?	Skills
Identify hazards. Assess risks. Implement control measures. Review and update as required.	EC1, EC4, EC5.

2.2 Test condition of growing media.

What do learners need to demonstrate?	Skills
Test soil texture, pH, electrical conductivity: • Set up/calibrate equipment for the task • Identify the texture and assess the structure of soil using industry guidance and best practice • Test the pH of soil using relevant equipment • Test the electrical conductivity of growing media using relevant equipment • Dispose of waste appropriately	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

2.3 Assess quality of **planting materials**.

Range:
Planting materials – Seeds, plants.

What do learners need to demonstrate?	Skills
Conduct a germination test on an appropriately sized sample. Calculate the germination percentage. Visual inspection of plant material.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8.

2.4 Assess the safety and suitability of machinery and equipment for a specified task.

What do learners need to demonstrate?	Skills
Assess the safety and suitability of machinery and equipment for a specified task: • Check all guards are in place • Check compatibility of prime-mover and machinery/equipment • Test overload/safety features • Check all components for wear, damage and security • Test all controls and components are functioning correctly • Check tyre pressures if applicable	EC4, EC5, MC1.

2.5 Set up **equipment and machinery** for a specified task.

Range:
Equipment and machinery: Cultivator, drill/planter, roller.

What do learners need to demonstrate?	Skills
Set up equipment and machinery for a specified task: • Set for depth and level on soil engaging equipment. • Calculate planting density. • Calibrate drilling/planting machinery/equipment for the specified crop. • Lubricate moving parts as per manufacturer's recommendations. • Ensure equipment is clean.	EC1, EC4, EC5, MC1.

2.6 Manually lift and move materials.

What do learners need to demonstrate?	Skills
Safe lifting techniques. Use of mechanical aids. Accurate placement of materials.	EC4, EC5.

Skills applicable to field-based systems

2.7 Assess **soil** structure from a profile pit.

Range:
Soil – Local soil types.

What do learners need to demonstrate?	Skills
Identification of horizons: • topsoil including presence of organic matter • sub soil • worm activity • parent material Assess the soil structure and identify positive and negative properties.	EC1, EC4, EC5, MC1, MC2, MC5, MC8, DC4.

2.8 Test **soil** for nutrients.

Range:
Soil – Local soil types.

What do learners need to demonstrate?	Skills
Take a representative soil sample in preparation for analysis. Interpret soil analysis results. Determine actions required to correct nutrient excesses/deficiencies. Dispose of waste appropriately.	EC1, EC4, EC5, MC1, MC2, MC5, MC8, DC4.

2.9 Attach an **implement** to a tractor.

Range:
Implements – Trailed and mounted.

What do learners need to demonstrate?	Skills
Safely and efficiently attach an implement to a tractor, including all ancillary attachments including electrical and hydraulic connections. Safely and efficiently manoeuvre the tractor and implement to the worksite.	EC4, EC5.

2.10 Cultivate soil using appropriate soil engaging machinery/equipment.

What do learners need to demonstrate?	Skills
Determine the cultivation requirements according to instructions. Carry out cultivation safely, efficiently and effectively. Monitor quality of work and carry out adjustments as required. Consolidate seed bed.	EC4, EC5, MC1.

2.11 Set up planting machinery for accurate placement of planting material and operate planting machinery specific to **crop type**.

Range:
Crop type – Combinable crops, forage crops, root crops.

What do learners need to demonstrate?	Skills
Set up planting machinery for accurate placement of planting material. Safely and accurately operate planting machinery specific to crop type. Monitor performance of machinery. Monitor quality of work and carry out adjustments as required.	EC4, EC5, MC1, MC3, MC5, DC4.

2.12 Assess quality of planting operation undertaken by others using an appropriate **method**.

Range:
Methods – Crop walk, quadrat.

What do learners need to demonstrate?	Skills
Assess crop emergence – uniformity, plant population. Provide constructive feedback to others orally.	EC4, EC5, MC1, MC2, MC3, MC5, MC8, DC4.

Skills applicable to container-based systems

2.13 Propagate **plants** by seed in trays/modules.

Range:
Plants - Vegetables (brassicas), salads (tomato, cucumber, aubergine, lettuce, sweet pepper, microgreens), herbs (parsley, basil, coriander), ornamentals: trees (oak, pine, Sitka spruce, birch, field maple), shrubs (quick thorn, hazel, blackthorn), bedding plants (Petunia, Pelargonium, Impatiens, Lobelia, Viola, Primula).

What do learners need to demonstrate?	Skills
Propagate plants by seed in trays/modules: • Uniformly fill trays/modules with growing media • Firm growing media in trays/modules • Sow seeds in trays/modules as per protocol • Cover seeds in trays/modules • Label, water and place in appropriate environment • Dispose of waste appropriately	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

2.14 Propagate **plants** by vegetative means.

Range:
Plants – Vegetables (asparagus), fruits (blueberry, apples, pears, plums, strawberries, currants), herbs (mint, rosemary, thyme), ornamentals: trees (Acer, Populus, Salix, Cupressus), shrubs (Cornus, Rhododendron, Camellia, Rosa, Clematis), bedding plants (Osteospermum, Sanvittalia, Bidens).

What do learners need to demonstrate?	Skills
Propagate plants by vegetative means: • Collect vegetative material – take cuttings • Prepare vegetative material – trim, cut to size, create a site/wound for grafting, cuttings for transplant • Insert prepared vegetative material onto/into growing media/site (tray/module, wound) • Label, water and place in appropriate environment. • Dispose of waste appropriately	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

2.15 Apply nutrients.

What do learners need to demonstrate?	Skills
Mix nutrients to recipe. Apply nutrients.	EC1, EC4, EC5, MC1, MC3, MC4, MC5, MC8, DC4.

2.16 Set environmental conditions.

What do learners need to demonstrate?	Skills
Set environmental conditions appropriate to crop type, crop stage and requirements. Irrigate crops appropriate to crop type and requirements.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

Performance outcome 3

3. Manage crops in field-and container-based systems to optimise yield and quality

Students must demonstrate skills by managing two different crops: one in field-based and one in container-based systems. Skills should be demonstrated in environments that reflect commercial crop management. Skills can be assessed in relation to different growth stages.

Skills applicable to both systems

3.1 Carry out a site-specific risk assessment.

What do learners need to demonstrate?	Skills
Identify hazards. Assess risks. Implement control measures. Review and update as required.	EC1, EC4, EC5.

3.2 Capture environmental data.

What do learners need to demonstrate?	Skills
Use appropriate equipment to measure: • temperature • humidity • wind speed and direction • rainfall • light (Photosynthetically Active Radiation (PAR) meter)	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

3.3 Interpret environmental data.

What do learners need to demonstrate?	Skills
Interpret rainfall data to determine irrigation requirements. Interpret data to identify trends in historic weather data.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

3.4 Measure emergence of **crop**, calculate the establishment percentage and assess root establishment.

Range:

Crop – Field-based: Combinable crops (wheat, barley, oats), forage crops (maize, grass). Container-based: Vegetables (brassicas), salads (tomato, cucumber, lettuce, microgreens), herbs (parsley, basil, coriander).

What do learners need to demonstrate?	Skills
Assess crop emergence – uniformity, plant population. Calculate the establishment percentage using an appropriate method for the crop type. Assess root establishment.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

3.5 Monitor **crop** growth to determine crop progress and **management actions** required.

Range:

Crop – Field-based: Combinable crops (wheat, barley, oats), forage crops (maize, grass).

Container-based: Vegetables (brassicas), salads (tomato, cucumber, lettuce, microgreens), herbs (parsley, basil, coriander), ornamentals: trees (oak, pine, Sitka spruce, field maple), shrubs (quick thorn, hazel, blackthorn), bedding plants (Petunia, Pelargonium, Viola, Primula, Osteospermum), fruits (blueberry, strawberries).

Management actions – Required operations, appropriate timing.

What do learners need to demonstrate?	Skills
Monitor crop progress and growth stage. Identify atypical growth symptoms – plant colour, form. Identify management actions required (nutrient application, plant protection product application, removal of foliage, assess re-potting requirements, growth regulators). Identify required operations and appropriate timing.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

3.6 Identify and quantify **pests, diseases and weeds** and consult with **technical experts** to determine **actions** required.

Range:

Pests, diseases and weeds – for combinable crops, forage crops, covered container-based crops.

Technical experts – Agronomist.

Actions – Integrated Pest Management (IPM), application of plant protection products.

What do learners need to demonstrate?	Skills
Identify pests, weeds, diseases and disorders. Quantify pests, weeds, diseases and disorders. Determine actions required including treatment thresholds, and appropriate timing of operations. Engage in technical discussions with experts. Use questioning techniques to obtain and clarify information.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

3.7 Apply Integrated Pest Management (IPM) **techniques** to prevent/control pests and weeds.

Range:
Techniques – Weeds – Hand rogueing, mowing, scything, topping, strimming.
Pests - Scaring devices, natural predators, parasites, traps, fencing/enclosures/guards.

What do learners need to demonstrate?	Skills
Carry out weed prevention/control using IPM techniques. Carry out pest prevention/control using IPM techniques.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

3.8 Measure growing media moisture content and determine irrigation requirements.

What do learners need to demonstrate?	Skills
Measure growing media moisture content using an appropriate soil moisture sensor. Determine irrigation requirement according to growing crop needs and weather forecast where applicable.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

3.9 Assess crops for **potential adverse effects** on yield and quality and forecast surplus/deficit output against business targets.

Range:
Potential adverse effects – Pest damage, competition from weeds, pressure from disease, weather damage, lodging, secondary growth.

What do learners need to demonstrate?	Skills
Assess crops for potential adverse effects on yield and quality. Calculate potential output losses. Forecast surplus/deficit output against business targets.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

3.10 Process and analyse data to support decision making.

What do learners need to demonstrate?	Skills
Process and analyse data to support decision making. Assess suitability of information and data provided – source reliability/accuracy. Compare with business/industry benchmark figures. Represent information and data using graphs and charts. Summarise information and ideas into standard forms and templates. Estimate time required to scale up operations.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, MC9, DC4.

Skills applicable to field-based systems

3.11 Assess the safety and suitability of machinery and equipment for a specified task.

What do learners need to demonstrate?	Skills
Assess the safety and suitability of machinery and equipment for a specified task. Check all guards are in place. Check compatibility of prime-mover and machinery/equipment. Test overload/safety features. Check all components for wear, damage and security. Test all controls and components are functioning correctly. Check tyre pressures.	EC4, EC5, MC1.

3.12 Set up **equipment and machinery** for a specified task.

Range:
Equipment and machinery – Slurry spreader/manure spreader, fertiliser spreader/sprayer.

What do learners need to demonstrate?	Skills
Set up equipment and machinery for a specified task: • Set up according to manufacturer's recommendations • Calculate application rate • Calibrate fertiliser application machinery/equipment • Lubricate moving parts as per manufacturer's recommendations • Ensure equipment is clean	EC1, EC4, EC5, MC1.

3.13 Operate **machinery** to safely and accurately apply **nutrients**.

Range:
Machinery – Slurry spreader/manure spreader, fertiliser spreader/sprayer.
Nutrients – Organic, inorganic.

What do learners need to demonstrate?	Skills
Operate machinery to apply organic and inorganic nutrients. Monitor quality of work and carry out adjustments as required. Ensure application is confined to target. Complete application records.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

Skills applicable to container-based systems

3.14 Irrigate crops.

What do learners need to demonstrate?	Skills
Align irrigation to crop. Operate irrigation equipment.	EC1, EC4, EC5, MC1,

Measure irrigation runoff. Measure moisture content of growing media using appropriate equipment.	MC2, MC3, MC4, MC5, MC8, MC9, DC4.

3.15 Carry out **maintenance** of container-based crops.

Range:
Maintenance – Nutrient application, training, disbudding, de-leafing, pruning to shape, staking, transplanting, weeding, top dressing.

What do learners need to demonstrate?	**Skills**
Carry out maintenance activities. Dispose of waste appropriately.	EC1, EC5.

3.16 Transplant **plant materials**.

Range:
Plant materials – Seedlings, propagules, plantlets, whips.

What do learners need to demonstrate?	**Skills**
Transplant plant materials from one growth environment (trays/modules) to another.	EC1, EC5.

3.17 Apply aftercare to transplanted crops.

What do learners need to demonstrate?	**Skills**
Staking/protection of plants. Crop thinning. Monitor for weeds, pests and diseases. Implement control measures if required, including IPM. Determine irrigation requirements.	EC1, EC4, EC5, MC1, MC2, MC4, MC5 MC8, DC4.

3.18 Process and analyse data to support decision making for container-based crops.

What do learners need to demonstrate?	**Skills**
Calculate crop/fruit balance. Analyse and interpret environmental data to inform plant management decisions.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

Performance outcome 4

4. Harvest crops for commercial markets

Students are required to demonstrate harvesting skills in field-based and container-based systems. Skills should be demonstrated in environments that reflect commercial crop harvesting.

Skills applicable to both systems

4.1 Assess the suitability of **conditions** for harvest.

Range:
Conditions – Soil/growing media conditions, current weather conditions, weather forecast.

What do learners need to demonstrate?	Skills
Assess the suitability of conditions for harvest. Report findings to the appropriate person.	EC1, EC4, EC5.

4.2 Assess a sample of **crop** for quality, suitability for harvest and estimate yield using appropriate **methods**.

Range:
Crop – Field-based: Combinable crops (wheat, barley, oats), forage crops (maize, grass).
Container-based: Vegetables, salads, herbs, fruits.
Methods – Quality: Visual inspection, meters, laboratory analysis.
Suitability for harvest: Dry matter/moisture, size, maturity, growth stage, damage, appearance.
Yield: Method appropriate to crop type (fresh weight yield).

What do learners need to demonstrate?	Skills
Apply appropriate methods to determine quality of crop sample pre-harvest. Assess the suitability of a crop for harvest. Apply appropriate methods to estimate yield. Dealing with uneven ripening/maturity. Report findings to the appropriate person. Dispose of waste appropriately.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

4.3 Cost the harvesting of a **crop**.

Range:
Crop – Field-based: Combinable crops (cereals, pulses, oilseeds), forage (maize, grass), roots (potato, sugar beet).
Container-based: Vegetables, salads, herbs, fruits, ornamentals.

What do learners need to demonstrate?	**Skills**
Calculate the cost for each operation involved in the harvesting process. Calculate the total harvesting cost by area/weight. Input, process, manipulate and interrogate data digitally. Evaluate the options for harvesting (contractor vs. own equipment).	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, MC9, DC4.

4.4 Plan the harvesting of a **crop**.

Range:
Crop – Field-based: Combinable crops (cereals, pulses, oilseeds), forage (maize, grass), roots (potato, sugar beet).
Container-based: Vegetables, salads, herbs, fruits, ornamentals.

What do learners need to demonstrate?	**Skills**
Identify steps involved in completing a harvesting task. Sequence and prioritise the steps using a timeline. Allocate resources (including people, equipment, materials and time) to steps. Manage own time to meet objectives.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

4.5 Carry out a site-specific risk assessment.

What do learners need to demonstrate?	**Skills**
Identify hazards. Assess risks. Implement control measures. Review and update as required.	EC1, EC4, EC5.

4.6 Assess the safety and suitability of machinery and equipment for a specified task.

What do learners need to demonstrate?	Skills
Assess the safety and suitability of machinery and equipment for a specified task. Check all guards are in place. Check compatibility of prime-mover and machinery/equipment. Test overload/safety features. Check all components for wear, damage and security. Test all controls and components are functioning correctly. Check tyre pressures if applicable.	EC4, EC5, MC1.

4.7 Set up **harvesting equipment and machinery** for a specified task.

Range:

Harvesting equipment and machinery – Tractors, trailers, harvest equipment, forage equipment, loading equipment, hand tools, mechanical, Danish trollies, conveyers, irrigation equipment, waste bag, snips, trays, carry trays, punnets, sleeves, cleaning equipment, labelling, barcoding.

What do learners need to demonstrate?	Skills
Select and set up equipment and machinery according to manufacturer's recommendations. Lubricate moving parts as per manufacturer's recommendations. Ensure equipment is clean.	EC4, EC5, MC1.

4.8 Operate **equipment and machinery** to safely and efficiently harvest **crops**.

Range:

Crops – Field-based: Combinable crops, forage crops.

Container-based: Vegetables, salads, herbs, fruits, ornamentals.

Equipment and machinery – Tractors, trailers, harvest equipment, forage equipment, loading equipment, hand tools, mechanical, Danish trollies, conveyers, irrigation equipment, waste bag, snips, trays, carry trays, punnets, sleeves, cleaning equipment, labelling, barcoding.

What do learners need to demonstrate?	Skills
Safely and efficiently operate machinery to harvest crops, and process crop residue if appropriate. Apply physical dexterity using precise and controlled movements. Monitor quality of work and carry out adjustments as required. Clean equipment and machinery following harvesting. Dispose of waste appropriately. Update harvesting records with crop yield.	EC1, EC4, EC5.

4.9 **Prepare** crop storage facilities.

Range:
Prepare – Clean and disinfect, set appropriate temperature, manage light levels, control pests.

What do learners need to demonstrate?	Skills
Clean storage facilities in readiness for storing harvested crop. Apply the use of hand-held equipment. Disinfect storage facilities as required for specific crop. Set appropriate environmental conditions. Ensure absence of pests. Dispose of waste appropriately. Complete storage cleaning/disinfection records.	EC1, EC4, EC5.

4.10 Assess a sample of harvested **crop** for quality using appropriate **methods**.

Range:
Crop – Field-based: Combinable crops, forage crops.
Container-based: Vegetables, salads, herbs, fruits, ornamentals.
Methods – Visual inspection, moisture content, dry matter, temperature, purity of sample, size and shape, colour, weight, insect/pest damage, smell, test equipment, sugar content, acidity, firmness.

What do learners need to demonstrate?	Skills
Assess a sample of harvested crop for quality against specifications. Apply appropriate methods to determine quality of crop sample post-harvest. Determine acceptable levels of damage/contamination. Dispose of waste appropriately.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

Performance outcome 5

5. Maintain the areas surrounding the crop production environment

Skills can be demonstrated in relation to areas surrounding field-based or container-based crop production environments.

5.1 Assess a site for hazards and risks and recommend suitable control measures.

What do learners need to demonstrate?	Skills
Complete a site-specific risk assessment using the template provided. Identify hazards. Assess risks. Implement control measures. Review and update as required.	EC1, EC4, EC5.

5.2 Use **tools, equipment and machinery** to complete estate maintenance.

Range:
Tools, equipment and machinery – Hand, power, mechanical.

What do learners need to demonstrate?	Skills
Use hand and power tools, equipment and machinery to complete estate maintenance.	EC4, EC5, MC1.

5.3 Clean areas surrounding the crop production environment using appropriate **methods** and implement **biosecurity measures**.

Range:
Methods – By hand, mechanical, powered equipment.
Biosecurity measures – PPE, cleanliness, hygiene (personal, tools/equipment/machinery).

What do learners need to demonstrate?	Skills
Clean the external environment using appropriate methods. Use appropriate PPE. Implement appropriate biosecurity measures when maintaining the area.	EC4, EC5.

5.4 Apply **coatings** to **surfaces** to meet requirements.

Range:
Coatings – Paint, preservative, sealant.
Surfaces – Building structure (walls, floors).

What do learners need to demonstrate?	Skills
Prepare surfaces for coating. Coat surfaces to meet requirements.	EC4, EC5, MC1, MC2, MC4, MC5,

	MC9.

5.5 Carry out tasks to repair **wooden structures**.

Range:
Wooden structures – Fencing.

What do learners need to demonstrate?	**Skills**
Measure and cut timber-based products to meet requirements. Join timber-based products to meet requirements using appropriate methods.	EC4, EC5, MC1, MC2, MC4, MC5, MC9.

5.6 Carry out tasks using **ironmongery and gate furniture**.

Range:
Ironmongery and gate furniture – Hinges, hangers, latches, locks, sliding bolts.

What do learners need to demonstrate?	**Skills**
Install ironmongery and gate furniture.	EC4, EC5, MC1, MC2, MC4, MC5, MC9.

5.7 Install **glazing** according to specification.

Range:
Glazing – Glass, plastic.

What do learners need to demonstrate?	**Skills**
Install glazing in openings according to specification.	EC4, EC5, MC1, MC2, MC4, MC5, MC9.

5.8 Maintain **field boundaries** using appropriate **methods**.

Range:
Field boundaries – Hedge (installation and trimming), fence installation, field margin, walls, ditches/dykes.
Methods – By hand, power tools, mechanical.

What do learners need to demonstrate?	**Skills**
Maintain field boundaries according to specifications (legal requirements, scheme requirements).	EC4, EC5, MC1, MC2, MC4, MC5, MC9.

5.9 Maintain paths and roadways using appropriate **equipment**.

Range:
Equipment – Hand tools, mechanical.

What do learners need to demonstrate?	Skills
Maintain paths and roadways. Clear paths and roadways of unwanted vegetation using appropriate equipment.	EC4, EC5, MC1, MC2, MC4, MC5, MC9.

5.10 Repair masonry to meet requirements.

What do learners need to demonstrate?	Skills
Repair brickwork to meet requirements: • Remove damaged/cracked mortar using an appropriate method. • Fill with new mortar using an appropriate method.	EC4, EC5, MC1, MC2, MC4, MC5, MC9.

5.11 Cut and join plastic pipework.

What do learners need to demonstrate?	Skills
Measure and cut plastic pipework to meet requirements. Join plastic pipework to meet requirements.	EC4, EC5, MC1, MC2, MC4, MC5, MC9.

5.12 Maintain drains and ditches using appropriate **equipment**.

Range:
Equipment – Hand tools, mechanical.

What do learners need to demonstrate?	Skills
Clear underground drains using appropriate equipment. Maintain ditches by managing vegetation.	EC4, EC5, MC1, MC2, MC4, MC5, MC9.

5.13 Apply correct procedures for disposal of waste.

What do learners need to demonstrate?	Skills
Classify and segregate waste for appropriate storage and disposal. Dispose of waste appropriately.	EC4, EC5.

5.14 Audit **stock** according to requirements.

Range:
Stock – Seed, nutrients, chemicals, fuels, growing crops, crops in store, growing media, containers, waste.

What do learners need to demonstrate?	Skills
Accurate auditing of stock according to business and legal requirements. Complete appropriate records.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

5.15 Ensure compliance with assurance schemes.

What do learners need to demonstrate?	Skills
Audit the compliance of activities with assurance scheme requirements.	EC4, EC5.

5.16 **Communicate information** to the public.

Range:
Communicate information – Digital, information/safety signs, promotional material.

What do learners need to demonstrate?	Skills
Create materials for public information. Use digital tools to communicate with others. Convey technical information to non-technical audiences.	EC4, EC5, DC1, DC2.

Guidance for delivery

The purpose of this specialism is for learners to know and undertake the theory and practice of Field-based and Container-based Crop Production. A range of classroom-based and practical delivery methods should be employed to ensure both theory and practice are delivered with strong linkage to vocational context. Centres are encouraged to introduce employers and specific professionals from the farming, plant and food production industries to provide interesting and relevant information to the learner.

All practical delivery should focus 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. Learners should understand the importance of maintaining an awareness of current legislation and Codes of Practice.

Machinery use outcomes are best initially delivered in a workshop context with eventual move to a working farm/field or crop production environment. Reference should also be made to biosecurity and environmental protection measures throughout. The requirement for regular maintenance and use of the manufacturer's manuals should also be identified. Pre-start checks and safe starting techniques will form part of these outcomes.

For the more theory-based outcomes it is anticipated that the delivery will be through formal lectures, but it is recommended that they are linked directly with interactive lessons in a real environment and that visiting speakers are used where possible to provide a vocationally relevant context. Laboratory and field-based practical sessions will be essential to help learners to explore soil characteristics, plant physiology and structure, and a series of visits to plant nurseries, arable and mixed farms and indoor growers could help learners better understand factors affecting the establishment, maintenance and harvesting of field-based and container-based crops. Learners should also have access to a range of soils, as well as appropriate equipment and resources to undertake soil sampling and testing.

Suggested learning resources

Books & periodicals

- Bell, B. (2016) Farm Machinery (6th edn). London: Old Pond Publishing
- Davies, D., Finney, B. and Eagle, D. (2001) Resource Management: Soil. Totnes: Farming Press
- Wilson, P. and King, M. (2004) Arable Plants – A field guide. Princeton, NJ: Princeton University Press
- Finch, HJS., Samuel, AM., Lane, GPF. (2014) Lockhart & Wiseman's Crop Husbandry including Grassland (9th edn.) Oxford: Pergamon Press
- Adams, C.R.; Early, M.; Brook J.; Bamford K. (2014) Principles of Horticulture Level 2 (7th edn.) London: Routledge
- Adams, C.R.; Early, M.; Brook J.; Bamford K. (2014) Principles of Horticulture Level 3 (1st edn.) London: Routledge
- Hartmann & Kester's Plant Propagation: Principles and Practices: (2013) Pearson International
- Allaby, M. (2019) Dictionary of Plant Sciences Oxford: Oxford University Press.
- Brown, L (2002) Applied Principles of Horticultural Science (2nd edn) Butterworth-Heinemann

- Ingram, D S., Vince-Prue, D., Gregory P J., (2015) Science and the Garden: The Scientific Basis of Horticultural Practice (3rd edn) Wiley-Blackwell
- Redman, G. John Nix Pocketbook for Farm Management Melton Mowbray: Agro Business Consultants
- AHDB Nutrient Management Guide (RB209)
- Horticulture Week
- Farmers Weekly
- The Horticulturist

Websites

- The Soil Association – **www.soilassociation.org**
- Department for Environment Food and Rural Affairs (DEFRA) – **www.gov.uk/government/organisations/department-for-environment-food-rural-affairs**
- DEFRA Plant Health Portal – **https://planthealthportal.defra.gov.uk**
- Environment Agency – **www.gov.uk/government/organisations/environment-agency**
- Health and Safety Executive – **www.hse.gov.uk**
- Agriculture and Horticulture Development Board (AHDB) – **www.ahdb.org.uk**
- National Farmers Union – **www.nfuonline.com**
- National Federation of Young Farmers' Clubs – **www.nfyfc.org.uk**
- Linking Environment And Farming (LEAF) – **www.leaf.eco**
- The Institute for Agriculture and Horticulture (TIAH) – **www.tiah.org**
- IdentiPest British Crop Protection Council (BCPC) – **www.identipest.co.uk**
- Farming Community Network – **www.fcn.co.uk, www.farmwell.org.uk**

Scheme of assessment additional information

The below tables illustrate how each performance outcome is assessed through the use of assessment themes along with how each assessment criteria including the knowledge criteria in outcome 1 is packaged into an assessment theme for assessment purposes.

Assessment criteria that appear more than once against an assessment theme is required so that content is assessed within the context of a specific performance outcome.

Performance Outcome	Assessment themes	Assessment criteria
PO2 Establish crops in field and container-based systems for optimum yield and quality (30%)	Preparing for field-based crop establishment	1.16 Different types of crops 1.17 The principles of crop rotation 2.2 Test condition of growing media 2.3 Assess quality of planting materials 2.7 Assess soil structure from a profile pit 2.8 Test soil for nutrients
	Health and safety in field-based crop establishment	1.1 Health and safety legislation and codes of practice for crop production 1.2 Health and safety related incidents and hazards involved in crop production 2.1 Carry out a site-specific risk assessment
	Field-based crop establishment	1.12 Suitability of crop establishment machinery, equipment and technology in different situations and developments in technology for establishing crops 1.15 The relationship between machinery and soil structure 1.13 Operating principles of crop establishment machinery, equipment and technology 1.14 How to maintain crop establishment machinery and equipment and deal with common faults 1.21 Preparation techniques for the growing area 2.4 Assess the safety and suitability of machinery and equipment for a specified task 2.5 Set up equipment and machinery for a specified task 2.6 Manually lift and move materials 2.9 Attach an implement to a tractor 2.11 Set up planting machinery for accurate placement of planting material and operate planting machinery specific to crop type 2.10 Cultivate soil using appropriate soil engaging machinery/equipment

		2.12 Assess quality of planting operation undertaken by others using an appropriate method
	Health and safety in container-based crop establishment	1.1 Health and safety legislation and codes of practice for crop production 1.2 Health and safety related incidents and hazards involved in crop production 2.1 Carry out a site-specific risk assessment 2.6 Manually lift and move materials
	Container-based crop establishment	1.12 Suitability of crop establishment machinery, equipment and technology in different situations and developments in technology for establishing crops 1.16 Different types of crops 1.18 Types of planting material 1.19 Growing media and soil types 1.20 The origins of different types of growing media 1.25 Different forms of crop plant material used for establishment 2.3 Assess quality of planting materials 1.13 Operating principles of crop establishment machinery, equipment and technology 1.22 The conditions and environments and facilities required for plant propagation 1.23 Techniques for propagation by seed, including seed treatments and aftercare requirements for container-based systems 1.24 Techniques for propagation by vegetative means, including aftercare requirements 1.26 Methods of crop irrigation 1.27 Types of aftercare used to support crop establishment 1.28 Environmental controls 2.13 Propagate plants by seed in trays/modules 2.14 Propagate plants by vegetative means 2.15 Apply nutrients 2.16 Set environmental conditions

Performance Outcome	Assessment themes	Assessment criteria
PO3 Manage crops in field and container-based systems to optimise yield and quality (30%)	Field-based crop monitoring	1.6 Nutrients and phytohormones required by different types of crops 1.8 Types and sources of information and data required to support crop production decisions 1.32 Different types of crops 1.33 Quality characteristics of healthy plants 1.34 Practices used to manipulate crop growth and quality 1.35 The effect of environmental conditions on plant protection methods and crop growth 1.36 Activities required to manage crops 1.37 Common pests, weeds and diseases 1.38 The principles of Integrated Pest Management (IPM) 3.2 Capture environmental data 3.3 Interpret environmental data 3.4 Measure emergence of crop, calculate the establishment percentage and assess root establishment 3.5 Monitor crop growth to determine crop progress and management actions required 3.6 Identify and quantify pests, diseases and weeds and consult with technical experts to determine actions required 3.7 Apply Integrated Pest Management (IPM) techniques to prevent/control pests and weeds 3.8 Measure growing media moisture content and determine irrigation requirements 3.9 Assess crops for potential adverse effects on yield and quality and forecast surplus/deficit output against business targets 3.10 Process and analyse data to support decision making
	Field-based crop management	1.3 Environmental impacts and malpractices arising from crop production activities 1.4 Environmental legislation, regulations, codes of practice and organisational policies 1.5 Biosecurity measures, hygiene practices and their application in crop production 1.7 Types of crop production records and how they are managed in the workplace 1.29 Suitability of crop management machinery, equipment and technology in different situations and developments in technology for managing crops 1.30 Operating principles of crop management machinery, equipment and technology 1.31 How to maintain crop management machinery and equipment and deal with common faults 3.1 Carry out a site-specific risk assessment 3.11 Assess the safety and suitability of machinery and equipment for a specified task

		3.12 Set up equipment and machinery for a specified task 3.13 Operate machinery to safely and accurately apply nutrients
	Container-based crop monitoring	1.6 Nutrients and phytohormones required by different types of crops 1.7 Types of crop production records and how they are managed in the workplace 1.32 Different types of crops 1.33 Quality characteristics of healthy plants 1.34 Practices used to manipulate crop growth and quality 1.35 The effect of environmental conditions on plant protection methods and crop growth 1.36 Activities required to manage crops 1.37 Common pests, weeds and diseases 1.38 The principles of Integrated Pest Management (IPM) 3.2 Capture environmental data 3.5 Monitor crop growth to determine crop progress and management actions required 3.6 Identify and quantify pests, diseases and weeds and consult with technical experts to determine actions required 3.7 Apply Integrated Pest Management (IPM) techniques to prevent/control pests and weeds 3.9 Assess crops for potential adverse effects on yield and quality and forecast surplus/deficit output against business targets 3.18 Process and analyse data to support decision making for container-based crops
	Container-based crop management	1.5 Biosecurity measures, hygiene practices and their application in crop production 3.1 Carry out a site-specific risk assessment 3.14 Irrigate crops 3.15 Carry out maintenance of container-based crops 3.16 Transplant plant materials 3.17 Apply aftercare to transplanted crops

Performance Outcome	Assessment themes	Assessment criteria
PO4 Harvest crops for commercial markets (26%)	Business planning	1.9 The crop production supply chain 1.10 Financial information associated with crop production 1.49 Activities required to harvest and store crops 1.50 Principles of stock management systems 1.51 Types of financial records and information 4.3 Cost the harvesting of a crop 4.4 Plan the harvesting of a crop
	Assessing a crop for harvest	1.41 Types of data required to support crop harvesting decisions including harvest records and storage records 1.47 The effect of growing media on harvesting 4.1 Assess the suitability of conditions for harvest 4.2 Assess a sample of crop for quality, suitability for harvest and estimate yield using appropriate methods
	Harvesting field-based crop	1.41 Types of data required to support crop harvesting decisions including harvest records and storage records 1.42 Suitability of crop harvesting and storage machinery, equipment and technology in different situations 1.43 Operating principles of crop harvesting and storage machinery, equipment and technology 1.44 How to maintain crop harvesting and storage machinery and equipment and deal with common faults 1.45 The relationship between machinery and soil structure 1.46 Harvesting different types of crops 4.5 Carry out a site-specific risk assessment 4.6 Assess the safety and suitability of machinery and equipment for a specified task 4.7 Set up harvesting equipment and machinery for a specified task 4.8 Operate equipment and machinery to safely and efficiently harvest crops
	Harvesting container-based crop	1.41 Types of data required to support crop harvesting decisions including harvest records and storage records 1.46 Harvesting different types of crops 4.5 Carry out a site-specific risk assessment 4.7 Set up harvesting equipment and machinery for a specified task

		4.8 Operate equipment and machinery to safely and efficiently harvest crops
	Crop storage	1.39 Management of common pests and problems associated with different crops in storage 1.40 Crop storage methods, facilities and packaging 1.41 Types of data required to support crop harvesting decisions including harvest records and storage records 1.48 Environmental controls 1.52 Industry quality standards, assurances and audit processes 4.9 Prepare crop storage facilities 4.10 Assess a sample of harvested crop for quality using appropriate methods

Performance Outcome	Assessment themes	Assessment criteria
PO5 Maintain the areas surrounding the crop production environment (14%)	Business management	1.11 Audit processes involved in confirming compliance with requirements 1.53 Costs and revenues associated with maintaining areas surrounding production environments 1.54 Actual and potential markets and methods of promotion 1.55 Standards for maintenance of areas surrounding the production environment set by different standards setting bodies and implications for non-compliance 1.57 The importance of habitat management and techniques applied to achieve these 1.58 Potential risks arising from production activities and their impact on the wider environment 5.13 Apply correct procedures for disposal of waste 5.14 Audit stock according to requirements 5.15 Ensure compliance with assurance schemes 5.16 Communicate information to the public
	Estate maintenance	1.56 Types of boundaries, structures and surfaces in estates 1.59 The operating principles of maintenance machinery and equipment 1.60 Common faults in machinery and equipment used for estate maintenance 1.61 Techniques used to maintain equipment and machinery 5.1 Assess a site for hazards and risks and recommend suitable control measures 5.2 Use tools, equipment and machinery to complete estate maintenance 5.3 Clean areas surrounding the crop production environment using appropriate methods and implement biosecurity measures 5.4 Apply coatings to surfaces to meet requirements

		5.5 Carry out tasks to repair wooden structures 5.6 Carry out tasks using ironmongery and gate furniture 5.7 Install glazing according to specification 5.8 Maintain field boundaries using appropriate methods 5.9 Maintain paths and roadways using appropriate equipment 5.10 Repair masonry to meet requirements 5.11 Cut and join plastic pipework 5.12 Maintain drains and ditches using appropriate equipment

401 Floristry

Level:	3
GLH:	950
Assessment method:	Practical Assignment

What is this Occupational Specialism about?

The purpose of this specialism is for learners to know and undertake designing and development processes within floristry.

Learners will have the opportunity to plan, produce and evaluate their work whilst using resources and developing inspiration, technical skills and design methods.

Learners will develop their knowledge and understanding of floristry, and skills in:

- safe working practices in floristry
- creating designs in media, tied, glued and wired designs
- communicating with colleagues and clients
- creating designs to meet client requirements
- producing designs for events

Learners may be introduced to this specialism by asking themselves questions such as:

- What are the different types of projects can I expect to work on in this industry?
- What are the different types of floral designs will I be able to do on entering industry?
- What are the career opportunities in this industry?

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

1. Floristry knowledge criteria

Performance Outcomes

On completion of this specialism, learners will be able to:

2. Design all floral work to meet client requirements for special events

3. Coordinate the care and conditioning of fresh floral materials and plants

4. Assemble all commercial flower, foliage and plant arrangements

5. Create free-standing event-based structures decorated with floral designs

Completion of this specialism will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented at the end of the specification.

Underpinning knowledge

Common knowledge criteria

Floristry knowledge criteria

1.1 Health and safety **legislation** and **safe working practices.**

Range:

Legislation – Health and Safety at Work, Management of Health and Safety at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR), The Control of Substances Hazardous to Health Regulations, Personal Protective Equipment at Work Regulations and any other relevant legislation.

Safe working practices – Manual handling, lone working, working at height.

What do learners need to learn?	Skills
The requirements of current legislation in relation to health and safety in the floristry industry, how to access it and how it affects their own activities in the workplace, including: • risk assessment • first aid • fire safety The purpose of legislation within the floristry industry: • Why there is a need for the legislation • Roles and responsibilities as set out in legislation • Possible consequences of non-compliance	EC4, EC5

1.2 Types of **PPE**.

Range:

PPE – Gloves, apron, footwear, face mask (respirator), eye protection, high visibility jackets, steel toe cap boots, safety hats, security passes.

What do learners need to learn?	Skills
The purpose and correct use of appropriate PPE to reduce risks for themselves and others.	EC4, EC5

1.3 Types of **tools** and **technical mechanics**.

Range:

Tools – Floristry knife, long-bladed knife, saw, drill, floristry scissors, ribbon scissors, tweezers, clippers, secateurs, stem stripper, glue gun, pliers, wire cutters, stapler, water spray mister.

Technical mechanics – Floral glue, stub wire, binding wire, pot tape, stem tape, measuring tape, adhesive fix, self-adhesive clear tape, glue sticks.

What do learners need to learn?	Skills
The range of tools and technical mechanics available to florists, including their purpose and how to use, maintain and store them appropriately.	EC4, EC5

1.4 **Design schema**.

Range:

Design schema – Order category, arrangement style, line direction, point of growth, placement of materials.

What do learners need to learn?	Skills

How the design schema applies to the design process, including how it can:
• inform the planning of designs
• provide a structure for analysis, evaluation and development of designs
Design categories, their format and how they are applied to floral designs, including:
• Order category:
  ○ symmetrical
  ○ asymmetrical
• Arrangement style:
  ○ decorative
  ○ vegetative
  ○ form linear
• Line direction:
  ○ radial
  ○ crossing
  ○ parallel
• Point of growth:
  ○ single point of growth
  ○ multiple points of growth
• Placement of materials:
  ○ even distribution
  ○ varied density
  ○ grouped
  ○ random
  ○ rows
	EC4, EC5

1.5 The **principles** and **elements** of design.

Range:
Principles – Balance, contrast, dominance, harmony, rhythm, scale, proportion.
Elements – Colour, form, texture, space, line.

What do learners need to learn?	**Skills**

How the principles and elements of floral design work together and how they are used to create aesthetically pleasing designs.
How the principles and elements of design can be used to inform critical evaluation and development of designs.
How colours are created and their relationships with each other on the colour wheel, including:
• primary colours
• secondary colours
• tertiary colours
• achromatic
• hue
• tint
• tone
• shade
• temperature (hot and cold)
• luminosity
• advancing
• receding
• colour harmonies:
  ○ monochromatic
  ○ complementary
  ○ contrasting
  ○ analogous
  ○ split complementary
  ○ near complementary
  ○ polychromatic
  ○ triadic
  ○ tetradic
	EC5, EC4

1.6 **Sources** of inspiration.

Range:
Sources – Culture, botany, emotion, design methodology, technique, economics.

What do learners need to learn?	**Skills**
How sources of inspiration are used to inform and develop design ideas, including inspiration informed by: • culture • botany • emotion • design methodology • technique • economics	EC4, EC5

How outside influences can be used as predictors of future trends in the floristry industry and the impacts on the industry, including: • colour trends • design styles • botanical materials • packaging • new products • international designers	

1.7 Decorative and non-decorative **techniques** used in floral designs.

Range:
Techniques – Attaching techniques, wiring techniques, manipulation and decorative techniques.

What do learners need to learn?	**Skills**
The purpose and appropriate application of a range of techniques, considering the impact they have on the design, skills required for assembly and any cost/time implications. Techniques: • Attaching techniques – Binding, tying and knotting, clamping, wedging, gluing, pinning, stapling, taping • Wiring techniques – Support wiring, external wiring, semi-internal wiring, internal wiring, cross-wiring, stitching, single-leg mount, double-leg mount, hook wiring, branching unit, ribbed unit, natural unit, feathering, pipping, sepal pinning • Manipulation and decorative techniques – Basing, backing, bow making, bundling, caging, edging, framing, grouping, lacing, layering, pave, pinning, plaiting, pleating/folding, rolling/cupping, spiralling, sheltering, stacking, taping, threading, veiling, weaving, winding, wrapping • Water retaining techniques – Cotton wading, floating, taping, tubes/phials, wax, gluing	MC9, MC10

1.8 **Evaluation** of floral designs.

Range:
Evaluation – Design choices, suitability, costing, application of design theory, workmanship.

What do learners need to learn?	**Skills**
How to evaluate a design against specifications and make modifications if necessary. Considerations when evaluating designs: • Customer requirements. • Suitability of techniques used • Design schema • Application of elements and principle of design • Suitability and fit for purpose • Appropriate use of fresh and sundry materials (including longevity) • Suitability of costing methods applied • Commercial viability and value for money • Implications of any changes made	EC5, EC4

Specific knowledge criteria for performance outcomes

Design all floral work to meet client requirements for special events (PO2)

1.9 **Methods** used to interpret customer requirements.

Range:
Methods: Site visit, use of open and closed questions, active listening, managing customer expectations.

What do learners need to learn?	Skills
Interpretation of customer and event requirements including: • venue contact details (event planner internal/external) • customer brief • site visit form • budget/costing • purpose of the floristry product • time frame for construction of an event • water source • delivery and parking • potential difficulties which may arise (seasonality, suitability of customers chosen materials, peak periods and high demand)	EC5, MC6, MC2, MC9

Communication

1.10 **Methods** of communication.

Range:
Methods – Face to face, verbal, non-verbal, written, telephone, digital (including email, messaging, video call, social media, website).

What do learners need to learn?	Skills
How different methods of communication can be used effectively, including: • the suitability of different communication methods • the requirements of specific clients including complaints and bereavements • how to visually communicate ideas/designs (including the use of sketches and mood boards) • how digital resources and tools can be used effectively	EC1, EC2, DC2

1.11 Presenting to **technical** and **non-technical** audiences.

Range:
Technical – Employers, employees, colleagues.
Non-technical – Clients, other vendors.

What do learners need to learn?	Skills
Appropriate strategies to use when addressing different audiences and delivery mechanisms which can be altered, including the use of: • technical language • formal/informal presentation methods • imagery (including photos, diagrams and sketches)	EC2, EC3, EC1, DC1, DC3

Floral designs

1.12 **Symbolism** and how it is applied to event designs.

Range:
Symbolisms – Cultural, historical, colour association.

What do learners need to learn?	Skills
How symbolism can be used to influence and inform design choices for events including: • weddings • funerals • cultural events Understanding which designs may be considered appropriate. How the use of specific materials and colours can create links and associations.	EC5

1.13 **Factors** that affect designs.

Range:
Factors – Intended purpose, timescales, budget, seasonality, resource availability.

What do learners need to learn?	Skills
How a range of factors can influence design choices and impact the suitability and practicalities of designs, including: • intended purpose of the design (e.g. to be worn, carried, displayed) • timescales (e.g. for planning, construction and duration of event) • seasonality (e.g. suitability and availability of materials, local climate, peak periods or other events)	MC9, EC5

1.14 Construction **methods** of floral designs.

Range:
Methods – Hand tied, designs in a medium, wired, glued.

What do learners need to learn?	Skills
The construction methods available to florists, the main features of each and considerations which can identify suitability of these methods, including: • their benefits and limitations • how they are considered when preparing designs	M C9, EC4

• implications for assembly and cost	

1.15 Content of a design **presentation**.

Range:
Presentation – Images, design plans, digital resources, samples, mock ups, pricing.

What do learners need to learn?	**Skills**
How to prepare and deliver design presentations to clients, including appropriate use of: • images (photos of previous works, site visits, inspirations) • design plans (e.g. sketches, layouts/floorplans, dimensions) • digital resources (e.g. presentation software) • samples • mock ups • pricing (e.g. quotations, pricing breakdowns) How to identify key factors which need to be considered behind the scenes, but may not be appropriate to share in a client presentation, including: • construction methods • work plans • timings • transportation methods • packaging • skills required • staffing requirements • ancillary/sundry products • costings • buying lists • venue amenities	EC1, EC3, DC2

Mathematical techniques

1.16 Application of mathematical **techniques** and methods to inform design processes.

Range:
Techniques: Addition, subtraction, multiplication, division, percentages, fractions, calculating area and volume, rounding up, rounding down.

What do learners need to learn?	**Skills**
How to apply a range of mathematical techniques to inform the design process and to assist with decision making and application of practical and appropriate design choices. Mathematical techniques should be used to complete tasks such as calculating retail prices, working to budgets, formulating stem counts and working out quantities for buying lists.	MC2, MC4, MC9

1.17 Difference between estimation and accurate **measurement**.

Range:
Measurement – Units of measurement, measuring tools.

What do learners need to learn?	Skills
How to apply measuring skills to ensure the required level of accuracy when planning and constructing floral designs. Considerations when working with measurements include: • units of measurements applied (Metric – mm, cm, m) • measuring equipment to be used (e.g. ruler, tape measure, laser) • how measurements will be recorded • implications of poor or inaccurate measurement practice	MC1, MC2

1.18 **Techniques** for the 2D and 3D representation of designs.

Range:
Techniques – Sketching/drawing, digital tools, mock-ups, scale models.

What do learners need to learn?	Skills
How to effectively represent designs in 2D and 3D forms to assist with communication of ideas to colleagues and clients. Techniques which can be used, include: • sketching/drawing designs • using digital tools (image viewing, sharing and manipulation) • mock-ups (e.g. creating the design, or a simplified version) • scale models (e.g. creating a smaller scale model of the design and/or location)	DC1, DC2, DC3

Coordinate the care and conditioning of fresh floral materials and plants (PO3)

1.19 Typical **hazards** associated with care and conditioning of fresh floral materials and plants.

Range:
Hazards – Tools, chemicals, fresh materials (thorns, poisonous, irritant).

What do learners need to learn?	Skills
Typical hazards, including: • tools • cleaning chemicals • flower/plant food • hazardous botanical materials (thorns, spines, irritants, poisonous) • botanical waste Control measures which can be implemented to minimise risk through the process of risk assessment.	MC10

1.20 **Methods** used for managing care and conditioning tasks.

Range:
Methods – Planning, prioritising tasks.

What do learners need to learn?	Skills
How to plan for and manage conditioning tasks to ensure: • preparation is completed in advance (vases cleaned) • time and staff are available to complete the tasks • botanical materials are prioritised to maximise longevity or meet order requirements	MC10

1.21 **Sources of information** available to support care and conditioning of fresh botanical materials.

Range:
Sources of information – Books, search engines, other professionals (florists, sales reps, wholesaler).

What do learners need to learn?	Skills
What sources of information are available to support the care and conditioning process and how to locate and utilise them effectively.	EC4, EC5

Care and conditioning

1.22 **Activities** involved in caring for and conditioning fresh botanical materials.

Range:
Activities – Checking off delivery note, identification, unpacking, stripping, trimming, grooming, special treatment methods, feeding, revival, labelling, storing, hydration.

What do learners need to learn?	Skills
Activities and processes involved in the care and conditioning of fresh botanical materials, to ensure: • materials are correctly identified to allow appropriate conditioning methods and storage techniques to be applied • wastage is kept to a minimum • issues can be identified and addressed appropriately	MC10

1.23 Identification of fresh **botanical materials**.

Range:
Botanical materials – Cut flowers, foliage and plants. (Plant identification list appendix 1).

What do learners need to learn?	Skills

How to identify a wide range of fresh flowers, foliage and plants, using correct botanical nomenclature, and be able to identify:
• any special characteristics
  ○ poisonous
  ○ irritant
  ○ thorns
  ○ fragrance
  ○ vase life
• any special care requirements which may be needed (e.g. specific flower food)
• quality indicators associated with the material
• different stem structures of botanical material (soft, hollow, semi-woody, woody, latex)
• countries where they are sourced, grown and transported
	EC5

Assemble all commercial flower, foliage and plant arrangements (PO4)

1.24 Methods used to minimise **waste** produced by florists' assembling designs.

Range:
Waste – Fresh material, glass, cardboard, plastics and metals.

What do learners need to learn?	Skills
Methods used to minimise waste, including: • managing buying – careful planning of material requirements • stock rotation – using stock at appropriate stages of maturity and how to influence and control the natural senescence of fresh materials • correct care, conditioning, handling and storage of materials – using appropriate methods for the selected materials to ensure the quality of the product is not compromised	MC10

1.25 Floristry **techniques** and how they are used to construct designs.

Range:
Techniques – Attaching techniques, wiring techniques, manipulations techniques.

What do learners need to learn?	Skills
Purpose and appropriate application of a range of techniques, considering the impact they have on the design, skills required for assembly and any cost/time implications, including: • attaching techniques – binding, tying and knotting, gluing, pinning, stapling • wiring techniques – support wiring, external wiring, semi-internal wiring, internal wiring, stitching, single-leg mount, double-leg mount, hook wiring, units, feathering, pipping, sepal pinning • manipulation techniques – basing, backing, bow making, grouping, caging, edging, layering, plaiting, pleating/folding, rolling/cupping, spiraling, taping, threading, veiling, weaving, wrapping	MC10

1.26 Design **evaluation**.

Range:
Evaluation – Design choices, suitability, costing, application of design theory, workmanship.

What do learners need to learn?	Skills
How to evaluate a design against specifications and make modifications if necessary. Considerations when evaluating designs including: • customer requirements • suitability of techniques used • design schema • application of elements and principles of design • suitability and fit for purpose • appropriate use of fresh and sundry materials (including longevity)	EC4, EC5

• suitability of costing methods applied • commercially viable and value for money • implications of any changes	

Care and conditioning of assembled designs

1.27 **Methods** used to maintain, and store constructed designs.

Range:
Methods – Removal, replacement, watering, labelling, environmental controls.

What do learners need to learn?	**Skills**
How to care for and maintain floral designs to ensure they: • remain in optimum condition for as long as possible • don't become damaged or misplaced	MC10

1.28 Suitability of fresh materials and their **characteristics** for planned designs.

Range:
Characteristics – Poisonous, irritant, vase life, stem length, environmental sensitivities.

What do learners need to learn?	**Skills**
Characteristics of a wide range of fresh materials and the implications of these which need to be considered when planning designs, including: • suitability for the intended design • any potential risks • any physical limitations • will longevity be adversely affected by the design, construction method or environment?	EC5, MC6

Create free standing event-based structures decorated with floral designs (PO5)

1.29 Typical **hazards** associated with installing free standing event-based structures.

Range:

Hazards – Use of equipment (e.g. ladders, power tools), materials/design falling.

What do learners need to learn?	Skills
Common hazards associated with installing floral designs which could result in serious harm to themselves or others (visitors, colleagues, members of the public). Hazards include: • use of tools (including power tools) • handling/lifting of designs and props • working at height • slips, trips and falls • lone working • working on uneven surfaces • special characteristics of botanical materials • potential harmful plants (BFA) Control measures used to minimise associated risks: • CPD/Training specific to work activities • Adhere to risk assessment • Wearing correct PPE • Cordoning off work areas • Correct use of signage • Tools and equipment are in correct working order and complies with legislation (PAT testing)	EC5

1.30 Types of **PPE** available for creating installations of floral designs, their purpose and implications for poor use.

Range:

PPE – Gloves, eye protection, footwear, face mask (respirator), apron, high visibility jackets, steel toe cap boots, safety hats, security passes.

What do learners need to learn?	Skills
Types of PPE available, their purpose and how to use them appropriately to reduce risks.	EC5

1.31 Symbolisms associated with event **structures** and how these are implemented at events.

Range:
Structures – Chuppah, Mandap, wedding arches, canopies.

What do learners need to learn?	Skills
Know the use of symbolic structures for different cultures and how these are implemented at events, including: • Chuppah • Mandap Know the use of symbolic structures for related events and how these are implemented at events. Including: • arches • canopies	EC5

1.32 Types of **environments** where installations of floral designs may be required.

Range:
Environments – Indoor, outdoor, listed/protected buildings, public and private spaces.

What do learners need to learn?	Skills
Different surfaces on which free standing event-based structures could be required: • grass • carpet • wood • stone/gravel • even/uneven surface • temporary flooring • protected or delicate surfaces Advantages and disadvantages of different surfaces: • stability • health and safety • protection of the environments Environmental characteristics that need to be considered: • light (natural and artificial) • ventilation (airflow/air conditioning) • access to utilities • space • existing decorations • temperature (weather conditions) • listed/heritage buildings (methods of protecting the building) • protective matting	EC5, MC2

1.33 Structural **science** and how it impacts on the design and installation of floral designs.

Range:
Science – Forces, loads, materials.

What do learners need to learn?	Skills
Structural properties of event structures, how they are assessed and the impact they may have on the design, including: • strength of the material (e.g. metal, timber, fibreglass, plastic) • flexibility • water-resistance • visual aesthetics • weight • footprint of structure • centre of gravity • physical balance Potential impact of poor assessment and the possible consequences: • collapse of structure • damage to property • injury or death • financial costs • reputational damage	EC4, EC5

1.34 **Conventions** of technical drawings and how they are used to communicate design ideas.

Range:
Conventions – Symbols, key, scale.

What do learners need to learn?	Skills
How drawing conventions are used to depict design ideas and plans, including: • symbols • key • scale (use of appropriate scales to show how designs work within an area) Be able to use conventions to communicate ideas to both technical and non-technical audiences.	MC7, MC8, EC1

1.35 Types of **equipment** used in the installation free standing event structures.

Range:
Equipment – Power tools (drill, saw, glue gun), ladder/platform, tape measure, saw, screwdriver, hammer and nails, sandpaper, clamps.

What do learners need to learn?	Skills
The different types of equipment used to install event structures, including: • their characteristics and purposes • how they are operated effectively and safely • how they are maintained including cleaning and storage • their suitability for different design and installation requirements	EC5

1.36 The **logistics** required for the installation of floral designs.

Range:
Logistics – Packaging, handling, transportation, time management.

What do learners need to learn?	Skills
Typical activities involved, including: • planning activities – materials, equipment, staffing, routes, access to venue, preparation of work area • appropriate storage – onsite and offsite, environmental conditions • handling of design – manual handling, transportation of design • handling of fresh material – environmental conditions, storage, handling without causing damage • packaging – protection, transportation • vehicles (including methods of securing designs) – suitability of vehicles, fixing points within vehicles, dimensions of vehicles, access for vehicles • working to a timeframe, the implications of any delays and actions– suppliers, client and venue requirements, physical deterioration of designs, contractual implications (vehicle hire), reputational damage	EC5, MC10

1.37 Types of event structure **materials** used for event-based structures.

Range:
Materials: Wood, metal, fibreglass and plastic.

What do learners need to learn?	Skills
Different types of timber-based products available and how they impact the construction of the structure and floral design, including: • their properties/characteristics • suitability for different purposes • implications for design and installation • cost implications Advantages and disadvantages of different types of materials: • weight • strength • water resistance • cost • finish of the material • sustainable sources	EC5

1.38 Types of assembly **methods**.

Range:
Methods – Cutting, joining, fixing, attaching.

What do learners need to learn?	Skills
Types of assembly/construction methods, including: • their suitability for use with different materials • how they contribute to meeting design requirements • their suitability for use in different environments • equipment, machinery and materials required • how to deal with unexpected situations (uneven surfaces, breakages)	EC5

Performance outcome 2

2. Design all floral work to meet client requirements for special events (PO2)

2.1 Determine customer requirements for an event through appropriate **methods**.

Range:
Methods – Open/closed questions, discussion with customer, digital communication, use of imagery, interpret customer brief (site visit, customer order).

What do learners need to demonstrate?	Skills
Using appropriate methods, establish the following requirements: • type of event • budget • location (space available) • date/time • specific requirements (e.g. allergies) • design requirements (colours, quantities, style, purpose) Record client requirements and personal data accurately and store them in accordance with legislation.	EC1, EC5, MC9

2.2 Research customer requirements using different **sources of information** to inform floral design proposals.

Range:
Sources of information – Primary, secondary, site visit, social media, wholesaler's website, and digital media.

What do learners need to demonstrate?	Skills
Use different sources of information to form appropriate ideas based on a client's brief. Complete site visits to establish information required to aid planning, including: • accurate measurements of environmental features and areas available for designs • access (roads, gateways, doors, paths) • décor (special features, characteristics) • utilities Be able to estimate space available for designs when taking accurate measurements is not possible.	EC1, EC4, EC5, DC1, MC1

2.3 Create a design proposal in response to a client brief.

Range:

Design proposal – Scale/technical drawing, sketches, mood board, samples, digital presentation, imagery (photography).

What do learners need to demonstrate?	**Skills**
Be able to produce design proposals that can be used to present to technical and non-technical audiences, considering: • client brief • health and safety • legislation • research • budget (terms & conditions, costing, written quotation) • environment (venue, location) • sustainable practice • seasonal availability Be able to sketch/draw by hand planned designs to assist communication of ideas to technical and non-technical audiences, using: • traditional mediums (pens, pencils, paper) • technology Make informed decisions about suitability of design plans based on: • client communication • research • design schema • elements and principles of design	DC2, DC3, EC1

2.4 **Present** a design proposal in response to a client brief and research.

Range:
Present – Digital software, remote presentation, face to face, verbal and non-verbal, physical media.

What do learners need to demonstrate?	**Skills**
Be able to present a design proposal including technical information in an appropriate format to technical and non-technical audiences, using a variety of resources, including: • sketches/drawing • diagrams • technical drawings (using conventions) • written quotations (terms & conditions, costings) • mood boards • imagery (including photos of previous events or site visit) Be able to differentiate between information which should remain within the business, and which should be shared with clients. Be able to summarise information and present it to technical and non-technical audiences in an efficient and professional manner. Check audience understanding of presented information and provide clarity when required. Develop a rapport with technical and non-technical audiences to support the effective communication, development and implementation of ideas.	EC2, DC1, DC3

2.5 Amend design proposals in response to feedback from the **client**.

Range:
Client: Technical, non-technical.

What do learners need to demonstrate?	**Skills**
Be able to interpret client feedback and respond appropriately to client requirements, considering any impact on: • client brief (location, date and time, purpose) • health and safety • legislative compliance • budget (terms & conditions, costing, written quotation) • environment (venue, location) • seasonal availability	EC1, MC9

2.6 Plan the construction of floral designs.

What do learners need to demonstrate?	**Skills**
Be able to interpret customer requirements and plan designs, considering: • customer brief • cost/budget • purpose of the floral design • timeframe and resources	EC1, EC4, MC3, MC7, MC9,

- challenges with the design including seasonality, suitability, peak periods and demand

Be able to sketch proposed designs, including:

- full botanical nomenclature
- mechanics and/or construction method
- sundry requirements
- dimensions

Apply design theory knowledge to design plans, including:

- elements and principles of design
- design schema
- sources of inspiration

Prepare buying lists for planned designs, including:

- full botanical nomenclature
- quantities
- delivery requirements (time, date and location)

Produce a schedule of work, taking into consideration:

- discrete steps involved in completing a complex task
- sequencing and prioritising tasks
- time management

Performance outcome 3

3. Coordinate the care and conditioning of fresh floral materials and plants (PO3)

3.1 Work safely when carrying out conditioning tasks.

What do learners need to demonstrate?	Skills
Be able to work safely by adhering to the following: • correct PPE • risk assessment • health and safety legislation • safe use of equipment • waste management • maintaining a clean and tidy work area • cleaning of tools and equipment after use	MC10

3.2 Calculate and allocate **resources** required for conditioning tasks.

Range:
Resources – People, equipment, chemicals, materials and time.

What do learners need to demonstrate?	Skills
Be able to calculate resources required for a task based on: • order of priority • volume of materials • purpose of the materials • stock rotation • capacity of the business • logistics • time limitations	MC2, MC9, MC10

3.3 Store **fresh materials** in appropriate environmental conditions.

Range:
Fresh materials – Cut flowers, cut foliage, pot plants (Plant identification list appendix 1).

What do learners need to demonstrate?	Skills
Be able to store fresh materials appropriately considering the following: • light • temperature • humidity • watering requirements • prevention of physical damage (being knocked/squashed) • purpose of botanical materials (preferred stage of maturity)	MC5, EC5

3.4 Identify fresh materials that are showing signs of premature deterioration.

Range:
Fresh materials: Cut flowers, cut foliage, pot plants (Plant identification list appendix 1).

What do learners need to demonstrate?	**Skills**
Be able to identify fresh materials that are showing signs of: • wilting • physical damage (ripped, torn or dropping leaves) • pests and diseases • fungus • dehydration • browning of leaves Capture digital images of materials which fail to meet basic quality standards and report to the appropriate person.	DC1, EC1.

3.5 Apply care and conditioning **methods** for fresh botanical materials.

Range:
Methods – Unpack, quality checks, stem counts, knife skills, foliage removal, feeding, cutting stems, watering, removing pollen, grooming, specialist treatments.

What do learners need to demonstrate?	**Skills**
Be able to apply the following care and conditioning methods, whilst demonstrating dexterity, including precise and controlled movements with appropriate application of force and delicacy: • Unpack – safely remove materials from packaging without damage • Quality checks – checking all materials for signs of premature deterioration or damage • Stem counts – ensuring the correct volume has been delivered against invoices and orders • Knife skills – safely use a knife to remove foliage, thorns and cut stems • Foliage removal – use appropriate tools to remove foliage below the water line without causing damage to the stem • Feeding – use correct flower food in line with manufacturer's instructions • Cutting stems – use appropriate tools (knife, scissors or secateurs) to cut stems on 45°angle • Watering – ensure fresh botanical materials have the correct amount of water • Removing pollen – remove pollen from flowers without damage • Grooming – remove dead or damaged foliage/petals to enhance the look of the material. Apply leaf shine if appropriate/required • Specialist treatments – use a variety of specialist treatments where appropriate including hot water, singeing and support for hollow stems	MC10

3.6 Organise and dispose of **waste** appropriately.

Range:
Waste – Recyclable and non-recyclable, compostable.

What do learners need to demonstrate?	**Skills**
Ability to differentiate and organise recyclable, non-recyclable and compostable waste and how to dispose of them, including: • green waste • plastics • paper • card • glass • metal • general waste	MC10

3.7 Interpret and utilise data from **documents** relating to fresh stock from wholesaler.

Range:
Documents – Delivery notes, invoices, refunds.

What do learners need to demonstrate?	**Skills**
Identify and utilise important data, including: • costs/prices • invoice reference and due date Organise and manipulate data into usable formats and share with colleagues, including: • stock availability (what is pre-ordered and what is available to use) • retail prices	MC5, MC7.

Performance outcome 4

4. Assemble commercial flower, foliage and plant arrangements (PO4)

4.2 Prepare to construct floral **designs**.

Range:
Designs – Tied, medium, wired and glued.

What do learners need to demonstrate?	Skills
Be able to prepare the work area for construction of floral designs, with consideration of: • health and safety (for self and others) • space requirements • logistics (storage and transport) Be able to prepare all appropriate materials to construct floral designs, including: • botanical materials • mechanics • tools • containers • packaging • sundries	MC1, MC2, MC10

4.3 Construct **tied floral designs** which meet industry standards.

Range:
Tied floral designs – Tied design including a self-made frame/structure, tied design including a self-made collar, tied bouquet with radial stems, tied bouquet with parallel stems, limited tied design, tied waterfall design, tied presentation bouquet, tied sheaf, compact tied design, loose tied design.

What do learners need to demonstrate?	Skills
Be able to construct tied designs which are fit for purpose and meet industry standards, including: • clean stems (from above the binding point, down) • uniform stem length • stems cut on a 45° angle (when going into water) • single secure binding point • appropriate proportions are applied (1/3:2/3, 50/50) Be able to complete practical tasks in a professional manner, demonstrating physical dexterity and considering: • the environment • sustainability • waste management • health and safety	MC3, MC4.

• appropriate handling of botanical materials (including delicacy and avoiding damage)
• aftercare requirements:
  ○ misting
  ○ watering
  ○ storage and protection	

4.4 Construct floral designs in **mediums** which meet industry standards.

Range:
Mediums – Loose design, based design, textured design, grouped design, large-scale design (minimum 90 cm in at least 1 dimension), limited design, framework design, round design, design with corners or points, design to be carried, vegetative design, form linear design, bouquet in a holder.

What do learners need to demonstrate?	**Skills**

Be able to construct designs in mediums which are fit for purpose and meet industry standards, including:
• non-decorative mediums are disguised/concealed
• sufficient water is available for the fresh materials
• materials are secure/stable
• materials are supported (if required)
 	
Use a range of mediums, including:
• tubes/vials
• chicken wire
• natural products (including moss, sticks/branches)
• containers (vases)
• pin holders
• floral foam alternatives
• floral foam
 	
Be able to complete practical tasks in a professional manner, demonstrating physical dexterity and considering:
• the environment
• sustainability
• waste management
• health and safety
• appropriate handling of botanical materials (including delicacy and avoiding damage)
• aftercare requirements:
  ○ misting
  ○ watering
  ○ storage and protection
 	
Be able to prepare and construct large scale design:
• mechanics/fixing methods (nails, screws, adhesive, brackets, rope/chord)
	MC3, MC10

• power tools/tools (saw, drill, screwdriver, hammer, tape measure, clamps)	

4.5 Construct **glued floral designs** which meet industry standards.

Range:
Glued floral designs – Self-made frame/structure, limited design, round design, upright design, semi-crescent design, cascading design, teardrop, body adornment, design to be carried, design to be worn, collage.

What do learners need to demonstrate?	**Skills**

Be able to construct glued designs which are fit for purpose, including:
• no glue is visible
• an appropriate gluing platform has been used
• materials are secure and appropriately supported
Be able to complete practical tasks in a professional manner, demonstrating physical dexterity and considering:
• the environment
• sustainability
• waste management
• health and safety
• appropriate handling of fresh materials (including delicacy and avoiding damage)
• aftercare requirements:
  ○ misting
  ○ watering
  ○ storage and protection
	MC3, MC10

4.6 Construct **wired floral designs** which meet industry standards.

Range:
Wired floral designs – Self-made frame/structure, limited design, round design, upright design, semi-crescent design, cascading design, teardrop, body adornment, design to be carried, design to be worn.

What do learners need to demonstrate?	**Skills**
Be able to construct wired designs which are fit for purpose, including: • suitable gauge wires are used • all materials and wires are taped • tape is applied in a neat and uniform manner • all botanical wounds are sealed appropriately • a single binding point is used (except when constructing branching or ribbed units) • nothing other than wire and tape is included in any binding/fixing point • non-decorative mechanics are hidden/disguised • excess wires are removed to reduce bulk and weight Be able to complete practical tasks in a professional manner, demonstrating physical dexterity and considering:	MC3, MC10

• the environment
• sustainability
• waste management
• health and safety
• appropriate handling of fresh materials (including delicacy and avoiding damage)
• aftercare requirements:
  ○ misting
  ○ watering
  ○ storage and protection	

4.7 Construct planted designs.

Range:
Planted designs – Planted bowl/basket, pot-et-fleur, terrarium, dish garden, single plant.

What do learners need to demonstrate?	**Skills**

Be able to complete practical tasks in a professional manner, demonstrating physical dexterity and considering:
• the environment
• sustainability
• waste management
• health and safety
• appropriate handling of fresh materials (including delicacy and avoiding damage)
• aftercare requirements:
  ○ misting
  ○ watering
  ○ storage and protection
	MC3, MC10

4.8 Apply **techniques** to floral designs.

Range:
Techniques – Attaching techniques, wiring techniques, manipulation and decorative techniques, water retaining techniques.

What do learners need to demonstrate?	**Skills**
Be able to apply the following techniques to floral designs across glued, wired, mediums and tied: • Attaching techniques – binding, tying and knotting, clamping, wedging, gluing, pinning, stapling, taping • Wiring techniques – support wiring, external wiring, semi-internal wiring, internal wiring, cross-wiring, stitching, single-leg mount, double-leg mount, hook wiring, branching unit, ribbed unit, natural unit, feathering, pipping, sepal pinning, wire mesh • Manipulation and decorative techniques – basing, backing, bow making, bundling, caging, edging, framing, grouping, lacing, layering, pave, pinning, plaiting, pleating/folding, rolling/cupping, spiralling, sheltering, stacking, taping, threading, tying and knotting, veiling, weaving, winding, wrapping	MC3, MC10

• Water retaining techniques – cotton wading, floating, taping, tubes/phials, wax, gluing	

4.9 Package floral designs for protection, transportation and/or presentation.

What do learners need to demonstrate?	**Skills**
Be able to package floral designs (glued, wired, medium and tied) appropriately for protection, transportation and/or presentation, using a range of materials, including: • cellophane • craft paper • fabric wrap • boxes • tissue • ribbons • raffia • gift cards • care cards • tags/labels • buckets • crates	MC10

4.10 Evaluate floral designs.

What do learners need to demonstrate?	**Skills**
Evaluate a range of floral designs, considering a variety of factors, including: • design requirements (job specification and/or client brief) • suitability of techniques used • suitability of construction method used • commercial viability • elements and principles of design • design schema • suitability of design (is it fit for purpose?) • suitable method used to calculate retail cost • development points identified from feedback and self-evaluation • quality of workmanship demonstrated	EC4, EC5

Performance outcome 5

5. Create free standing event structures decorated with floral designs (PO5)

5.1 Work safely when constructing and decorating event structures.

What do learners need to demonstrate?	Skills
Be able to work safely by adhering to the following: • correct PPE • risk assessment • health and safety legislation • safe use of equipment • manual handling and lifting techniques • waste management • maintaining a clean and tidy work area • cleaning of tools and equipment after use	EC1, EC4, EC5, MC9

5.2 Design and plan free standing **event structures**.

Range
Event structures – Arches, canopies, floating, column, screen, curtain, wall, obelisk, moongate, broken arch, floral chandelier.

What do learners need to demonstrate?	Skills

Be able to interpret customer requirements to design and plan event-based structures, considering:
• customer brief
• cost/budget
• purpose of the design
• timeframe and resources
• challenges with the design, including location, amenities, logistics, environmental factors, seasonality, suitability
Exchange ideas with others to inform design decisions, including:
• technical audiences
• non-technical audiences
Apply mathematical methods to design event-based structures, including:
• accurate and precise measurements (of materials and environments)
• appropriate units of measurement
• create a 2D representation of proposed designs, including:
  ○ mechanics and/or construction technique
  ○ dimensions
Apply design theory knowledge to design plans, including:
• principles and elements of design
• design schema
• sources of inspiration
Prepare buying lists for planned designs, including:
• size requirements
• fixings
• quantities
	EC1, EC4, EC5, MC9, MC10

• delivery requirements (date and location) Produce a schedule of work, taking into consideration: • sequencing and prioritising tasks • time management • strengths and weakness of self and others	

5.3 Prepare and transport event structures.

What do learners need to demonstrate?	**Skills**
Be able to prepare the work area for construction, with consideration of: • health and safety (for self and others) • space requirements • logistics (storage and transport) Be able to prepare and decorate event structures: • mechanics/fixing methods (nails, screws, adhesive, brackets, rope/chord) • tools (saw, drill, screwdriver, hammer, tape measure, clamps) Transport event structures safely, including: • moving by hand • using aids where necessary (trolly, lifting straps) • load into vehicle • secure into vehicle • unload from vehicle	MC10

5.4 Assemble and install **event structures**.

Range:
Event structures
Free standing – wedding arches, canopies, column, obelisk, moongate.
Suspended design – canopies, floral chandelier.

What do learners need to demonstrate?	**Skills**
Be able to assemble event structures, considering: • health and safety • working with others (in a pair) – communicating effectively with others • stability and security of the structure • environmental factors (including protection of buildings and property) Apply assembling methods to event structures, including: • measuring (measure twice, cut once) • marking – mark accurately and precisely • fixing/attaching - screws, nails, brackets, adhesives, cord/rope • finishing to a commercial standard Be able to complete practical tasks in a professional manner and considering: • the environment • sustainability	EC2, EC6

• waste management • health and safety • finishing touches (gaps)	

5.5 Prepare floral **designs** to decorate event structures.

Range:
Designs: Tied, wired, glued and medium.

What do learners need to demonstrate?	**Skills**
Be able to prepare the work area for the construction of floral designs, with consideration of: • health and safety (for self and others) • use of signage • appropriate use of tools • floor areas free from trip hazards • PPE • space requirements • logistics (storage and transport) Be able to prepare all appropriate materials to construct floral designs, including: • botanical materials • mechanics • tools • containers • packaging • sundries	MC10

5.6 Construct floral **designs** to decorate event structures.

Range:
Designs: Wired, glued, tied and medium.

What do learners need to demonstrate?	**Skills**

Be able to construct designs which are fit for purpose, considering:
• design requirements (client brief)
• the environment
• sustainability
• waste management
• health and safety
• appropriate handling of botanical materials (including delicacy and avoiding damage)
• aftercare requirements:
  ○ misting
  ○ watering
  ○ storage and protection
• incorporation of appropriate fixing methods to facilitate attachment
 	
Utilise appropriate construction methods to construct floral designs, using a
	MC3

range of mediums, as appropriate, including: • moss • tubes/vials • chicken wire • natural products (including moss, sticks/branches) • containers • floral foam alternatives • floral foam Apply suitable techniques to floral designs, including: • attaching techniques – binding, tying and knotting, clamping, wedging, gluing, pinning, stapling, taping • manipulation and decorative techniques – basing, backing, bow making, bundling, caging, edging, framing, grouping, lacing, layering, pavé, pinning, plaiting, pleating/folding, rolling/cupping, spiralling, sheltering, stacking, taping, threading, tying and knotting, veiling, weaving, winding, wrapping • water retaining techniques – cotton wading, floating, taping, tubes/phials, wax, gluing Provide appropriate support for materials which require additional support.	

5.7 Position and secure floral designs to decorate free standing event structures.

What do learners need to demonstrate?	**Skills**
Position floral designs on free standing event structures, considering: • design requirements (client brief) • structural limitations • application of principles and elements of design • the environment • sustainability (eg, natural twine against single use cable ties) • waste management • health and safety • appropriate handling of botanical materials (including delicacy and avoiding damage) • use of manual handling aids (if required) Work with colleagues to assist with lifting/positioning. Secure floral designs onto freestanding timber-based structures, ensuring: • appropriate attachment methods are used (eg, natural twine, cable ties, screws, binding) • health and safety of self and others is maintained • durability	EC1, EC5, MC10

5.8 Dismantle event structures which have been decorated with floral designs and dispose of waste appropriately.

What do learners need to demonstrate?	Skills
Dismantle structures decorated with floral designs including: • design requirements (client brief) • the environment (including preventing damage to building/property) • sustainability • waste management • health and safety • appropriate handling of fresh materials (including delicacy and avoiding damage) • aftercare requirements • storage and cleaning Dispose of waste appropriately, considering: • health and safety • environmental factors • methods of waste disposal (recycling, composting, reusing/repurposing, general waste) • responsibilities of self and others for waste disposal	MC10

5.9 Evaluate performance, design and construction.

What do learners need to demonstrate?	Skills
Evaluate event structures, decorated with floral designs, considering a variety of factors, including: • design requirements (job specification and/or client brief) • suitability of techniques used • suitability of construction method used • commercial viability • elements and principles of design • design schema • suitability of design (is it fit for purpose?) • suitable method used to calculate retail cost • development points identified	EC4, EC5.

Guidance for delivery

The purpose of this specialism is for learners to know and undertake the theory and practice of Floristry. A range of classroom-based and practical delivery methods should be used to ensure both theory and practice are delivered with strong linkage to vocational context. Centres are encouraged to introduce employers and specific professionals from the floristry industry to provide interesting and relevant information to the learner.

Throughout all practical tasks focus 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. 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 and operator's manuals. Learners should understand the importance of maintaining an awareness of current legislation and Codes of Practice.

Thought should be given to the need for biosecurity and environmental protection measures throughout. The requirement for regular maintenance and use of the manufacturer's manuals should also be identified.

For the more theory-based outcomes it is anticipated that delivery will be through formal lectures but it is recommended that they are linked directly with interactive lessons in a real environment and that visiting speakers are used where possible to provide a vocationally relevant context. Seasonal and trend designs should be included during practical sessions which will enable learners to explore new techniques, products and sundries to help learners better understand factors affecting commercial viability. Learners should also have access to a range of mediums, containers, decorative wires and glue to undertake accurate evaluations of designs created.

Suggested learning resources

Books

- Owen, L. (2014) The Professional Florists Manual. Worksop: British Florist Association
- Diligent, S. and Mazuch, W. (2020) A Guide to Floral Mechanics. Diligent & Mazuch
- Whale, S. (2011). Cut Flowers. Birmingham: Jago Publishing Ltd
- Whale, S. (2019) Houseplants. Birmingham: Jago Publishing Ltd
- Whale, S. (2021) Cut Foliage. Birmingham: Jago Publishing Ltd

Websites

- The British Floristry Association – **www.britishfloristassociation.org**
- UK Floristry Judges Guild – **www.floristryjudgesguild.co.uk**
- Floristry Trade Club – **www.floristrytradeclub.co.uk/florist-magazine-editors-blog**
- Interflora Trade Club – **www.floristrytradeclub.co.uk**
- Fleur Creatif – **https://fleurcreatif.com**

Appendix 1 Identification list of cut materials and potted plants

Where the species name is not given below, this is because more than one species is in common use.
Where the species is not defined, e.g. Rosa, candidates should insert 'sp.' or the cultivar name if known, e.g. Rosa 'Aqua'.
Learners at level 3 on this Floristry Occupational Specialism need to know the full identification list.

Cut flowers	Cut foliages/berried	Pot plants
Aconitum napellus Agapanthus Allium Alstroemeria Anemone coronaria Anigozanthos Anthurium andraeanum Aster spp Bouvardia Bupleurum rotundifolium 'Griffithii' Campanula spp Carthamus tinctorius Chamelaucium uncinatum Chrysanthemum indicum Cymbidium Dahlia Delphinium Dendrobium Dianthus caryophyllus Eremurus Eryngium Euphorbia fulgens Eustoma russellianum Freesia Gerbera Gladiolus Gypsophila paniculata Helianthus annuus Hippeastrum Heliconia Hyacinthus orientalis Hydrangea macrophylla Iris hollandica Lathyrus odoratus	Arachnoides adiantiformis Asparagus setaceus plumosus Asparagus umbellatus Aspidistra elatior Buxus sempervirens Chamaecyparis lawsoniana Danae racemosa Equisetum hyemale gossypium Eucalyptus cinerea Eucalyptus parvifolia Fatsia japonica Galax urceolata Gaultheria shallon Hedera spp Hosta Hypericum Ilex spp Myrtus communis Philodendron 'Xanadu' Pittosporum tobira Pittosporum tenuifolium Ruscus hypoglossum Salix babylonica 'Tortuosa' Viburnum tinus Xerophyllum tenax	Adiantum Aeonium Aechmea fasciata Ananas comosus Asparagus densiflorus 'Sprengeri' Aspidistra Begonia elatior Chrysanthemum indicum Chamaedorea elegans Chlorophytum comosum Codiaeum pictum Crassula argentea Cyclamen persicum Cymbidium Dieffenbachia seguine Euphorbia pulcherrima Fatsia japonica Ficus benjamina Ficus elastica Ficus pumila Fuchsia spp Hedera helix Hyacinthus Hydrangea macrophylla Hypoestess phyllostchya Impatiens Kalanchoe blossfeldiana Lilium Mammillaria Monstera deliciosa Narcissus 'Tete a Tete' and 'Paper White' Nephrolepis exaltata

Liatris spicata Lilium (Asiatic hybrids) Lilium longiflorum Lilium (Oriental hybrids) Limonium sinuatum Matthiola incana Moluccella laevis Narcissus Nerine bowdenii Ornithogalum thyrsoides Phlox Ranunculus Rosa Scabiosa caucasica Scilla peruviana Sedum spectabile Solidago Syringa vulgaris Trachelium caeruleum Triteleia Tulipa spp Veronica Zantedeschia		Opuntia Pelargonium Phalaenopsis Philodendron scandens Saintpaulia ionantha Sinningia Senecio cruentus Spathiphyllum Stephanotis floribunda Yucca elephantipes

Cut flowers	**Cut foliages/berried**	**Pot plants**
Achillea filipendulina	Ananas comosus	Abutilon
Acacia dealbata	Anthurium andreanum	Acorus gramineus
Ageratum	Asparagus asparagoides	Aglaonema
Alchemilla mollis	Asparagus densiflorus	Aloe
Allium sphaerocephalon	Asparagus virgatus	Anthurium
Alstroemeria	Brassica oleracea	Asplenium
Amaranthus caudatus	Brunia albiflora	Begonia boweri
Ammi majus	Callicarpa	Begonia rex
Asclepias tuberosa	Camellia japonica	Bougainvillea
Astilbe	Capsicum annuum	Calathea
Astrantia major	Chameadorea	Calceolaria
Banksia	Chamaerops	Cissus
Calendula officinalis	Cornus alba	Clivia
Callistephus chinensis	Corylus avellana	Cocos nucifera
Cattleya	Cotinus coggygria	Coleus
Celosia argentea cristata	Cyperus glaber	Cordyline
Centaurea cyanus	Cyperus papyrus	Crassula
Chrysanthemum indicum	Dracaena sanderiana	Crocus
Convallaria majalis	Grevillea	Cryptanthus
Craspedia	Hibiscus trionum	Ctenanthe
Crocosmia	Laurus nobilis	Dracaena fragrans
Curcuma	Ligustrum	Dracaena marginata

Delphinium hybrids	Liriope muscari	Echeveria
Dianthus barbatus	Mahonia	Epidendrum
Dianthus caryophyllus	Malus	Erica
Digitalis	Panicum grass	Euonymous japonicus
Eustoma russellianum	Pennisetum	Exacum affine
Forsythia intermedia	Phormium tenax	Fittonia
Fritillaria meleagris	Photinia fraseri	Galanthus
Genista fragrans	Pinus strobus	Gardenia jasminoides
Gerbera	Pistacia	Guzmania
Gladiolus colvillei	Prunus laurocerasus	Hibiscus rosa-sinensis
Gloriosa rothschildiana	Quercus	Hoya
Godetia grandiflora	Rhododendron	Hypoestes phyllostachya
Gomphrena globosa	Salvia rosmarinus	Jasminum polyanthum
Helenium	Setaria grass	Lithops
Helichrysum bracteatum	Skimmia japonica	Maranta leuconeura
Heliconia pendula	Sphagnum	Medinilla
Helleborus niger	Strelitzia reginae	Musa
Ilex verticillata	Symphoricarpos	Nertera
Ixia	Tillandsia usneoides	Passiflora
Kniphofia uvaria	Triticum grass	Pelargonium
Lavandula	Tsuga heterophylla	Pellaea
Leucospermum	Typha latifolia	Peperomia
Leucadendron	Weigela florida	Pilea
Limonium hybrids	Zea	Platycerium bifurcatum
Lunaria annua		Primula acaulis
Lysimachia clethroides		Primula obconica
Mentha		Pteris
Monarda		Rhododendron simsii
Muscari		Sansevieria trifasciata
Narcissus hybrids		Schefflera aboricola
Nigella damascena		Schlumbergera
Oenothera		Scirpus
Oncidium		Selaginella
Orchid		Solanum pseudocapsicum
Origanum vulgare		Soleirolia soleirolii
Ornithogalum arabicum		Streptocarpus
Paeonia lactiflora		Syngonium
Papaver somniferum		Tolmiea menziesii
Papaver nudicaule		Tradescantia fluminensis
Paphiopedilum		Vriesea
Physalis		Zamioculas
Physostegia virginiana		
Polianthes tuberosa		
Protea		
Rosa		
Rudbeckia		
Sandersonia		
Saponaria		

Scabiosa stellata Solidaster luteus Spiraea Stephanotis floribunda Stillingia Strelitzia reginae Tagetes Tanacetum parthenium Trollius Vanda Viburnum opulus Zinnia elegans		

Scheme of assessment additional information

The below tables illustrate how each performance outcome is assessed through the use of assessment themes along with how each assessment criteria including the knowledge criteria in outcome 1 is packaged into an assessment theme for assessment purposes.

Assessment criteria that appear more than once against an assessment theme is required so that content is assessed within the context of a specific performance outcome.

Performance Outcome	Assessment themes	Assessment criteria
PO2 Design all floral work to meet client requirements for special events (20%)	Health and Safety	1.1 Health and safety legislation and safe working practices 1.2 Types of PPE
	Plan and prepare designs	1.3 Types of tools and technical mechanics 1.4 Design schema 1.5 The principles and elements of design 1.6 Sources of inspiration 1.7 Decorative and non-decorative techniques used in floral designs 1.12 Symbolism and how it is applied to event designs events 1.14 Construction methods of floral designs 1.16 Application of mathematical techniques and methods to inform design processes 1.24 Methods used to minimise waste produced by florists' assembling designs 1.25 Floristry techniques and how they are used to construct designs 1.28 Suitability of fresh materials and their characteristics for planned designs 2.1 Determine customer requirements for an event through appropriate methods 2.2 Research customer requirements using different sources of information to inform floral design proposals 2.5 Amend design proposal in response to feedback from the client

		2.6 Plan the construction of floral designs
	Present designs	1.9 Methods used to interpret customer requirements 1.10 Methods of communication 1.11 Presenting to technical and non-technical audiences 1.13 Factors that affect designs 1.15 Content of a design presentation 1.18 Techniques for the 2D & 3D representation of designs 2.3 Create a design proposal in response to a client brief 2.4 Present a design proposal in response to a client brief and research

Performance Outcome	Assessment themes	Assessment criteria
PO3 Coordinate the care and conditioning of fresh floral materials and plants (20%)	Health and Safety	1.19 Typical hazards associated with care and conditioning of fresh floral materials and plants 3.1 Work safely when carrying out conditioning tasks
	Plan and prepare for conditioning	1.20 Methods used for managing care and conditioning tasks 1.21 Sources of information available to support care and conditioning of fresh 1.22 Activities involved in caring for and conditioning fresh botanical materials botanical materials 1.23 Identification of fresh botanical materials 3.2 Calculate and allocate resources required for conditioning tasks
	Condition materials	3.3 Store fresh materials in appropriate environmental conditions 3.4 Identify fresh materials that are showing signs of premature deterioration 3.5 Apply care and conditioning methods for fresh botanical materials 3.6 Organise and dispose of waste appropriately 3.7 Interpret and utilise data from documents relating to fresh stock from wholesaler

Performance Outcome	Assessment themes	Assessment criteria
PO4 Assemble commercial flower, foliage and plant arrangements (40%)	Prepare materials	4.2 Prepare to construct floral designs
	Construct designs	1.25 Floristry techniques and how they are used to construct designs 1.27 Methods used to maintain and store constructed designs 4.3 Construct tied floral designs which meet industry standards 4.4 Construct floral designs in mediums which meet industry standards 4.5 Construct glued floral designs which meet industry standards 4.6 Construct wired floral designs which meet industry standards 4.7 Construct planted designs 4.8 Apply techniques to floral designs 4.9 Package floral designs for protection, transportation and/or presentation
	Evaluate designs	1.8 Evaluate design and make modification if necessary 1.26 Design evaluation 1.28 Suitability of fresh materials and their characteristics for planned designs 4.10 Evaluate floral designs

Performance Outcome	Assessment themes	Assessment criteria
PO5 Create free standing event-based structures decorated with floral designs (20%)	Health and Safety	1.29 Typical hazards associated with installing free standing event-based structures 1.30 Types of PPE available for creating installations of floral designs, their purpose and implications for poor use 5.1 Work safely when constructing and decorating event structures
	Plan and prepare event-based designs	1.31 Symbolisms associated with event structures and how these are implemented at events 1.32 Types of environments where installations of floral designs may be required 1.34 Conventions of technical drawings and how they are used to communicate design ideas 1.30 Methods used to maintain and store constructed designs 1.35 Types of equipment used in the installation of free standing event structures 1.36 The logistics required for the installation of floral designs 1.37 Types of event structure materials used for event-based structures 1.38 Types of assembly methods 5.2 Design and plan free standing event structures 5.3 Prepare and transport event structures
	Construct and dismantle event-based designs	5.4 Assemble and install event structures 5.5 Prepare floral designs to decorate event structures 5.6 Construct floral designs to decorate event structures 5.7 Position and secure floral designs to decorate free standing event structures 5.8 Dismantle event structures which have been decorated with floral designs and dispose of waste appropriately
	Evaluate event designs	1.17 Difference between estimation and accurate measurement 1.33 Structural science and how it impacts on the design and installation of floral designs 4.10 Evaluate floral designs 5.3 Prepare and transport event structures 5.9 Evaluate performance, design and construction

402 Land-based engineering

Level:	3
GLH:	970
Assessment method:	Practical assignment

What is this Occupational Specialism about?

The purpose of this specialism is for learners to know and undertake the scheduled and preventive maintenance, fault diagnosis, repair and installation of land-based machinery and equipment.

Learners will have the opportunity to plan, perform and evaluate their work whilst utilising a range of techniques, methods and resources.

Learners will develop their knowledge and understanding of, and skills in:

- knowledge of scheduled, preventive and predictive maintenance and preparation for out-of-season storage
- knowledge and application of the operating principles of different types of land-based machinery and equipment
- knowledge of tools, equipment and materials and their application in land-based engineering
- skills in conducting maintenance of land-based machinery and equipment
- skills in the repair of land-based machinery and equipment
- skills in carrying out diagnostic activities on land-based machinery and equipment
- skills in the handover of land-based machinery and equipment

Learners may be introduced to this specialism by asking themselves questions such as:

- What different types of land-based machinery and equipment are there and what are they used for?
- What do land-based engineers do on a daily basis?
- What areas of the industry do land-based engineers work in?

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

1. Land-based engineering knowledge criteria

Performance Outcomes

On completion of this specialism, learners will be able to:

2. Maintain land-based machinery and equipment

3. Repair land-based machinery and equipment

4. Diagnose land-based machinery and equipment faults

5. Handover land-based machinery and equipment

Completion of this specialism will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented at the end of the specification.

Underpinning knowledge

Specific Land-based engineering knowledge criteria for performance outcomes:

Maintain land-based machinery and equipment (PO2)

Land-based equipment and machinery maintenance

1.1 **Factors** influencing the performance and maintenance requirements of land-based equipment and machinery.

Range:
Factors – Environment: The application and working environment, climate, soil types, crop/vegetation types, weather, landscape, ground conditions.
Maintenance schedules: Timescales, activities.
Operation: Consequences of incorrect operation, settings, application and operator maintenance of domestic, semi-professional and professional equipment and machinery.

What do learners need to learn?	Skills
How the working environment impacts the maintenance requirements of land-based equipment and machinery, including dust, enclosed areas, heavy loading, vermin damage. How maintenance schedules can affect machinery efficiency and performance. How the selection and operation of land-based equipment and machinery influences performance and maintenance requirements. How to recognise what components need to be cleaned, adjusted or replaced, and how to decide which approach to take. How the environment, climate, crop/vegetation, soil type and ground conditions impact the performance of land-based equipment and machinery. How the operation of land-based equipment and machinery impacts the environment.	EC5.

1.2 The function of **software** in the operation of machinery and equipment.

Range:
Software – Monitoring (telematics, predictive maintenance (PdM)), diagnostic, servicing, confirmation of operation.

What do learners need to learn?	Skills
The function of software in the operation of machinery and equipment: • How the software aids and monitors effective performance • How the software is used to support maintenance activities • Methods used to adapt software during and following maintenance activities (installation, updating, amending) • How on-board and remote software is used to monitor and record machine information (performance and usage data), shut down operation, set performance parameters and track location	EC4, EC5, MC5, DC1, DC4.

1.3 **Legal obligations** related to maintenance activities.

Range:
Legal obligations – Warranties, guarantees and licences: Manufacturers' warranties, other types of extended warranty (insurance backed, sellers), type approval licences, contract hire/lease agreements.
Maintenance legislation and regulations: Responsibilities under the Health and Safety at Work Act 1974, the Provision and Use of Work Equipment Regulations (PUWER), Lifting Operations and Lifting Equipment Regulations (LOLER).
Waste legislation and regulations: Environmental Protection Act 1990 (as amended), Waste (England and Wales) Regulations, Control of Substances Hazardous to Health Regulations (COSHH).

What do learners need to learn?	**Skills**
Implications of maintenance activities to the terms and conditions of warranties and licences, including: • terminology associated with warranties and licences • requirements for replacement parts (original equipment manufacturer (OEM), alternative) Legal obligations under PUWER and LOLER to report issues associated with land-based machinery and equipment encountered during preventive maintenance activities. Implications of waste legislation and regulations on maintenance activities including disposal of contaminates, fluids and components.	EC5.

1.4 **Preventive** and **predictive** maintenance and preventive maintenance schedules.

Range:
Preventive maintenance (PM) – Scheduled, out of season (post-season, pre-season).
Predictive maintenance (PdM) – Forecasting maintenance operations using interconnected measurement and data collection systems from the machine.

What do learners need to learn?	**Skills**
Preventive and predictive maintenance: • The benefits of each type • Implications (including financial, performance) of poor maintenance Content of typical preventive maintenance schedules (including out of season) and their application.	EC5.

1.5 **Factors** influencing maintenance operations.

Range:
Factors – Carrying out machine maintenance operations considering machine application, machine availability and location, parts availability, timeframe, weather, seasons, health and safety, poor or incomplete previous maintenance work.

What do learners need to learn?	**Skills**
Factors influencing maintenance operations:	EC5.

• How they influence the planning, scheduling and carrying out of maintenance tasks	

1.6 Machinery and equipment **samples** required for completion of maintenance activities.

Range:
Samples – Transmission/hydraulic oil, engine oil, fuel, coolant.

What do learners need to learn?	**Skills**
Machinery and equipment samples required for completion of maintenance activities, including: • methods used to collect samples • data available following analysis of samples and how these inform maintenance activities • benchmarking data for samples that indicate optimum performance of machinery and equipment	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

1.7 Causes and implications of component **contamination**.

Range:
Contamination – Particulate contamination, moisture, internal/external leaks, chemicals, bacterial environment, incorrect fluids, cross-contamination of fluids, incorrect use of equipment, overheating.
Techniques, materials and equipment used – Hot/cold power washers, filters, degreasers, wipes, parts washers, chemical cleaners, magnetic filters.

What do learners need to learn?	**Skills**
Causes and implications of component contamination: • Measures used to avoid contamination when carrying out maintenance activities (removal of dirt/debris from around filler necks, use of clean and separate containers for different fluids, cleaning and sanitisation of machinery before maintenance/repair activities, general workshop cleanliness) • Techniques, materials and equipment used to remove contamination where it exists	EC5.

1.8 **Techniques** used to safely jack and support machines and equipment.

Range:
Technique – Jacking, lifting, slinging, restraining, support, use of lifting or supporting aids.
Equipment – Floor/bottle jacks, trolley jacks, cranes, gantries, rails, slings, chains, shackles, stands, type-approved supporting aids, wheel trolleys, table/scissor lift.

What do learners need to learn?	**Skills**
Techniques used to safely jack and support machines and equipment: • Selection, application and use of jacking and support equipment • Their capability and rating • Suitability of ground conditions • Currency of certification • Reporting procedures for faulty equipment	EC5.

• Isolation of work area	

1.9 Equipment and procedures used to remove and replace **service items and wearing parts**.

Range:
Service items and wearing parts related to – Power units, transmissions, electrics and electronics, hydraulics, braking, steering, traction (tracks/tyres), air conditioning, soil engaging equipment, cutting and mowing equipment, harvesting equipment, application equipment, transport equipment.

What do learners need to learn?	**Skills**
Procedures used to remove and replace service items, including: • safe release of stored energy • safe recovery of gases and refrigerants • component wear/serviceability assessment techniques • system venting/bleeding • returning components/systems to operational state • post-servicing operational checks Tools and equipment used to remove and replace service items including: • specific tools for service operations (including manufacturer-specific tools)	EC5.

1.10 **Methods** used to seal and secure components.

Range:
Methods – Sealing: Gaskets, thread tape, sealants, static/dynamic seals, sealer and adhesive removal products.
Securing: Bolts/fasteners, locking nuts, washers, threadlock/adhesives, correct sequences of tightening, correct torque settings, stress gradings.
Special tools: Seal fitment alignment and removal tools, torque wrench, angle torque gauge, scrapers.

What do learners need to learn?	**Skills**
Why sealing is necessary e.g. dust, water, fume, chemical ingress, compression, vacuum sealing, hydraulic, compressed air and loss of gases. Characteristics of the range of sealing and securing materials. Surface preparation techniques for sealants, gaskets and seals. Techniques used in sealing and securing components: • Their suitability for different applications • Their suitability for different maintenance requirements • Special tools and equipment required • Their application during maintenance activities	EC5.

1.11 Types of **calibration**

Range:
Calibration – Manual, mechanical, hydraulic, electronic/software, crop production/harvesting (application rates, monitoring, guidance systems).
Tools and equipment used to carry out calibration activities – Mobile device, electronic service tool (EST), equipment to measure values in vehicle electrical systems, software, tachometer, pressure and flow meters/gauges, stopwatch, scales, spring balances, torque, linear measuring equipment, calculator, measuring receptacles/containers, catchment trays.

What do learners need to learn?	**Skills**
Types and methods of calibration: • Their suitability for different purposes, components, machinery and equipment • Equipment used for calibration activities • Sources of information used for calibration (manufacturer's specifications, product specifications) • Their application during maintenance activities • How to verify calibration has been successful	EC1, EC5, MC1, MC2, MC4, MC5, MC7, MC8, DC4.

1.12 **Techniques** used to verify machinery and equipment operates to specification.

Range:
Techniques – Sensory inspection, monitoring systems, conformity tests (comparison to manufacturer specification, comparison testing, dynamometer tests, pressure and flow tests, stall tests, electrical and electronic tests, PAT tests), field/road testing.

What do learners need to learn?	**Skill**
Techniques used to verify machinery and equipment operates to specification throughout and following maintenance operations.	EC1, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4, DC6.

1.13 **Techniques for cleaning** land-based equipment and machinery.

Range:
Techniques for cleaning – External and internal surfaces: Power washers, chemical water/bead washers, vacuum cleaners, compressed air, surface wipes.
Systems and components: Ultrasonic cleaner, parts washers, chemicals/solvents, compressed air, degreasers, abrasives, polishes.

What do learners need to learn?	Skills
How to identify materials to be removed and the appropriate cleaning methods and precautions to be applied to them. Techniques for cleaning land-based equipment and machinery (including for out of season maintenance) including techniques used for cleaning of external and internal surfaces, systems and components. Techniques for decontamination of equipment, machinery, systems and components, and associated hazards (chemical, disease, toxic, corrosive, materials hazardous to health). How to use these techniques.	EC5.

1.14 Maintenance **tools** and **equipment**.

Range:
Tools – Hand tools: Spanners and wrenches, torque wrenches, sockets, drivers, extensions, joints, screwdrivers, keys, bits, pliers (conventional, internal and external circlip), side cutters, snips, hammers, chisels, punches, measuring tape/rule, vernier calliper, micrometer, feeler gauge, files, taps and dies, hack saws, torque wrench, pry bars, reamers.
Power tools: Electric power tools (mains and battery operated), pneumatic tools.
Equipment – Measurement and testing: Mobile devices, electronic service tool (EST) and software, rev counter, pressure and flow meters/gauges, scales, spring balances, electrical testing equipment**,** workshop lifting equipment, type approved supporting aids, jacking equipment.

What do learners need to learn?	Skills
Types of hand and power tools used for maintenance activities including: • their suitability for the maintenance task • how they are applied and operated • how to maintain hand and power tools in a serviceable condition Types of equipment used for maintenance tasks (including digital hardware and software) including: • their suitability for different maintenance tasks • their operation and application. Testing, calibration and certification requirements for tools, equipment and machinery.	EC1, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4, DC6.

1.15 Types of **maintenance information and data**.

Range:

Maintenance information and data – Required to complete maintenance tasks: Telematics, predictive maintenance data (PdM), technical data, operator's manuals, service manuals and bulletins, rework notices, manufacturer's service platforms, customer information, service history, analysis of samples, interrogation of onboard software.

To be recorded: Service history records, job cards, parts used, time spent on job, date completed, next service date.

Post maintenance: Service advisors, quotations.

What do learners need to learn?	**Skills**
Types of information and data required to complete maintenance tasks and their sources. Maintenance information to be recorded. How information is recorded: • Types of records used (paper based/electronic such as photographic) • The information they hold (service history, owner, manufacturer) • The importance of maintenance records (warranty, service/maintenance history) • The importance of accurate and timely completion • Audiences for different information (manufacturer, owner, dealership) Post-maintenance information required for the key stakeholders including owner, user and the methods of reporting. How to communicate maintenance information and data at a level appropriate to the recipient.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, DC1, DC4, DC6.

Repair land-based machinery and equipment (PO3)

1.16 **Causes** and **effects** of component failure.

Range:

Causes – Wear, corrosion, incorrect/insufficient fluids/lubricants, contamination of fluids, lubricant loss/failure, seal/sealant failure, incorrect assembly, incorrect operation/application of equipment (overloading, short circuit, high electrical resistance, incorrect storage, lack of maintenance, incorrect settings/calibration), temperature (heat/cold), ground conditions, physical damage, impact/shock loading, fatigue, use of sub-standard replacement parts, imbalance, misalignment, vibration, overspeed, unauthorised modification.

Effects – Accelerated wear, loss of performance, overheating, seizure, component/machine breakdown, noise, vibration, increased operational costs, reduced residual values.

What do learners need to learn?	Skills
Typical causes and effects of component failure leading to repair requirements.	EC5.

1.17 **Warranties, licences** and **regulations** related to machinery and equipment repair.

Range:

Warranties and licences – Manufacturers' warranties, extended warranties, type approval licences, contract hire/lease agreements, terms and conditions.

Regulations – Environmental Protection Act 1990 (as amended), Waste (England and Wales) Regulations, Control of Substances Hazardous to Health Regulations (COSHH).

What do learners need to learn?	Skills

Limitations of terms and conditions of warranties and licences:
• Associated terminology
• Implications for making repairs to machinery and equipment:
  ○ Implications of using original equipment manufacturer (OEM)/non-OEM parts on warranties and licences
  ○ Implications of use of the machine on warranties and licences (type approval/intended use/excessive use)
  ○ Warranty requirements for maintenance to be carried out by manufacturer trained/approved technician
  ○ Customer entitlements under warranties
 	
Implications of waste regulations on repair activities including disposal of contaminates, fluids and components.
	EC5.

Repair operations

1.18 **Factors** influencing repair operations.

Range:
Factors – Location of machine, retrieval and recovery of failed machines, recovery of accident damaged machines, on-site repair risks and hazards (including roadside working), complexity of repair required, customer requirements, contractual requirements, economy/viability of repair, warranty requirements, timescales, parts availability, seasonal and weather considerations, specialist tools required, skills experience and specialism of available technicians.

What do learners need to learn?	Skills
Factors influencing repair operations: • How they influence the planning, allocation and scheduling of repair tasks • Impact of geographical location on factors influencing repair operations	EC5.

1.19 **Techniques** for the repair of systems and components.

Range:
Techniques – Removal, disassembly, refitting, re-assembly.

What do learners need to learn?	Skills
Techniques for removal, disassembly, refitting, timing, re-assembly of systems and components. Suitability of techniques for different repair tasks, and the tools, equipment and materials required to complete repairs. Technique application used when carrying out repairs.	EC1, EC5, MC1.

1.20 **Techniques** used to thermally join ferrous and non-ferrous materials.

Range:
Techniques – Fusion: Metal inert gas (MIG), manual metal arc (MMA), thermoplastics. Non-fusion: Soldering, brazing.

What do learners need to learn?	Skills
Techniques used to thermally join materials, including: • their suitability for different materials and applications • preparation of tools, equipment and materials • how to limit distortion caused by thermal joining processes • additional health and safety requirements and legislation	EC1, EC5.

1.21 **Techniques** and **tools** used to cut and shape materials.

Range:
Techniques – Cutting, grinding, drilling, tapping.
Tools - Hand tools – Shears, saws, chisels, reamers, tap and die, heat, files, anvil, hammers, oxy-acetylene.
Power tools – Drills, plasma, circular and reciprocating saws, grinders with cutting discs.

What do learners need to learn?	**Skills**
Techniques and tools used to cut and shape materials for repairs, including: • their suitability for different materials and applications • preparation of tools, equipment and materials • additional health and safety requirements Awareness of the purpose of other powered techniques including turning and milling.	EC1, EC5.

1.22 Application of **techniques** used in sealing and chemical bonding.

Range:
Techniques – Sealing: Gaskets, sealants, static/dynamic seals, sealer, thread/bearing locking compounds, gasket and adhesive removal products.
Chemical bonding: Activators and adhesives.

What do learners need to learn?	**Skills**
Techniques and materials used in sealing and chemical bonding, including: • their suitability for different materials and applications • preparation of tools, equipment and materials • preparation techniques used prior to sealing and bonding activities • additional health and safety requirements	EC1, EC5.

1.23 **Types** of calibration used in repair and commissioning processes.

Range:
Types – Mechanical, hydraulic, electronic/software, crop production (application rates, monitoring, guidance systems).
Tools and equipment – Laptop/computer/electronic service tool (EST), software, tachometer, pressure and flow meters/gauges, scales, spring balances, torque wrenches, liquid flow meters and measurement, catchment trays, measuring receptacles/containers, stopwatch, calculator.

What do learners need to learn?	Skills
Types of calibration, including: • their suitability for different purposes, components, machinery and equipment • equipment used for calibration activities Tools and testing equipment requiring calibration, including: • their application when carrying out repair activities • verification of calibration	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4.

1.24 **Techniques** and **equipment** used to verify repairs conform to manufacturers specifications.

Range:
Techniques – Performance/functionality tests, data analysis.
Equipment – Hydraulic test equipment, dynamometer, electronic diagnostic and calibration equipment, precision measuring equipment, electrical test equipment, temperature measurement.

What do learners need to learn?	Skills
The range of testing/analysis and calibration techniques and how they are applied to verify repairs conform to manufacturers specifications. How to use the range of testing and measuring equipment to verify repairs.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4, DC6.

1.25 Types of repair **information and data**.

Range:

Information and data – Pre and post-repair information required.

Required to complete repair tasks: service records, drawings, schematics, manufacturers technical information, resale repair requirements.

Types of repair records: quotations, insurance reports, job cards, service and lease contracts.

What do learners need to learn?	**Skills**
Pre and post repair information required from and by the key stakeholders including owner, operator, machine lease holder, manufacturer. Types of information and data required to complete repair tasks including service history and warranty records, drawings and schematics (interpretation of symbols and conventions), manufacturers technical information, and their sources. Types of repair records (quotations, insurance reports, job cards, service and lease contracts) • The information they hold • Their purpose • The importance of accurate and timely completion	EC1, EC4, EC5, MC7, DC4.

Diagnose land-based machinery and equipment faults (PO4)

1.26 Land-based equipment and machinery fault diagnosis.

What do learners need to learn?	Skills

How to establish the customers' expectations and compare these to manufacturers performance data:
• How information about the working environment, maintenance schedules and operation of land-based equipment and machinery can be used to support a diagnosis:
  ○ working environment (operating environment/storage environment, climate, soil types)
  ○ maintenance schedule (timescales/frequency, activities, history)
  ○ operation (incorrect/excessive use, incorrect application)
  ○ current and emerging technologies and their effect on system operation, integration and diagnostics
• Methods used to verify the accuracy of information provided by key stakeholders, including:
  ○ establishing the sequence of events
  ○ observation
  ○ photographs
  ○ recordings
  ○ machinery operation
  ○ verbal description
  ○ questioning and listening (including open questioning)
  ○ written description
  ○ repeat checks
• Information and data required to support diagnostic tasks, including:
  ○ techniques used to obtain data
  ○ suitability of techniques for different types of data and situations
 	
How to verify machine performance:
• normal and abnormal characteristics of machinery performance
• checks to establish machine can be field tested
• field test machine to reproduce fault
• prepare machine for diagnostic tests to be carried out
• the difference between cause and effect of a mechanical failure
• the difference between a performance characteristic and a perceived impending failure
 	
How to compile a plan to establish data to diagnose intermittent faults:
• compare and consider data
• formulate a diagnosis and plan of action
	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4, DC6.

1.27 **Software** used to support diagnostic activities.

Range:
Software – Manufacturer specific and alternative diagnostic software.

What do learners need to learn?	Skills
The function of software in the operation of machinery and equipment: • How the software ensures effective performance • How software can be used to support diagnostic activities • Methods used to adapt software to support diagnostic activities including installation, updating, amending, licensing	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4, DC6.

Diagnostic operations

1.28 Causes and implications of component **contamination**.

Range:
Contamination – Corrosion, moisture ingress, solid and soft particle ingress, bacterial, chemical, cross contamination.

What do learners need to learn?	Skills
Causes and implications of component contamination: • Measures used to comply with safe operation of the diagnostic equipment and process – cleanliness of equipment, connections, operator • Precautions to prevent contamination affecting the results of the diagnostic process • Types of liquid and solid contaminants • How evidence of contamination can be used to support a diagnosis	EC5.

1.29 Machinery and equipment **samples** required as part of a diagnostic activity.

Range:
Samples – Transmission/hydraulic oil, engine oil, fuel, coolant.

What do learners need to learn?	Skills
Machinery and equipment samples required as part of a diagnostic activity, including: • the contribution samples make to diagnostic activities • methods used to collect samples • how data provided from sample analysis can be used to support a diagnosis • benchmarking data for samples that indicate optimum performance of machinery and equipment	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

1.30 **Techniques** used in the preparation of machinery and equipment for diagnostic activities.

Range:
Techniques – Checks to confirm machine is in serviceable condition for diagnostic activities (warning lights, fault codes, alarms, fluid levels).

What do learners need to learn?	Skills
Techniques used in the preparation of machinery and equipment before diagnostic activities, in accordance with manufacturers' procedures: • Their suitability for different diagnostic activities • Importance of ensuring machine is set up appropriately for the diagnostic activity • Importance of accurately replicating the failure conditions. • Diagnostic tools calibrated and current • Health and safety considerations	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4, DC6.

1.31 Diagnostic **techniques** and **processes**.

Range:
Techniques – Sensory, electronic, electrical, mechanical, comparison of results to manufacturers' specifications, monitoring (onboard, remote).
Processes – Isolation, substitution, comparison.
Tools, equipment and machinery – Mechanical (meters, gauges, dynamometer), electronic (electrical/electronic testing equipment), digital (hand-held/laptop-based diagnostic/interrogation equipment).

What do learners need to learn?	**Skills**
Range of diagnostic techniques, including: • their purpose • their suitability for different situations • their application How the processes of isolation, substitution, comparison are used to formulate a logical diagnostic conclusion. Types of tools, equipment and machinery used for diagnostic tasks (including mechanical, electronic, digital), including: • their characteristics • their operation • techniques used to maintain equipment and machinery for use including storage, cleaning, visual and technical checks Methods used to verify machinery and equipment and their components conform to manufacturers' specifications.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4, DC6.

1.32 **Diagnostic reports, drawings and schematics.**

Range:
Diagnostic reports, wiring diagrams/schematics, hydraulic diagrams/schematics.

What do learners need to learn?	**Skills**
How they are used to present information and data. How they are interpreted. Conventions of diagnostic reports, drawings and schematics (wiring and hydraulics) including basic ISO symbols. How to report on fault diagnosis tasks. Importance of photographs to illustrate a diagnostic report.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC7, MC8, DC1, DC4, DC6.

Handover land-based machinery and equipment (PO5)

1.33 Pre-delivery inspections (**PDI**).

Range:
PDI – Checking against manufacturers' specifications, following company procedures, checking customer order, checking cleanliness, operational checks, checking performance capabilities, legal compliance checks, completing documentation.

What do learners need to learn?	Skills
Requirements for preparing machinery and equipment to be presented and installed with the owner/operator.	EC1, EC2, EC4, EC5, MC1, MC2, MC7.

1.34 Land-based equipment and machinery **commissioning**.

Range:
Commissioning – Checking suitability and safety of commissioning site.
Handover to customer.
Completing documentation.
Factors affecting commissioning and handover: Environment (location, access, climate, soil types, crop types), schedules (timescales, activities, season) and operation (end-user, application).

What do learners need to learn?	Skills
Equipment and machinery applications including: • their performance limitations • where to find information • correct use of systems, machinery or equipment • causes, effects and implications of inappropriate system, machinery or equipment use Function of software in the commissioning of machinery and equipment: • How the software ensures effective performance • Methods used to adapt software during commissioning including installation, updating, amending, licensing • Current and emerging technologies and their effect on system operation and integration Characteristics of commissioning sites (noise levels, potential bystanders, space, topography) including: • their suitability for specific machinery and installation requirements • actions required to ensure the site is suitable and safe Factors affecting commissioning and handover: • The relationships between these factors and the implications for commissioning and handover information and activities Techniques used to verify machinery and equipment operates to specification after commissioning.	EC1, EC2, EC4, EC5, EC6.

1.35 **Legal requirements** when commissioning a machine.

Range:

Legal requirements – Legislation and regulations: Responsibilities under the Health and Safety at Work Act, Provision and Use of Work Equipment Regulations (PUWER), Lifting Operations and Lifting Equipment Regulations (LOLER).

Waste legislation and regulations: Environmental Protection Act 1990 (as amended), Waste (England and Wales) Regulations, Control of Substances Hazardous to Health Regulations (COSHH).

Warranties and licences: Manufacturers' warranties, type approval licences.

What do learners need to learn?	**Skills**
Legal requirements when commissioning and handing over a new or used machine including the technical advice and assistance that can be offered to customers. Benefits and limitations of terms and conditions of warranties (including extended warranties) and licences, including: • terminology associated with warranties and licences • the importance of correct installation and handover procedures Information, documentation and equipment required prior to installing machinery and equipment. Information required to complete the installation documentation, including acceptance criteria and meet legislative requirements. What constitutes misrepresentation, including incorrect specification/efficiencies, not as represented/sold, warranty coverage.	EC5.

Handover of machine

1.36 **Information** required by the operator as part of the handover.

Range:
Information – Safe stop procedure, operator's handbook, maintenance requirements, warranty, serial numbers, suitable operator training.

What do learners need to learn?	Skills
Information which must be provided and explained to the operator as part of the handover: • How to operate machinery and equipment • Safe stop procedure and reasons for use • Importance of the operator's handbook • Meaning of universal symbols in the operator's handbook • Maintenance and warranty requirements • Importance of serial numbers • Issues related to second-hand machinery and equipment • Advice on suitable operator training for the machinery and equipment Techniques used to establish that the machine operator can operate the installed machine and understands information provided on completion of the installation (observation, questioning, demonstration). What to do if the machine installation goes wrong, including machine does not meet customer's expectations, machine is not to the specification the customer ordered, the customer realises they have chosen the wrong machine. How to communicate at a level appropriate to the operator of the machine.	EC1, EC2, EC4, EC5, EC6.

Performance outcome 2

2. Maintain land-based machinery and equipment

This performance outcome relates to scheduled and preventive maintenance and preparation for out-of-season storage.

2.1 Prepare the workplace for **maintenance tasks**.

Range:
Maintenance tasks – Daily operator maintenance, routine service tasks (filters, settings, fluids), replacement of wearing components, pre-season and out-of-season servicing.

What do learners need to demonstrate?	Skills
Assess health and safety risks associated with maintenance tasks. Complete a dynamic risk assessment for the maintenance task and location. Prepare the work area. Prepare tools and equipment for the task.	EC1, EC4, EC5.

2.2 Prepare **machinery and equipment** for maintenance tasks.

Range:
Machinery & equipment – Systems – Power units, gearboxes/transmission/drivelines, hydraulic systems, electric and electronic, braking, steering, suspension.

Functions – Crop and animal husbandry and processing, soil engaging, materials handling and transport, estate maintenance, ground care, transport.

What do learners need to demonstrate?	Skills
Select and use the correct PPE and procedures. Safe isolation of machinery and equipment. Decontaminate and clean the machinery and equipment: hazardous and non-hazardous waste.	EC5.

2.3 Prepare machinery and equipment and select **resources** for maintenance activity.

Range:
Resources – Consumables, parts, lifting and supporting equipment.

What do learners need to demonstrate?	Skills
Determine resources requirements for maintenance activities. Safely jack, support and stabilise machinery and equipment.	EC5.

2.4 Assess machinery and equipment for potential defects.

What do learners need to demonstrate?	Skills
Measure machinery and equipment parameters using manual or electronic methods. Set machinery and equipment parameters. Collect samples for analysis if required. Adjust land-based machinery and equipment component mechanisms.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC8, DC4.

2.5 Remove worn/failed components from machinery and equipment.

What do learners need to demonstrate?	Skills
Drain fluids. Remove worn/failed components.	EC1, EC4, EC5.

2.6 Re-assemble machinery and equipment.

What do learners need to demonstrate?	Skills
Types of activities during re-assembly: • Cleaning and decontamination of machinery and equipment component part • Replace service parts/consumables and fit new/reconditioned components • Prepare surfaces for sealing • Seal components • Fill systems with fluids • Vent systems • Torquing fasteners • Verify machinery and equipment re-assembly conforms to the manufacturer's specifications	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

2.7 Prepare machinery and equipment for post-season storage.

What do learners need to demonstrate?	Skills
Clean machinery and equipment. Carry out post-season inspection, preparation and report findings. Apply preventive coatings to land-based machinery and equipment components (anti-corrosive, protective coatings, paint).	EC1, EC4, EC5, MC1, MC2, MC5, MC7.

2.8 Recording information relating to activities carried out on machinery and equipment.

What do learners need to demonstrate?	Skills
Manage own time to meet objectives. Record activities completed. Record time taken. Record parts and consumables used. Record customer recommendations.	EC1, EC4, EC5.

2.9 Classify and dispose of **waste products and materials** from service and repair of machinery and equipment.

Range:
Waste products and materials – Hazardous, non-hazardous, recyclable.

What do learners need to demonstrate?	Skills
Separate waste products/materials according to requirements. Dispose of waste in appropriate manner with due regard to environmental regulations and guidance.	EC5.

Performance outcome 3

3. Repair land-based machinery and equipment

Students must demonstrate skills required to prepare machinery for repairs, best practice required to dismantle, store, reassemble and verify conformity of components, sub-assemblies and machinery and equipment.

3.1 Allocate **resources** to a **repair task**.

Range:
Resources – Time, materials, equipment, labour.
Repair tasks – Power units, gearboxes/transmission/drivelines, hydraulic systems, electric and electronic, braking, steering, suspension.

What do learners need to demonstrate?	**Skills**
Plan the activities required. Complete a dynamic risk assessment for the task and location. Estimate the time and personnel required. Plan the parts, consumables, materials, equipment required. Manage own time to meet objectives. Provide information on the cost of a repair – parts, time and labour. Convey technical information to different stakeholders.	EC1, EC4, EC5, MC9.

3.2 Remove **components**.

Range:
Components – Electrical/electronic, mechanical, hydraulic.

What do learners need to demonstrate?	**Skills**
Use equipment to support machinery and equipment being repaired. Secure mechanical components to prevent movement. Immobilise the machine and safely release stored energy. Prepare tools and equipment prior to carrying out repair activities. Disassemble mechanical components. Clean components.	EC5.

3.3 Dismantle and repair **mechanical components.**

Range:
Mechanical components – Power units, gearboxes/transmission/drivelines, braking, steering, suspension.

What do learners need to demonstrate?	**Skills**
Remove damaged/seized/broken fixings. Follow manufacturers dismantling and repair procedures. Use special tools appropriate for dismantling and repair procedures. Reinstate threads. Repair components using thermal joining techniques – fusion, non-fusion, adhesives. Sharpen and set cutting components of machinery and equipment. Demonstrate physical dexterity with appropriate force when dismantling machinery and equipment.	EC5.

3.4 Use equipment to confirm **mechanical settings**.

Range:
Mechanical settings – Rolling resistance, torque limiting devices, preload, backlash, shimming, protrusion, end float, tolerances, torque, tooth contact, balance (static, dynamic).

What do learners need to demonstrate?	**Skills**
Retrieve data from equipment and machinery software. Calculate machinery and equipment tolerance parameters. Upload data to machinery and equipment software. Mark and layout components. Measure components. Balance and align components.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC4.

3.5 Re-assemble components.

What do learners need to demonstrate?	**Skills**
Follow manufacturers' procedures for re-assembly and adjustment. Align mechanical components. Install seals. Install bearings. Seal components. Configure electrical/electronic/mechanical/hydraulic components. Route flexible components (wiring harnesses, pipes). Secure flexible components against chafing. Make, secure and insulate electrical/electronic connections. Calibrate systems. Demonstrate physical dexterity with appropriate force when repairing machinery and equipment. Dispose of waste appropriately.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC7, MC8, DC4, DC6.

Performance outcome 4

4. Diagnose land-based machinery and equipment faults

Students must carry out diagnostic activities on mechanical, hydraulic, electrical and electronic systems on land-based engineering machinery and equipment.

4.1 Prepare **machinery and equipment** and plan for diagnostic activities.

Range:

Machinery & equipment – Systems**:** Power units, gearboxes/transmission/drivelines, hydraulic systems, electric and electronic, braking, steering, suspension.

Functions**:** Crop and animal husbandry and processing, soil engaging, materials handling and transport, estate maintenance, ground care, transport.

What do learners need to demonstrate?	Skills
Complete a dynamic risk assessment for the task and location. Prepare machinery and equipment for diagnostic activities. Gather information from different sources (owner/operator/manufacturer/dealer/online). Apply questioning and listening techniques. Analyse provided information. Sequence and prioritise diagnostic tasks following manufacturer's diagnostic procedure. Safely isolate circuits and components in a system.	EC1, EC4, EC5, EC6, MC1.

4.2 Apply **techniques** and **processes** for diagnosis of faults.

Range:
Techniques – Sensory, electronic, benchmarking, monitoring.
Processes – Isolation, substitution, comparison.

What do learners need to demonstrate?	Skills
Use visual inspection and sensory perception to establish diagnostic information. Apply isolation/substitution/comparison appropriately to establish diagnostic information. Simulate machinery and equipment operations to replicate fault symptoms. Measure with accuracy. Follow manufacturers' recommended procedures. Apply a logical approach to problem solving. Configure digital technology. Use appropriate equipment to collect diagnostic information.	EC1, EC4, EC5, MC1, MC2, MC3, MC4, MC5, MC6, MC7, MC8, DC1, DC4, DC6.

4.3 Use **test equipment** to establish diagnostic data.

Range:
Test equipment – Electrical, electronic, hydraulic, mechanical.

What do learners need to demonstrate?	**Skills**
Selection of the appropriate equipment for the diagnostic task. Check that test equipment is serviceable. Calibrate test equipment for accuracy (zeroing, check equipment calibration is current). Operate test equipment following manufacturer's instructions. Connect electronic test equipment to software. Pair electronic test equipment with machinery. Use on-board or remote digital software to collect diagnostic information.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC1, DC4, DC6.

4.4 Analyse information and data to make a diagnosis.

What do learners need to demonstrate?	**Skills**
Analyse information and data, including the results of the diagnostic techniques and processes carried out. Use software to interrogate data. Compare data to manufacturer's specification. Apply a logical approach to problem solving. Conclude diagnosis of the machinery/equipment fault.	EC1, EC4, EC5, MC1, MC2, MC4, MC5, MC8, DC1, DC4, DC6.

4.5 Present information and data.

What do learners need to demonstrate?	**Skills**
Record diagnostic data and diagnostic results. Validate data. Present information and data to meet the needs of different stakeholders (customer, manufacturer, workshop manager). Convey recommendations in a form to meet the needs of different stakeholders (written, graphs, figures). Substantiate conclusions with evidence (diagnostic data/results).	EC1, EC4, EC5, DC1.

Performance outcome 5

5. Handover land-based machinery and equipment

Students are **not** required to demonstrate the **use** and **operation** of land-based machinery as part of the handover process.

5.1 Plan for a **machinery or equipment** handover.

Range:
Machinery & equipment – Crop husbandry, soil engaging, materials handling and transport, estate maintenance, ground care, transport.

What do learners need to demonstrate?	Skills
Assess suitability for handover on site, taking into account relevant factors – Environment (location, access, climate, soil types), schedules (timescales, activities, season), operation (end-user, application). Carry out a risk assessment. Plan the logistics required to carry out a machinery and equipment handover.	EC1, EC4, EC5, EC6, MC2.

5.2 Prepare the site to enable safe and effective handover of machinery and equipment.

What do learners need to demonstrate?	Skills
Ensure the site is safe, secure and in suitable condition. Implement control measures identified in the risk assessment.	EC5.

5.3 Verify machinery and equipment is prepared to requirements.

What do learners need to demonstrate?	Skills
Verify machinery and equipment is prepared to requirements (customer order, manufacturer's specifications). Interpret information and data provided (operator's manual, customer reviews). Carry out safety checks.	EC1, EC4, EC5, MC1, MC2.

5.4 Complete the machine/equipment **handover process**.

Range:
Handover process – Information which must be provided and explained to the operator as part of the handover:

- How to operate machinery and equipment
- Safe stop procedure and reasons for use
- Importance of the operator's handbook
- Meaning of universal symbols in the operator's handbook
- Maintenance and warranty requirements
- Importance of serial numbers
- Issues (including wear, performance levels) related to second-hand equipment and machinery

What do learners need to demonstrate?	**Skills**
Summarise information. Present information orally to others. Convey technical information to different audiences. Use open and closed questions to gain information. Check understanding of others (owner/operator). Complete installation documentation.	EC1, EC4, EC5.

Guidance for delivery

The purpose of this specialism is for learners to gain knowledge and develop skills to enable them to successfully enter the Land-based Engineering Sector as Technicians. A range of theoretical and practical delivery methods should be used to ensure both knowledge and skills are delivered with strong linkage to the sector's vocational context. Centres are encouraged to introduce employers and specific professionals from the industry to provide an insight to current developments and challenges the sector encounters.

Throughout all practical tasks focus should be on safe working. It is expected that the learner will be aware of safe working practices and familiar with behaviours expected by employers within the sector. Learners will be required to learn and follow health and safety risk control measures throughout their programme of study (e.g. using appropriate personal protective equipment, following regulations and codes of practice and demonstrating care for themselves and others in the workplace).

For the more knowledge-based outcomes it is anticipated that the delivery will be through formal lectures, but it is recommended that they are linked directly with interactive and skills development lessons and that visiting speakers or visits to land-based engineering employers' premises are used where possible to provide a vocationally relevant context.

Workshop-based skills development sessions will be essential to help learners to explore and practice their abilities in maintenance, fault diagnosis and repair procedures of land-based machinery.

Learners must have access to a range of current land-based machines and equipment, plus their associated repair manuals/information and specialist repair tools. Learners must also gain an overview of the purpose, function and operation of land-based machines and equipment.

The delivery will also need to include the effect and impact the wider land-based sector has on land-based engineering, for example, measures employed to control biosecurity, environmental impact, cardon footprints and ethical issues.

Learners will benefit from visits to a range of (franchised and non-franchised) commercial premises where land-based engineering, maintenance, repair and handover activities are carried out.

Formative assessment for the content may include oral Q&A, observation of tasks on components and systems, as well as machinery.

Suggested learning resources

Books

- Operator manuals
- Service manuals
- Bell, B. (2016) Farm Machinery. (6th edn). London: Old Pond Publishing
- Davies, A. C. (2008) The Science and Practice of Welding. Cambridge: Cambridge University Press

Websites:

- Manufacturers' Online support facilities.
- The Institution of Agricultural Engineers (IAgrE)– **www.iagre.org**

- Health & Safety Executive – **www.hse.gov.uk**
- British Agricultural & Garden Machinery Association – **www.bagma.com**
- Agricultural Engineers Association – **www.aea.uk.com**
- Land-based Engineering Training and Education Committee Limited (LE-TEC) - **www.landbasedengineering.com**

Scheme of assessment additional information

The below tables illustrate how each performance outcome is assessed through the use of assessment themes along with how each assessment criteria including the knowledge criteria in outcome 1 is packaged into an assessment theme for assessment purposes.

Assessment criteria that appear more than once against an assessment theme is required so that content is assessed within the context of a specific performance outcome.

Performance Outcome	Assessment themes	Assessment criteria
PO2 Maintain land-based machinery and equipment (22.5%)	Maintenance preparation	1.13 Techniques for cleaning land-based equipment and machinery 1.14 Maintenance tools and equipment 2.1 Prepare the workplace for maintenance tasks 2.2 Prepare machinery and equipment for maintenance tasks 2.3 Prepare machinery and equipment and select resources for maintenance activity
	Information and factors influencing maintenance	1.1 Factors influencing the performance and maintenance requirements of land-based equipment and machinery 1.2 The function of software in the operation of machinery and equipment 1.4 Preventive and predictive maintenance and preventive maintenance schedules 1.5 Factors influencing maintenance operations 1.6 Machinery and equipment samples required for completion of maintenance activities 2.4 Assess machinery and equipment for potential defects.
	Carry out maintenance	1.3 Legal obligations related to maintenance activities 1.7 Causes and implications of component contamination 1.8 Techniques used to safely jack and support machines and equipment 1.9 Equipment and procedures used to remove and replace service items and wearing parts 1.10 Methods used to seal and secure components 1.11 Types of calibration 1.12 Techniques used to verify machinery and equipment operates to specification 1.15 Types of maintenance information and data

		2.5 Remove worn/failed components from machinery and equipment 2.6 Re-assemble machinery and equipment 2.7 Prepare machinery and equipment for post-season storage 2.8 Recording information relating to activities carried out on machinery and equipment 2.9 Classify and dispose of waste products and materials from service and repair of machinery and equipment

Performance Outcome	Assessment themes	Assessment criteria
PO3 Repair land-based machinery and equipment (37.5%)	Information and factors influencing repairs	1.16 Causes and effects of component failure 1.17 Warranties, licences and regulations related to machinery and equipment repair 1.18 Factors influencing repair operations 1.25 Types of repair information and data
	Repair processes	1.19 Techniques for the repair of systems and components 1.20 Techniques used to thermally join ferrous and non-ferrous materials 1.21 Techniques and tools used to cut and shape materials 1.22 Application of techniques used in sealing and chemical bonding 1.23 Types of calibration used in repair and commissioning processes 1.24 Techniques and equipment used to verify repairs conform to manufacturers specifications 3.1 Allocate resources to a repair task 3.2 Remove components 3.3 Dismantle and repair mechanical components 3.4 Use equipment to confirm mechanical settings 3.5 Re-assemble components

Performance Outcome	Assessment themes	Assessment criteria
PO4 Diagnose land-based machinery and equipment faults (30%)	Preparation for diagnosis	1.26 Land-based equipment and machinery fault diagnosis 1.27 Software used to support diagnostic activities 1.30 Techniques used in the preparation of machinery and equipment for diagnostic activities 4.1 Prepare machinery and equipment and plan for diagnostic activities
	Carry out diagnosis	1.28 Causes and implications of component contamination 1.29 Machinery and equipment samples required as part of a diagnostic activity 1.31 Diagnostic techniques and processes 4.2 Apply techniques and processes for diagnosis of faults 4.3 Use test equipment to establish diagnostic data
	Interpret information	1.32 Diagnostic reports, drawings and schematics 4.4 Analyse information and data to make a diagnosis 4.5 Present information and data

Performance Outcome	Assessment themes	Assessment criteria
PO5 Handover land-based machinery and equipment (10%)	Handover	1.33 Pre-delivery Inspections (PDI) 1.34 Land-based equipment and machinery commissioning 1.35 Legal requirements when commissioning a machine 1.36 Information required by the operator as part of the handover 5.1 Plan for a machinery or equipment handover 5.2 Prepare the site to enable safe and effective handover of machinery and equipment 5.3 Verify machinery and equipment is prepared to requirements 5.4 Complete the machine/equipment handover process

403 Livestock Production (For 2023 cohort only)

Level:	3
GLH:	940
Assessment method:	Practical assignment

What is this Occupational Specialism about?

The purpose of this specialism is for learners to know and undertake the optimisation and maintenance of livestock production though all life stages and maintain areas surrounding the livestock production environment. Learners will have the opportunity to plan, perform and evaluate their work whilst utilising a range of techniques and resources.

Learners will develop their knowledge and understanding of, and skills in:

- knowledge of conditions required for optimal animal breeding and production
- knowledge of the tools, equipment and materials used in managing livestock
- knowledge of processes and methods used in managing livestock and the surrounding areas
- skills in optimising animal breeding and production
- skills in rearing and optimising livestock production
- skills in maintaining areas surrounding livestock

Learners may be introduced to this specialism by asking themselves questions such as:

- What are the different stages of livestock production and how are they managed?
- What are the daily responsibilities of a stock person?
- What areas of the livestock industry do stock people work in?

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

1. Underpinning livestock knowledge criteria.

Performance Outcomes

On completion of this specialism, learners will be able to:

2. Establish conditions for animal breeding.
3. Rear livestock from birth to production standard.
4. Optimise livestock production.
5. Maintain areas surrounding the livestock production environment.

Completion of this specialism will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented at the end of the specification.

Underpinning knowledge

Common knowledge criteria

Livestock Production common knowledge criteria

This occupational specialism relates to cattle, sheep, pigs and poultry production.

1.1 Animal welfare **frameworks** and **legislation**.

Range:
Frameworks – The codes of recommendations for all species, The Animal Welfare Act 2006**,** Five freedoms applicable to all species.
Legislation – The Welfare of Farmed Animals Regulations 2007, Veterinary Surgeons Act 1966, The Veterinary Medicines Regulations 2013, The Welfare of Animals (Transport) (England) Order 2006.

What do learners need to learn?	Skills
Role and purpose and importance of animal welfare frameworks (freedoms, needs and domains), legislation and Codes of Recommendations for the Welfare of Livestock. How the welfare needs of livestock are implemented and delivered in practice, when preparing for breeding, rearing and optimising production. Implications (prosecution, loss of assurance status, financial loss) of non-compliance to health and welfare of animals, the stock person and the business.	EC4, EC5.

1.2 **Hazards** and **risks** associated with the livestock production environment.

Range:
Hazards – lone working, livestock, hazardous materials (slurry, gases), machinery and equipment, biohazards, working at height, electricity overhead cables, septic tanks.
Risks – crushing, kicking, biting, contamination or asphyxiation by hazardous materials, contact with machinery and equipment, slips, trips and falls, drowning, electrocution.

What do learners need to learn?	Skills
Typical hazards involved in all areas of the livestock production environment. Risks associated with working in all areas of the livestock production environment and the appropriate control measures. Purpose, use and content of risk assessments.	EC3, EC4, EC5.

1.3 Human-animal interaction with **livestock**.

Range:
Livestock – Cattle, sheep, pigs, poultry.

What do learners need to learn?	**Skills**
Importance and effect of human-animal interaction with livestock. Techniques used to mitigate negative effects to livestock that may be caused through human-animal interaction: • consistent handling and restraint • welfare friendly handling and restraint • importance of routine.	EC4, EC5.

1.4 **Handling and restraint equipment** for all **stages of production**.

Range:
Handling and restraint equipment –
Cattle: Halter, race, crush, yoke, calf by hand, handling pens.
Sheep: Halter, race, weigh crate, dagging crate, turn over crate, crook, by hand, clamp, sheep handing pens.
Pigs: Pig board, crate, stall, snare, race, by hand, pens.
Poultry: Crate, by hand, nets.
Stages of production – Breeding, rearing and production.

What do learners need to learn?	**Skills**
Safety of the operator or stock person. Techniques for safe and welfare-orientated handling of livestock when capturing, handling and restraining livestock: • consistent and welfare friendly handling and restraint • non-slip flooring • dry floors • sheeted gates or boards • stock flow • appropriate use of farm dogs when dealing with sheep and cattle • poultry light levels • stocking rate in colonies Reasons for using feed to aid livestock movement. Suitability and application of restraints and handling systems for different situations: • health checks • administering veterinary medicine • weighing • husbandry tasks • moving livestock Recognition of livestock flight zones and points of balance. How the flight zone can contribute to effective livestock handling.	EC1, EC4, EC5.

Implication of flight zones when ensuring the safe and effective handling of livestock.	

1.5 **Techniques** to identify and monitor the health and wellbeing of **livestock** including signs of **good and poor health**.

Range:
Livestock – Cattle, sheep, pigs, poultry**.**
Techniques –
All species: Observation, smell, sound, clinical tests, weighing, temperature taking, feed and water intake, CCTV, Physical examination (including touch), record keeping (manual and electronic) mobile applications for detecting parturition, auto drafting.
Dairy cattle only: Milk yield monitoring.
Good and poor health –
Cattle, sheep and pigs: Condition of coat, skin, clean condition of mouth, dentition, condition of eyes, ears, nose, condition of head, body and limbs including feet, hoofs, condition of genitals, colour of mucous membranes, general mood, behaviour, group interaction, gait, movement, feeding and drinking behaviour, respiration, faeces (amounts, consistency and effects on production).
Poultry only: Feathers or scales, beak, claws, comb, condition of eyes, ears, condition of head, body and limbs including feet, colour of mucous membranes, general mood, behaviour, egg production monitoring, flock interaction, gait, posture, movement, feeding and drinking behaviour, respiration, faeces (amounts, consistency and effects on production).

What do learners need to learn?	**Skill**
Requirements of the baseline expectations and features of good and poor health for the range of livestock at all ages and stages of production. Advantages and disadvantages of different techniques that can be used to monitor young and adult livestock, their suitability to a range of production systems and the impact of these methods on the health and welfare of animals. Importance and value of applying these techniques to livestock. How these techniques are applied safely and empathetically to livestock. Suitability of different techniques when applied to different livestock and environments: • inside/outside • free-range • intensive/extensive Importance of correct livestock identification for stock management and legal compliance. Importance of following a health plan when monitoring livestock.	EC4, EC5, MC2, MC6

1.6 **Natural behaviour** that optimises health and welfare of **livestock**.

Range:
Natural behaviour – Eating habits, sleeping habits, social behaviour.
Livestock – Cattle, sheep, pigs, poultry.

What do learners need to learn?	Skills
Importance of the five freedoms in relation to the health, welfare and behaviour of all livestock species. How the knowledge of natural behaviour can be used to best optimise livestock health and welfare at all stages of production. How behaviour can be manipulated in indoor and outdoor environments.	EC4, EC5.

1.7 **Factors** that affect the movement and transportation of livestock.

Range:

Factors – Legislation and regulation, stage of production (breeding, rearing, production) and pregnancy, physical problems (illness, injury, lameness), condition, mixing sexes, animal temperament.

What do learners need to learn?	Skills
Importance of key legislative and ethical requirements when moving and transporting livestock for different purposes (transport of livestock: short and long journey, Animal Welfare Act for sale, movement). Importance of Animal Movement Regulations, Movement Licences, and the penalties of not complying with Movement Regulations. Conditions meaning livestock are unfit for transport (illness, physical injury, stage of production). Importance of techniques to avoid stress when transporting livestock. Methods used to prepare livestock for transportation. Types of transport and their suitability for different types of livestock. Types of equipment and facilities required to support the loading and unloading of livestock (lighting, ventilation, containment, feed and water access, capacity of transport, temperatures). Types of handling equipment required to support the loading and unloading of livestock: • loading race with backing gate • boards (pigs only) • catching gangs (poultry only)	EC4, EC5.

1.8 Different types of **grasses, legumes** and **herbal leys**, **cereal crops, forage crops** and **grazing techniques**.

Range:

Grasses – Perennial rye grass, Italian rye grass, timothy cocksfoot, meadow fescue, hybrid grasses.

Legumes – Red clover, white clover, lucerne, sainfoin, soya, beans.

Herbal leys – Chicory, plantain.

Cereal crops – Wheat, barley, oats, maize.

Forage crops – Swedes, turnips, forage rape, fodder beet, kale, mangolds.

Grazing techniques – Set stocking, rotational grazing, cell grazing, strip grazing, zero grazing, deferred grazing, clean grazing, conservation grazing, mob grazing.

What do learners need to learn?	**Skills**
Grasses, legumes, herbal leys, cereal crops and forage crops and their suitability to the range of production system (soil conditions, weather, intended use, industry needs, animal suitability). Growth stages of grasses and other forage crops. The suitability of these growth stages for given uses (grazing, zero grazing, silage for dairy cattle, silage for beef and sheep, hay). Characteristics of the different grasses. Grazing, harvesting and conservation techniques for different forage crops and their suitability to the range of production systems. Factors affecting growth of grasses, legumes and herbal leys, cereal crops and forage crops and how these are managed to support yield (plate meters, dry matter calculations) and quality (soil type, soil conditions, nutrient status, establishment, weather conditions, plant health, weed control). Soil structures and differences in soil types.	EC4, EC5, MC2

1.9 Establishment, management and harvesting of **grasses, legumes** and **herbal leys**, **cereal crops, forage crops**.

Range:

Grasses – Perennial rye grass, Italian rye grass, timothy, cocksfoot, meadow fescue, hybrid grasses.

Legumes – Red clover, white clover, lucerne, sainfoin.

Herbal leys – Chicory, plantain.

Cereal crops – Wheat, barley, oats, maize.

Forage crops – Swedes, turnips, forage rape, fodder beet, kale, mangolds.

What do learners need to learn?	**Skills**
Uses and lifecycles of different cereal and forage crops. Growing specifications (management tasks during the growing stage). Optimum conditions for growth (soil temperature, daylight hours, moisture content, topography, free from weeds, pests and disease, nutrient availability, correct soil pH).	EC4, EC5, MC1, MC2, DC4

Time allocation for the range of activities (crop monitoring, nutrient application, plant protection product application, cultural/physical control methods, Integrated Pest Management (IPM) required to manage crops). Resources required for the range of activities required to manage crops. Skills, including qualifications/licences, for the range of activities required to manage crops.	

1.10 Different types of **invasive plant** and their characteristics.

Range:
Invasive plant – Japanese knotweed, ragwort, Himalayan balsam, giant hogweed, dock, thistle, nettle, horsetail, rhododendron, bracken.

What do learners need to learn?	**Skills**
Different types of invasive plant that can have an adverse effect on livestock, forage and grassland. Characteristics of different types of common invasive plant and their effect on livestock. Environmental implications of invasive plants. Different methods that can be used to mitigate the effects of invasive plants on the environment. Invasive plants included in legislation that can be encountered in areas surrounding the production environment.	EC4, EC5.

1.11 **Soil types** and their **characteristics** and **properties.**

Range:
Types of soils – Sand, silt, clay, loam, peat.
Characteristics – Texture.
Properties – pH, nutrient availability, drainage, water holding capacity, organic matter and living organisms in the soil, ease of cultivation, colour and heat retention, existing pollutants, horizons.
Techniques – Soil sampling, pH testing, nutrient testing, interpretation of a soil profile.

What do learners need to learn?	**Skills**
Different types of soils including inorganic and organic. Characteristics and properties of different soil types. Their influence on flora selection and growth. Techniques used to determine soil properties.	EC4, EC5, MC4, MC8

1.12 **Factors** to consider when conserving grass for feed.

Range:
Factors – Legislation, environmental schemes.

What do learners need to learn?	**Skills**
Techniques used when conserving grass for feed from all areas of the livestock production environment:	

• operation timings • complying with environmental scheme requirements • avoiding protected species The operations involved in maintaining grassland (scarifying, rolling, dragging, weed control).	EC4, EC5, MC2, MC5, DC4

Specific knowledge criteria for performance outcomes

Establish conditions for animal breeding (PO2)

For this performance outcome, students are expected to acquire knowledge related to cattle, sheep, pigs and poultry production.

Livestock breeding

1.13 Environmental **requirements** associated with livestock breeding.

Range:
Requirements – Ventilation, lighting, temperature, space requirements, bedding, topography access to feed and water, fencing, shelter, natural behaviour, presence of other animals of the same species.

What do learners need to learn?	Skills
How different environmental factors can influence breeding success. Impact of these requirements on successful breeding. Use of technology (ventilation, lighting, temperature) and equipment (automated systems) to manage environmental requirements during livestock breeding.	EC4, EC5, DC6

Business management

1.14 **Performance indicators** during breeding.

Range:
Performance indicators – Cost, effectiveness of breeding, spread of service dates.

What do learners need to learn?	Skills
How breeding performance indicators are used to make livestock breeding decisions. Calculations relating to breeding performance. Techniques (benchmarking and auditing) used to monitor performance indicators and how they can by utilised. Implications for failing to meet breeding performance indicators (financial loss, difficulty obtaining data, difficulty solving problems).	EC4, EC5, MC1, MC2, DC6

Rear livestock from birth to production standard (PO3)

For this performance outcome, students are expected to acquire knowledge related to cattle, sheep, pigs and poultry.

Animal health and welfare

1.15 Characteristics of livestock that indicate they are ready for **stages of production**.

Range:
Stages of production – Weaning, growing, finishing, service/insemination (cattle, sheep, pigs). Growing, finishing, point of lay (poultry).

What do learners need to learn?	Skills
Characteristics of livestock that indicate they are ready for different stages of production and how they are monitored: • age • weight • growth rates • suitability for breeding	EC1, EC4, MC1, MC2

1.16 **Requirements** of livestock environment design and **accommodation.**

Range:
Requirements – Ventilation, lighting, temperature, bedding, stocking densities, access to feed and water, fencing, isolation facilities.
Accommodation – Indoor (pens, cubicles, crates) outdoor (fields, field shelter, huts).

What do learners need to learn?	Skills
How the types of accommodation, environment and design affect the different stages of production for all livestock species: • weaning • growing • finishing • service • insemination • point of lay Potential hazards (toxic plants, biohazards, sharp objects) of different livestock accommodation and how these are minimised. How the need to handle and move livestock is considered and managed in accommodation designs. Ensure the design minimises animal fear and distress and ensures optimisation of health and welfare. Recognising the effects of poor accommodation on livestock growth/ performance. Types and uses of equipment required to optimise livestock performance and promote welfare (temperature control, shed alarms, ventilation including mechanical, natural and controlled, lighting, CCTV, enrichment, feed and water equipment, insulation).	EC4, EC5, MC2, DC4

Techniques and equipment (barriers, gates, doors, fences, alarms, CCTV) used to monitor and maintain accommodation security and their suitability for different environments and species. Implications of poor security of accommodation (loss of livestock, theft, unwanted access, biosecurity issues).	

1.17 **Mechanical** and **manual techniques**, and the **products** used in livestock environment management.

Range:
Mechanical – Tractor, loader, telehandler, skid steer, auto scraper, trailer.
Manual – Brush, shovel, fork, pressure washer, steam cleaner, wheelbarrow.
Techniques – Frequency of cleaning sheds, washing and disinfection techniques, range of bedding materials, mechanical and manual cleaning techniques.
Products – Disinfectant, sterilising materials.

What do learners need to learn?	**Skills**
Techniques used in livestock environment management and how these techniques are applied. Benefits and potential harms these techniques could bring to livestock when managing their environments and management of livestock manure.	EC4, EC5

1.18 **Factors** affecting livestock achieving performance targets.

What do learners need to learn?	**Skills**
Factors that can affect livestock achieving performance targets and how to optimise them: • accommodation • nutrition and water • health status • environmental conditions • fertility of male and females • male female ratio • age of male • age of females • influence of breed and breeding • number of young produced or reared • hatch dates (poultry only) • spread of service • weaning date (cattle, sheep and pigs only)	EC1, EC4, EC5, MC1, MC2

Business management

1.19 **Performance indicators** and **methods** to monitor the rearing of livestock.

Range:
Performance indicators – Costings (feed, production), growth rate, feed conversion rates, mortality, environmental impact.
Methods – Operating procedures, record keeping, data analysis.

What do learners need to learn?	Skills
How the performance indicators are used to make decisions regarding livestock during the stages of production. Calculations relating to rearing performance. Implications of failing to meet performance indicators (failure to comply with contracts, financial loss).	MC5, MC6, MC8

1.20 **Methods** that can be used to identify livestock.

Range:
Methods –
All species: Heat monitors, collars, tapes, paint or raddle marks, tags, pedometers, digital and non-digital tagging, observation, CCTV, tattoo, specific documents for pedigree livestock.
Cattle sheep and pigs: Ear notching.
Cattle and pigs: Transponders.
Cattle only: Freeze banding, passports
Pigs only: Slap marking.
Poultry only: Rings on legs.

What do learners need to learn?	Skills
Legal requirements and movement documents for livestock birth registration and recording. Methods used to identify livestock, the importance of traceability and how this is managed. The suitability of the different methods in different situations and their impact on the health and welfare of the animal.	EC4, EC5

Optimise livestock production (PO4)

For this performance outcome, students are expected to acquire knowledge related to cattle, sheep, pigs and poultry.

Machinery and equipment

1.21 **Equipment and machinery** used for livestock management.

Range:
Equipment and machinery – Tractors, trailers, loading equipment, storage equipment, GPS, hand tools, mechanical equipment, robotics (milking and handling facilities, livestock transport equipment; feeding equipment, water supply equipment).

What do learners need to learn?	Skills
Types of equipment and machinery used for managing livestock and crop production, their characteristics, function, operation and suitability for tasks. Maintenance techniques (routine and non-routine maintenance) used to keep machinery and equipment in operational condition, and the implications of poor maintenance.	EC4, EC5, MC10

Animal production

1.22 Factors and **systems** used in livestock management.

Range:
Systems – Intensive, extensive.

What do learners need to learn?	Skills
Different systems used to manage livestock production, lifecycles, finishing processes. Factors that can affect performance of livestock: • nutrition, health status, age, breed and breeding, environmental conditions How these factors are managed to optimise performance.	EC4, EC5, MC2, MC10.

Business management

1.23 Key **performance indicators** of the production operation.

Range:
Performance indicators – All species: Feed conversion efficiency, growth rates, carcass quality.
Cattle only: Milk yield and quality, calving index.
Sheep only: number of lambs produced /reared.
Pigs only: litter size; numbers reared, weaning weights.
Poultry only: Egg production (number, size and quality).

What do learners need to learn?	Skills
How the performance indicators are used and monitored to make decisions regarding livestock during the production stage. Implications to livestock and business for failing to meet performance indicators: • higher feed costs • lower price for livestock products (meat, milk, eggs) • contractual obligations • impact on farm management and income.	EC4, EC5, MC5, MC6,

Maintain all areas of the Livestock Production Environment (PO5)

Health and safety

1.24 **Legal and regulatory** requirements for maintaining species and habitats and encouraging wildlife.

Range:
Legal and regulatory – Food and Environment Protection Act 1985, Control of Pollution Act 1974, Wildlife and Countryside Act 1981, Weeds Act 1959, Countryside and Rights of Way Act 2000, Environmental Land Management Scheme (ELMS), development of biodiversity plans.

What do learners need to learn?	Skills
Key requirements of environmental legislation, regulations, codes of practice and organisational policies and how they are applied to the maintenance of the production environment. Ecology of wildlife species (flora and fauna) that are present on farmland and the key characteristics of their habitats. Techniques (establishment of habitats) used to encourage habitats of beneficial species. Benefits and limitations of maintaining species and habitats in the production environments. Legal and regulatory requirements for maintaining species and habitats. Various grants schemes available to improve the environment.	EC4, EC5

1.25 Management of soil, air and water.

What do learners need to learn?	Skills
Principles of water, soil and air pollution codes of practice. Sources of pollution from livestock production environments. How to minimise pollution in livestock production environments. Storage and use of organic manures (slurry and farmyard manures). Implications to livestock production and maintenance of the environment: • stocking rates • avoiding run-off • manure management • waste management procedures • buffer zones	EC4, EC5, MC5, MC6

Business

1.26 Management considerations of **maintaining** all areas of the livestock production environment.

Range:
Maintenance – Paths, structural repairs, fencing and boundaries, protection of habitats.
Resources – Human, financial, physical.

Factors – Site and situation, public access, wildlife, habitats.
Implications – Fines, prosecution, loss of scheme income, public perception.
Techniques – Field maps, photographs, digital software, species surveys.

What do learners need to learn?	Skills
Management considerations of maintaining all areas of the livestock production environment. Maintenance requirements of an area and the factors that need to be considered when maintaining an area. Implications of management activities and how these are applied. Resources required for development and sustainability including ongoing maintenance of all areas of the livestock production environment. Factors that affect short-and long-term planning and their impact on implementation of plans. Timescales involved in operational implementation of a plan. Techniques used to monitor and evaluate progress of a plan.	EC4, EC5, MC1, MC2, MC9.

1.27 **Records** to be produced and stored in relation to maintenance of all areas of the livestock production environment.

Range:
Records – Legislative, management.

What do learners need to learn?	Skills
Types of records to be produced and stored: Legislative records: • pesticide application • fertiliser application • NVZ records Management records: • field operations • seed labels • environmental scheme compliance • income • expenditure • feed and grazing records Systems for management of information and data.	EC4, EC3 EC5, DC6

1.28 **Malpractices** when undertaking non-livestock production activities.

Range:
Malpractices – Pollution, interfering with, and destruction of, habitats, incorrect timing of operations, non-certificated operators, obstruction of rights of way, noise disturbances, inappropriate disposal of waste.

What do learners need to learn?	Skills
Examples of malpractices (unethical, inefficient, illegal) when undertaking non-livestock production activities and the potential implications to the business and the production environment. • prosecution	EC4, EC5.

• loss of assurance status • public perception	

1.29 Cost implications of maintaining all areas of the livestock production environment.

What do learners need to learn?	**Skills**
Costs of maintenance of all areas of the livestock production environment. and implications for profitability and business success.	EC4, EC5, MC1, MC2, MC8, MC10, DC4

1.30 **Performance targets** for all areas of the livestock production environment.

Range:
Performance target – Scheme requirements, business requirements.

What do learners need to learn?	**Skills**
How performance targets are applied in different situations and production environments: Scheme requirements: • environmental scheme • assurance scheme Business requirements: • physical performance • financial performance	EC4, EC5, MC5, MC6,

1.31 **Alternative uses** of all areas of the livestock production environment.

Range:
Alternative uses –
Land use schemes: Stewardship, environmental and land management scheme.
Diversification: Recreational uses, alternative livestock enterprise, renewable energy.

What do learners need to learn?	Skills
Opportunities for use of all areas of the livestock production environment for financial benefit and implications for use. • allowing public access • planting areas with restrictions on cutting/grazing • creation of wildlife habitats – loss of production Meeting scheme requirements. Consideration and importance of natural capital.	CSA, CSB, CSE, EC4, EC5, EC6.

1.32 Features of all **areas** of the livestock production environment.

Range:
Areas – Roads, public rights of way, hedgerows and boundaries, ponds and lakes, water courses, woodland.
Standards – Stewardship scheme, assurance scheme, local authority, national park authority, felling license, Environment Agency.
Techniques – Cutting, spraying, strimming, planting, boundary maintenance, hedge laying.

What do learners need to learn?	Skills
Standards for maintenance of all areas of the livestock production environment set by different standards setting bodies. Effects of techniques used to protect and enhance all areas of the livestock production environment: • creating habitats • enhancing existing habitats • removing undesirable weeds • protecting habitats	EC4, EC5.

Maintenance

1.33 Maintenance of all **areas** of the livestock production environment:

Range:
Areas –
Hedges: Planting, trimming, laying.
Ditches: Cleaning, ensuring free flow of water.
Boundaries: Repairs, installation (strained wire, post and rail, stone wall).

What do learners need to learn?	Skills
Maintenance techniques and materials used to maintain and repair boundaries, building fabric and habitats and how they are applied. Importance of considering building to local styles and traditions.	EC4, EC5, MC2, MC5, DC2, DC4

Machinery and equipment

1.34 Characteristics, **operation** and suitability of different types of **equipment and machinery** in non-production areas.

Range:
Operation – In accordance with manufacturer's guidance and by trained operators.
Equipment and machinery – Tractor, topper, mower, hedge cutter, post driver.

What do learners need to learn?	Skills
Characteristics, operation and suitability of different types of equipment and machinery used for maintenance of non-production areas. Routine (planned) and non-routine maintenance (dealing with breakdowns) techniques for equipment and machinery, including storage, cleaning, calibration, visual and technical checks.	EC1, EC2, EC4, EC5, MC2

Performance outcome 2

2. Establish conditions for animal breeding

For this performance outcome, students are expected to acquire the skills to work with cattle and sheep.

2.1 Review information to complete a risk assessment.

What do learners need to demonstrate?	Skills
Assess a situation for adverse health and safety risks. Use information sources to complete a risk assessment. Instruct others how to carry out a task.	EC1, EC2, EC3, EC6

2.2 Complete a **health assessment** on specified livestock.

Range:

Health assessment – Condition of coat, skin, clean condition of mouth, dentition, condition of eyes, ears, nose, condition of head, body and limbs including feet, hooves, condition of genitals, udder, colour of mucous membranes, general mood, behaviour, group interaction, gait, movement, feeding and drinking behaviour, respiration, temperature, urine, faeces (amounts, consistency and effects on production).

What do learners need to demonstrate?	Skills
Visually assess animals' health and record findings. Take an animal's temperature using appropriate technique. Apply identification markings for ease of management or read and record an animal's ear tag. Use information to complete a health check form. Check the suitability of an animal for breeding. Draw conclusions with evidence from data analysis.	EC1, EC2, EC3, EC4, EC6, MC1, MC2, MC5, DC3, DC4

2.3 Safely restrain an animal using appropriate **equipment**.

Range:
Restraint equipment –
Cattle: Halter, race, crush, yoke, calf by hand, handling pens.
Sheep: Halter, race, weigh crate, dagging crate, turn over crate, crook, by hand, clamp, sheep handing pens.

What do learners need to demonstrate?	**Skills**
Use an animal's flight zone to create movement. Demonstrate restraining techniques and operate restraining equipment. Segregate livestock from within a herd or flock. Apply physical dexterity with appropriate pressure and delicacy when interacting with livestock.	EC1, EC2, EC4, EC6, MC5

2.4 Interpret **signs** to assess **suitability** for livestock breeding.

Range:
Signs – Signs of heat, time of year.
Suitability – Age, size, weight, condition.

What do learners need to demonstrate?	**Skills**
Assess suitability of livestock for breeding. Calculate nutritional requirements of breeding livestock.	EC4, EC5, MC1, MC2, MC5

2.5 Follow process to aid breeding for cattle and sheep.

What do learners need to demonstrate?	**Skills**
The process to aid breeding that must include: • Select breeding stock (male and female) • Identify when the female is ready for breeding (age, size, weight, condition) • Identify signs of heat where appropriate • Identify the method of breeding (natural, artificial insemination) • Manage the mating process • Calculate parturition date • Assist with determining pregnancy • Management of the pregnant animal up to parturition • Management at parturition	EC4, EC5, MC1, MC2, MC3.

Performance outcome 2

3. Rear livestock from birth to production standard

For this performance outcome, students are expected to acquire the skills to work with cattle and sheep.

3.1 Use a weighing scale to weigh livestock safely.

What do learners need to demonstrate?	Skills
Check weighing equipment for accuracy. Use a weighing scale to safely weigh an animal. Confirm the weight of an animal and determine if any action needs to be taken.	EC4, EC5, MC1, MC2, MC3, MC4, MC5, DC4

3.2 Feed and water livestock using appropriate **equipment**.

Range:
Equipment – Bottle, tube, bucket, diet feeders, automatic water dispenser, troughs.

What do learners need to demonstrate?	Skills
Clean, sterilise and disinfect equipment used for feed and water. Calculate feed requirements as appropriate to the requirements of the animal. Prepare and mix feed as appropriate to the feeding equipment to be used. Feed livestock using the appropriate equipment. Follow safe working practices when applying knife skills during routine tasks.	EC4, EC5, MC1, MC2, MC3, MC4, MC5, DC4

3.3 Use **equipment** to maintain livestock indoor accommodation.

Range:
Equipment – Hand tools (brush, shovel, fork), scrapers, power washers.

What do learners need to demonstrate?	Skills
Apply disinfectant (hand sprayer or alternative) to livestock indoor accommodation to ensure cleansing process is followed. Use hand tools to maintain livestock indoor accommodation cleanliness and hygiene.	EC4, EC5, MC1, MC2, DC1, DC2

3.4 Restrain and identify **livestock** safely.

Range:
Livestock –
Cattle: Halter, race, crush, yoke, calf by hand, handling pens.
Sheep: Halter, race, weigh crate, dagging crate, turn over crate, crook, by hand, clamp, sheep handing pens.

What do learners need to demonstrate?	**Skills**
Take the lead when working with a colleague to restrain livestock. Correctly restrain animal safely and securely. Work with others to apply appropriate techniques to safely move a group of livestock whilst taking into account animal welfare. Apply physical dexterity with an appropriate application of force and pressure when interacting with livestock. Gather, download and interpret digital tagging data. Correctly tag livestock with consideration for welfare. Transcribe information from observation to a document.	EC4, EC5.

3.5 Prepare environment and accommodation for arrival and departure of livestock.

What do learners need to demonstrate?	**Skills**
Assess hygiene risks for the arrival and departure of livestock. Maintain personal hygiene and personal protective equipment. Measure livestock indoor accommodation and calculate space requirements according to the needs of the animal and legislative requirements. Calculate stocking densities for livestock. Ensure access to and provision of feed and water. Prepare accommodation for a new arrival depending on the needs and requirements of the livestock. Prepare accommodation using hygienic techniques and applying biosecurity measures. Update livestock records accordingly (registration documentation, passports).	EC1, EC4, EC5, MC1, MC2, MC3, MC5, DC2

3.6 Safe application of treatments to livestock.

What do learners need to demonstrate?	**Skills**
Administer oral treatments as instructed by the stockperson. Complete records once treatment has been administered. Measure with precision and apply topical treatments to livestock as instructed by a stockperson.	EC1, EC4, EC5, MC1, MC2, MC3, MC5, DC2

3.7 **Grass, forage crop and weed** species.

Range:
Grass – Perennial rye grass, Italian rye grass, Timothy cocksfoot, meadow fescue.
Forage crops – Maize, turnips, forage rape, swede, fodder beet, mangolds, kale, wholecrop silage.
Weeds – Thistles, docks, nettles, buttercups, dandelions, chickweed, nightshade, charlock.

What do learners need to demonstrate?	Skills
Be able to identify grass and forage crop species. Be able to identify weeds. The impact of weeds on the production environment: • lower crop yield • less grazing area • contamination of feed • poisonous to livestock	EC1, EC4, EC5, MC1, MC2, MC3, MC5, DC2 .

3.8 Carry out routine tasks when rearing **livestock.**

Range:
Livestock – Cattle, sheep.

What do learners need to demonstrate?	Skills
Cattle: • apply a calf jacket • apply a halter • disbud a calf (under supervision and according to current legislation) Sheep: • catch a sheep safely • manually tip and turn a sheep using the correct techniques to check feet to identify if treatment is needed • age a sheep from its teeth and assess teeth quality	EC1, EC2, EC4, EC5, EC6, MC2, MC10

3.9 **Techniques** to test soil samples for key requirements.

Range:
Techniques – Depth, W pattern, areas to avoid, suitable timing.

What do learners need to demonstrate?	Skills
Take a representative soil sample using the appropriate techniques. Test a soil sample for nutrients. Test a soil sample for pH.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

Performance outcome 4

4. Optimise livestock production

For this performance outcome, students are expected to acquire the skills to work with cattle and sheep.

4.1 Use farm **machinery** and **equipment** safely and correctly.

Range:
Machinery – Tractor.
Equipment – Trailer, front end loader/materials handler, bale spike/grab, pallet forks.

What do learners need to demonstrate?	Skills
Complete pre-use/pre-start checks on machinery and equipment. Hitch a trailer to a tractor. Reverse a tractor with a trailer 10 metres in a straight line. Reverse a tractor and trailer into a confined space. Reverse a tractor around a corner. Use mechanical equipment to load bales of forage, hay or straw or pallets on to a trailer. Use mechanical equipment to unload bales of hay or straw or pallets off a trailer. Operate mechanical equipment (diet feeder) to feed livestock. Operate mechanical equipment to bed livestock.	EC1, EC2, EC4, EC5, EC6, MC2, MC10

4.2 Dispose of waste materials appropriately.

What do learners need to demonstrate?	Skills
Remove and dispose of wrap, net or string from a bale using the correct methods: • separate (segregate) • store in sacks/containers • pending disposal via a licensed waste disposal contractor	EC1, EC2, EC4, EC5, EC6, MC2, MC10

4.3 Clean and store equipment.

What do learners need to demonstrate?	Skills
Clean and service equipment for storage. Apply biosecurity measures: • apply disinfectant (if required) • stored away from contamination	EC1, EC2, EC4, EC5, EC6, MC2, MC10, DC3

4.4 Prepare and load livestock for transport.

What do learners need to demonstrate?	Skills
Apply protective equipment for transportation of livestock. Read and gather, check identity and movement information and complete species-specific legal transportation documentation. Visually assess condition of the transport for livestock safety and wellbeing: • adequate size for type of livestock • partitions (if required) • cleanliness • roadworthy / road legal • no sharp projections • no damage to floor, sides or roof • suitable ventilation Visually assess livestock for fitness for travel. Load and unload livestock onto and off transport.	EC1, EC2, EC4, EC5, EC6, MC2, MC5, MC10

4.5 Assess livestock during production.

What do learners need to demonstrate?	Skills
Determine body condition scores of livestock. Assess livestock for locomotion. Weigh an animal using appropriate equipment (scales). Apply physical dexterity with precise and controlled movements. Process and validate livestock performance data. Assess growth against targets (feed conversion efficiency, mortality rate). Represent livestock performance data using mathematical diagrams.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

4.6 Carry out routine tasks for **livestock** production.

Range:
Livestock – Cattle, sheep.

What do learners need to demonstrate?	Skills
Follow process and procedures for routine tasks depending on business requirements. Undertake routine tasks involved in the production of cattle**:** • cleanse a teat • strip foremilk from livestock • inspect foremilk from livestock • insert a tube into a teat Use the relevant methods to set up milking equipment. Calculate chemicals needed to go through milking equipment. Use equipment to milk livestock. Follow procedures to clean down milking equipment using the appropriate tools and cleaning materials.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

Measure water temperature throughout cleaning process. Preparing cattle for sale. Selecting finished cattle. **Sheep:** • Handle sheep through a race using the correct techniques • Follow procedures to foot bath sheep • Crutch or dag sheep • Use appropriate techniques to roll a fleece	

Performance outcome 5

5. Maintain all areas of the Livestock Production environment

5.1 Carry out a site-specific risk assessment.

What do learners need to demonstrate?	Skills
Identify hazards and implement appropriate control measures. Risks associated with utilities in areas surrounding the production environment (electricity overhead cables, septic tanks) and the associated controls and PPE requirements.	EC1, EC4, EC5, EC6

5.2 Prepare and plan boundary maintenance.

What do learners need to demonstrate?	Skills
Identify sources of information to plan for boundary maintenance. • material suppliers • equipment suppliers • public access maps • planning permission (if required) Develop search criteria and questions to be answered and use questioning techniques to obtain and clarify information. Summarise information and ideas using text and diagrams. Estimate resource and material requirements for maintenance. Prepare and present a budget for boundary installation. Identify and use of online applications to communicate with others.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

5.3 Use relevant **equipment and materials** for boundary installation.

Range:
Equipment and materials – Post driver, hammer, fencing pliers, straining equipment, staples, nails, posts, wire, rails, electric fence energiser.

What do learners need to demonstrate?	Skills
Construct a fence using wood and install a gate appropriate for the situation. Construct and test a wired (electric) fence. Maintain strained wired fencing using the appropriate equipment.	EC1, EC2, EC4, EC5, EC6, MC1,

	MC2, MC3, MC5, DC4

5.4 Maintain the **production environment** using the appropriate **machinery**, equipment and materials.

Range:
Production environment – Hedges (installation, laying and trimming), stone wall, fences, dykes and ditches, areas of grass/scrub land.
Machinery – Tractor, topper/mower.

What do learners need to demonstrate?	**Skills**
Maintain field boundaries according to specifications (legal requirements, scheme requirements) and using appropriate equipment. Cut grassland for different purposes (strip grazing, grass topping, silage) Equipment and materials: Hedges – Hedge cutter, bill hook, stakes, twine, planting spade, plant guards Stone wall - Blocks/stones, mortar, hammer, chisel, trowel. Fences – Post driver, hammer, fencing pliers, straining equipment, staples, nails, posts, wire, rails. Dykes and ditches - Brush cutter/trimmer, slash hook, shovel/spade, drain rods. Areas of grass/scrub land – Tractor, topper/mower.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

5.5 Carry out tasks using **ironmongery**.

Range:
Ironmongery – Hinges, hangers, latches, locks, sliding bolts.

What do learners need to demonstrate?	**Skills**
Install ironmongery onto gates, posts or doors.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

5.6 Prepare **materials** for boundary installation and maintenance.

Range:
Materials – Wood or steel.

What do learners need to demonstrate?	**Skills**
Prepare for coating and apply a coating to the surface.	EC1, EC2, EC4, EC5,

	EC6, MC1, MC2, MC3, MC5, DC4

5.7 Maintain paths and roadways using appropriate **equipment.**

Range:
Equipment – Shovel, spade, rake, brush cutter/trimmer.

What do learners need to demonstrate?	**Skills**
Safely clear paths and roadways of unwanted vegetation using appropriate equipment.	EC1, EC2, EC4, EC5, EC6

5.8 Carry out correct procedures for disposal of waste.

What do learners need to demonstrate?	**Skills**
Classify waste according to method of disposal: • separate (segregate) • store in sacks/containers • pending disposal via a licensed waste disposal contractor	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

Guidance for delivery

The purpose of this specialism is for learners to know and undertake the theory and practice of Livestock Production. A range of classroom based and practical delivery methods should be used to ensure both theory and practice are delivered with strong linkage to vocational context. Centres are encouraged to introduce employers and specific professionals from the livestock industry to provide interesting and relevant information to the learner.

Throughout all practical tasks the focus 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. 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 and operator's manuals. Learners should understand the importance of maintaining an awareness of current legislation and Codes of Practice.

Thought should be put on the need for biosecurity and environmental protection measures throughout. The requirement for regular maintenance and use of the manufacturer's manuals should also be identified.

For the more theory-based outcomes it is anticipated that the delivery will be through formal lectures but it is recommended that they are linked directly with interactive lessons in a real environment and that visiting speakers are used where possible to provide a vocationally relevant context.

Wherever possible, it is expected that the learner is taught using methods and systems reflecting those used in a commercial sized enterprise.

Suggested learning resources

Books

Anatomy and Physiology of Farm Animals - Google Books
Fertiliser Manual (RB209)

- Section 1 Principles of Nutrient Management and Fertilser Use
- Section 2 Organic Materials
- Section 3 Grass and Forage Crops

XLVets Factsheets

- Colostrum Management
- Calf Pneumonia
- Dairy Cow Lameness
- The Oestrus Cycle
- Managing the Periparturient Cow
  Ovine Abortion

Websites

Welfare codes as published by DEFRA:

- Cattle code of recommendations and animal welfare guide: **https://www.gov.uk/government/publications/code-of-recommendations-for-the-welfare-of-livestock-cattle**
- Sheep and goats codes of recommendations and animal welfare guides: **https://www.gov.uk/government/publications/code-of-recommendations-for-the-welfare-of-livestock-sheep**

- Codes of recommendations and animal welfare guides for laying hens, broiler (meat) chickens, ducks and turkeys: **https://www.gov.uk/government/publications/poultry-on-farm-welfare**
- Pigs code of recommendations and animal welfare guide: **https://www.gov.uk/government/publications/pigs-on-farm-welfare**

Red Tractor Standards: **https://redtractor.org.uk/our-standards/**

- Poultry: **https://redtractor.org.uk/our-standards/poultry/**
- Dairy Cattle: **https://redtractor.org.uk/our-standards/dairy/**
- Beef and Lamb: **https://redtractor.org.uk/our-standards/beef-lamb/**
- Pork: **https://redtractor.org.uk/our-standards/pork/**

Agriculture and Horticulture Development Board: **https://ahdb.org.uk/**

Keeping farmed animals detailed information: **www.gov.uk/topic/keeping-farmed-animals**

Farm animals: looking after their welfare - **https://www.gov.uk/guidance/farm-animals-looking-after-their-welfare**

Health and Safety Executive **- www.hse.gov.uk**

https://britishpoultry.org.uk/

National Statistics **Chapter 8: Livestock - GOV.UK (www.gov.uk)**

National Animal Disease Information Service: **NADIS - National Animal Disease Information Service**

TB Hub **TB hub - Bovine TB Advice & Tuberculosis Information for Cattle Farmers**

AHDB Better Returns Series:

- Reducing Lameness
- Optimising sheep systems
- Growing and Finishing Lambs
- Managing Ewes
- Improving Ewe Nutrition
- Healthy Grassland Soils
- Dairy Beef production Systems
- Feeding Growing and Finishing Cattle
- Husbandry and Welfare of Pigs Husbandry and welfare of pigs | AHDB
- Dairy Lameness Lameness in dairy cows | AHDB
- Fertility Fertility in dairy cows | AHDB
- Breeding Dairy breeding and genetics | AHDB
- Dairy Markets Dairy markets | AHDB
- Mastitis Mastitis in dairy cows | AHDB
- Dairy Calf Management Dairy calf management | AHDB
- GREATsoils | AHDB
- Slurry Storage: Slurry storage | AHDB
- Carbon: Carbon: a glossary of terms | AHDB
- Controlled Environment for Livestock: Controlled Environment for Livestock WEB (windows.net)
- Wheat Growth Guide Wheat growth guide | AHDB
- Barley Growth Guide Barley growth guide | AHDB

Scheme of assessment additional information

The below tables illustrate how each performance outcome is assessed through the use of assessment themes along with how each assessment criteria including the knowledge criteria in outcome 1 is packaged into an assessment theme for assessment purposes.

Assessment criteria that appear more than once against an assessment theme is required so that content is assessed within the context of a specific performance outcome.

Performance Outcome	Assessment themes	Assessment criteria
PO2 Establish conditions for animal breeding (20%)	Health and welfare	1.1 Animal welfare frameworks and legislation 1.2 Hazards and risks associated with the livestock production environment 1.3 Human-animal interaction with livestock 1.4 Handling and restraint equipment for all stages of production 1.5 Techniques to identify and monitor the health and wellbeing of livestock including signs of good and poor health 2.1 Review information to complete a risk assessment 2.2 Complete a health assessment on specified livestock 2.3 Safely restrain an animal using appropriate equipment
	Breeding	1.6 Natural behaviour that optimises health and welfare of livestock 1.13 Environmental requirements associated with livestock breeding 1.14 Performance indicators during breeding 2.4 Interpret signs to assess suitability for livestock breeding 2.5 Follow process to aid breeding for cattle and sheep

Performance Outcome	Assessment themes	Assessment criteria
PO3 Rear livestock from birth to production standard (30%)	Health and welfare	1.1 Animal welfare frameworks and legislation 3.2 Feed and water livestock using appropriate equipment 3.6 Safe application of treatments to livestock
	Handling	1.3 Human-animal interaction with livestock 1.4 Handling and restraint equipment for all stages of production 1.20 Methods that can be used to identify livestock 3.1 Use a weighing scale to weigh livestock safely 3.4 Restrain and identify livestock safely
	Rearing	1.18 Factors affecting livestock achieving performance targets 1.19 Performance indicators and methods to monitor the rearing of livestock 1.15 Characteristics of livestock that indicate they are ready for stages of production 3.8 Carry out routine tasks when rearing livestock
	Crop	1.8 Different types of grasses, legumes and herbal leys, forage crops and grazing techniques 1.9 Establishment, management and harvesting of grasses, legumes and herbal leys, cereal crops, forage crops 1.10 Different types of invasive plant and their characteristics 1.11 Soil types and their characteristics and properties 1.12 Factors to consider when conserving grass for feed 3.7 Grass, forage crop and weed species 3.9 Techniques to test soil samples for key requirements
	Environment and accommodation	1.1 Animal welfare frameworks and legislation 1.3 Human-animal interaction with livestock 1.6 Natural behaviour that optimises health and welfare of livestock 1.15 Requirements of livestock environment design and accommodation 1.17 Mechanical and manual techniques and the products used in livestock environment management 3.3 Use equipment to maintain livestock indoor accommodation 3.5 Prepare environment and accommodation for arrival and departure of livestock

Performance Outcome	Assessment themes	Assessment criteria
PO4 Optimise livestock production (30%)	Health and welfare	1.1 Animal welfare frameworks and legislation 1.3 Human-animal interaction with livestock 1.5 Techniques to identify and monitor the health and wellbeing of livestock including signs of good and poor health
	Transportation	1.4 Handling and restraint equipment for all stages of production 1.7 Factors that affect the movement and transportation of livestock 4.4 Prepare and load livestock for transport
	Production	1.22 Factors and systems used in livestock management 1.23 Key performance indicators of the production operation 4.5 Assess livestock during production 4.6 Carry out routine tasks for livestock production
	Machinery and equipment	4.1 Use farm machinery and equipment safely and correctly 4.3 Clean and store equipment 1.21 Equipment and machinery used for livestock management

Performance Outcome	Assessment themes	Assessment criteria
PO5 Maintain all areas surrounding livestock production (20%)	Health and safety	1.2 Hazards and risks associated with the livestock production environment 1.27 Malpractices when undertaking non-livestock production activities 5.1 Carry out a site specific risk assessment
	Plan boundary maintenance	1.23 Legal and regulatory requirements for maintaining species and habitats and encouraging wildlife 1.24 Principles of soil, water, air energy, pollution codes of practice 1.25 Management considerations of maintaining all areas of the livestock production environment 1.26 Records to be produced and stored in relation to maintenance of all areas of the livestock production environment 1.28 Cost implications of maintaining all areas of the livestock production environment 1.29 Performance targets for all areas of the livestock production environment 1.30 Alternative uses of all areas of the livestock production environment 1.31 Features of all areas of the livestock production environment 5.2 Prepare and plan boundary maintenance
	Carry out boundary maintenance	1.32 Maintenance of all areas of the livestock production environment 1.33 Characteristics, operation and suitability of different types of equipment and machinery 5.3 Use relevant equipment and materials for boundary installation 5.4 Maintain boundaries using the appropriate equipment and materials 5.5 Carry out tasks using ironmongery 5.6 Prepare materials for boundary installation and maintenance 5.7 Maintain paths and roadways using appropriate equipment 5.8 Correct procedures for disposal of waste

413 Livestock Production (For 2024 cohorts onwards)

Level:	3
GLH:	930
Assessment method:	Practical assignment

What is this Occupational Specialism about?

The purpose of this specialism is for learners to know and undertake the optimisation and maintenance of livestock production through all life stages and maintain areas surrounding the livestock production environment. Learners will have the opportunity to plan, perform and evaluate their work whilst utilising a range of techniques and resources.

Learners will develop their knowledge and understanding of, and skills in:

- knowledge of conditions required for optimal animal breeding and production
- knowledge of the tools, equipment and materials used in managing livestock
- knowledge of processes and methods used in managing livestock and the surrounding areas
- skills in optimising animal breeding and production
- skills in rearing and optimising livestock production
- skills in maintaining areas surrounding livestock production environment

Learners may be introduced to this specialism by asking themselves questions such as:

- What are the different stages of livestock production and how are they managed?
- What are the daily responsibilities of a stock person?
- What areas of the livestock industry do stock people work in?

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

1. Underpinning livestock knowledge criteria.

Performance Outcomes

On completion of this specialism, learners will be able to:

2. Establish conditions for animal breeding.
3. Rear livestock from birth to production standard.
4. Optimise livestock production.
5. Maintain areas surrounding the livestock production environment.

Completion of this specialism will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented at the end of the specification.

Underpinning knowledge

Common knowledge criteria

Livestock Production common knowledge criteria

This occupational specialism knowledge section relates to livestock - cattle, sheep, pigs and poultry production.

1.1 Animal welfare **frameworks** and **legislation**.

Range:
Frameworks – The codes of recommendations for all species, The Animal Welfare Act 2006**,** Five needs applicable to all species.
Legislation – The Welfare of Farmed Animals Regulations 2007, Veterinary Surgeons Act 1966, The Veterinary Medicines Regulations 2013, The Welfare of Animals (Transport) (England) Order 2006.

What do learners need to learn?	Skills
Role and purpose and importance of animal welfare frameworks, legislation and codes of recommendations for the welfare of livestock. How the welfare needs of livestock are implemented and delivered in practice, when preparing for breeding, rearing and optimising production. Implications (prosecution, loss of assurance status, financial loss) of non-compliance to the health and welfare of animals, the stock person and the business.	EC4, EC5.

1.2 **Hazards** and **risks** associated with the livestock production environment.

Range:
Hazards – livestock, hazardous materials (slurry, gases, dust), biohazards: zoonoses, septic tanks, machinery and equipment, fuel, oils, animal pharmaceuticals, slippery surfaces, trailing cables and hosepipes, uneven surfaces, working at height, electricity overhead cables.
Risks – (How harm can occur) lone working, being crushed, being kicked, being bitten, contamination or asphyxiation, injury from contact with machinery and equipment, slips, trips and falls, drowning, electrocution, contracting diseases/illness.

What do learners need to learn?	Skills
Typical hazards involved in all areas of the livestock production environment. Risks associated with working in all areas of the livestock production environment. The appropriate control measures. Purpose, use and content of risk assessments.	EC3, EC4, EC5.

1.3 Human interaction with livestock.

What do learners need to learn?	Skills
Importance of correct human interaction with livestock. Effects of poor human interaction with livestock. Techniques used to mitigate negative effects to livestock that may be caused through poor human-animal interaction: • consistent handling and restraint • welfare friendly handling and restraint • importance of routine. Appropriate techniques to ensure the correct dose is given to livestock when administering oral and topical medicines.	EC4, EC5.

1.4 **Handling and restraint equipment** for all **stages of production**.

Range:
Handling and restraint equipment –
Cattle: Halter, race, crush, yoke, calf by hand, handling pens.
Sheep: Halter, race, weigh crate, dagging crate, turn over crate, crook, by hand, clamp, sheep handing pens.
Pigs: Pig board, pig paddle, weigh crate, farrowing crate, snare, race, by hand, pens.
Poultry: Crate, by hand, nets.
Stages of production – Breeding, rearing and production.

What do learners need to learn?	Skills
Safety of the operator or stock person. Techniques and requirements for safe and welfare-orientated handling of livestock when capturing, handling and restraining livestock: Techniques: • consistent and appropriate welfare friendly handling and restraint • stock flow • appropriate use of trained farm dogs when dealing with sheep and cattle • effective use of pig board • poultry light levels. Requirements: • non-slip flooring • dry floors • sheeted gates or boards. Reasons for using feed to aid livestock movement: • encourage • distract • placate. Suitability and application of restraints and handling equipment for different situations: • health checks • identification	EC1, EC4, EC5.

- administering veterinary medicine
- weighing
- husbandry tasks
- moving livestock.

Recognition of livestock flight zones and points of balance.
How the flight zone can contribute to effective livestock handling.
Implication of flight zones when ensuring the safe and effective handling of livestock.

1.5 **Techniques** to identify and monitor the health and wellbeing of livestock including signs of **good and poor health**.

Range:
Techniques – Observation, smell, sound, clinical tests, weighing, temperature taking, feed and water intake, CCTV, physical examination (including touch), record keeping (manual and electronic) mobile applications for detecting parturition, auto drafting.
Dairy cattle only: Milk yield/composition monitoring.

Good and poor health –
Cattle, sheep and pigs: Conformation, condition of coat, skin, condition of mouth, dentition (cattle and sheep), condition of eyes, ears, nose/snout, condition of head, body and legs including feet, hooves, condition of genitals, colour of mucous membranes, general mood, behaviour, group interaction, gait, movement, feeding and drinking behaviour, weight gain monitoring, temperature, respiration, faeces (amounts, consistency and effects on production).
Poultry only: Feathers or scales, beak, claws, comb, condition of eyes, ears, condition of head, body and legs including feet, wings, colour of mucous membranes, general mood, behaviour, egg production monitoring, weight gain monitoring, flock interaction, gait, posture, movement, feeding and drinking behaviour, respiration, faeces (amounts, consistency and effects on production).

What do learners need to learn?
Requirements of the baseline expectations and features of good and poor health for the range of livestock at all ages and stages of production.
Different techniques that can be used to monitor young and adult livestock and the impact of these on the health and welfare of animals.
How these techniques are applied safely and empathetically to livestock.
Suitability of different techniques when applied to different livestock and environments:

- inside/outside
- free-range
- intensive/extensive.

Importance of correct livestock identification for stock management and legal compliance.
Importance of following a health plan when monitoring livestock.

Skill
EC4, EC5, MC2, MC6

1.6 **Natural behaviour** that optimises health and welfare of livestock.

Range:
Natural behaviour – Eating habits, sleeping habits, social behaviour.

What do learners need to learn?	Skills
Importance of the five needs in relation to the health, welfare and behaviour of all livestock species. The effects of indoor and outdoor environments on livestock behaviour. The effects of animal centred design on the welfare of livestock to minimise distress. The steps that can be taken to optimise natural behaviour and health and welfare in indoor and outdoor environments at all stages of production (breeding, rearing, production).	EC4, EC5.

1.7 **Factors** that affect the movement and transportation of livestock.

Range:
Factors – Legislation and regulation, stage of production (breeding, rearing, production) and pregnancy, physical problems (illness, injury, lameness), condition, mixing sexes, mixing sizes, animal temperament.

What do learners need to learn?	Skills
Importance of key legislative and ethical requirements when moving and transporting livestock for different purposes (transport of livestock: short and long journey, Animal Welfare Act for sale and movement). Importance of Animal Movement Regulations, Movement Licences, and the penalties of not complying with Movement Regulations. Conditions meaning livestock are unfit for transport (illness, physical injury, stage of production). Importance of techniques to avoid fear and distress when transporting livestock. Checks used when preparing livestock for transportation at all stages of production (visual and physical checks of the livestock; fit for transport checks - the correct livestock are all there with correct identification). Types of transport (crates, boxes, trailers, lorries) and their suitability for different types of livestock. Types of equipment and facilities required to support the loading and unloading of livestock (loading race and backing gate, hurdles, EID reader, weighing equipment, lighting, ventilation, containment, feed and water access, capacity of transport, temperatures). The design of handling equipment and the techniques which support optimum animal health and welfare and the safety of operators. Types of handling resources required to support the loading and unloading of livestock: • boards (pigs only) • catching gangs (poultry only) • halters	EC4, EC5.

• aids (food bag, sheep dog, straw on tail board)	

1.8 Different types of **grasses, legumes** and **herbal leys**, **cereal crops, forage crops** and **grazing techniques**.

Range:
Grasses – Perennial rye grass, Italian rye grass, timothy, cocksfoot, meadow fescue, hybrid grasses.
Legumes – Red clover, white clover, lucerne, sainfoin, soya, peas, beans.
Herbal leys – Chicory, plantain.
Cereal crops – Wheat, barley, oats, maize.
Forage crops – Swedes, turnips, forage rape, fodder beet, kale, mangolds.
Grazing techniques – Set stocking, rotational grazing, cell grazing, strip grazing, zero grazing, deferred grazing, clean grazing, conservation grazing, mob grazing.

What do learners need to learn?	**Skills**
Grasses, legumes, herbal leys, cereal crops and forage crops and their suitability to the range of production system (soil conditions, weather, intended use, industry needs, animal suitability). Growth stages of grasses and other forage crops. The significance of these growth stages for given uses (grazing, zero grazing, silage for dairy cattle, silage for beef and sheep, hay, harvesting). Characteristics of the different grasses. Grazing, harvesting and conservation techniques for different forage crops and their suitability to the range of production systems. Factors affecting the growth of grasses, legumes and herbal leys, cereal crops and forage crops and how these are managed to support yield (plate meters, dry matter calculations) and quality (soil type, soil conditions, nutrient status, establishment, weather conditions, plant health, weed control).	EC4, EC5, MC2

1.9 Establishment, management and harvesting of **grasses, legumes** and **herbal leys**, **cereal crops, forage crops**.

Range:
Grasses – Perennial rye grass, Italian rye grass, timothy, cocksfoot, meadow fescue, hybrid grasses.
Legumes – Red clover, white clover, lucerne, sainfoin, peas.
Herbal leys – Chicory, plantain.
Cereal crops – Wheat, barley, oats, maize.
Forage crops – Swedes, turnips, forage rape, fodder beet, kale, mangolds.

What do learners need to learn?	**Skills**
Uses and lifecycles of different cereal and forage crops. Growing specifications (management tasks during the growing stage).	EC4, EC5, MC1, MC2, DC4

Optimum conditions for growth (soil temperature, daylight hours, moisture content, topography, free from weeds, pests and disease, nutrient availability, correct soil pH). Time allocation for the range of activities (crop monitoring, nutrient application, plant protection product application, cultural/physical control methods, Integrated Pest Management (IPM) required to manage crops). Resources required for the range of activities required to manage crops. Qualifications/licenses, for a range of activities required to manage crops.	

1.10 Different types of invasive plant and their characteristics.

Range:
Invasive plant – Japanese knotweed, ragwort, Himalayan balsam, giant hogweed, dock, thistle, nettle, horsetail, rhododendron, bracken, gorse, heather.

What do learners need to learn?	**Skills**
Different types of invasive plant that can have an adverse effect on livestock, forage, grassland and grazing areas. Characteristics of different types of invasive plant and their effect on livestock. Environmental implications of invasive plants. Different methods (cutting, grazing, herbicides) that can be used to mitigate the effects of invasive plants on the environment. Invasive plants included in legislation that can be encountered in areas surrounding the production environment.	EC4, EC5.

1.11 **Soil types** and their **characteristics** and **properties.**

Range:
Soil types – Sand, silt, clay, loam, peat, chalk.
Characteristics – Texture, structure.
Properties – pH, nutrient availability, drainage, water holding capacity, organic matter and living organisms in the soil, ease of cultivation, colour and heat retention, existing pollutants, horizons.

What do learners need to learn?	**Skills**
Different types of soils including inorganic and organic. Characteristics and properties of different soil types. Soil types, characteristics and properties influence on flora selection and growth. Techniques used to determine soil properties (soil sampling, pH testing, nutrient testing, interpretation of a soil profile).	EC4, EC5, MC4, MC8

1.12 **Factors** to consider when conserving grass for feed.

Range:
Factors – Legislation, environmental schemes.

What do learners need to learn?	**Skills**
Factors to consider when conserving grass for feed from all areas of the livestock production environment: • operation timings • complying with environmental scheme requirements • avoiding protected species. The operations involved in maintaining grassland (scarifying, rolling, harrowing, weed control).	EC4, EC5, MC2, MC5, DC4

Specific knowledge criteria for performance outcomes

Establish conditions for animal breeding (PO2)

For this performance outcome, learners are expected to acquire knowledge related to livestock - cattle, sheep, pigs and poultry.

Livestock breeding

1.13 Environmental **requirements** associated with livestock breeding.

Range:
Requirements – Ventilation, lighting, temperature, humidity monitoring, space requirements, bedding, topography, access to feed and water, fencing, shelter, natural behaviour, presence of other animals of the same species.

What do learners need to learn?	Skills
Different environmental requirements and how they can influence breeding success. Use of technology (ventilation, lighting, temperature) and equipment (automated systems) to manage environmental requirements during livestock breeding.	EC4, EC5, DC6

Business management

1.14 **Performance indicators** during breeding.

Range:
Performance indicators – Cost, effectiveness of breeding (tight lambing/calving block), mortality rate
Cattle: spread of service dates, calving index.
Sheep: spread of service dates, raddle (or alternative markers) lambing %, lamb weight
Pigs: spread of service dates, number of litters per year (farrowing rate), litter size, piglets weaned per litter.
Poultry: number of hatching eggs, birth weight.

What do learners need to learn?	Skills
How breeding performance indicators are used to make livestock breeding decisions. Calculations relating to breeding performance: • cattle: calving index, conception rate • sheep: scanning percentage, lambing percentage • pigs: progeny born alive/dead, conception rate • poultry: hatching percentage Techniques (benchmarking and auditing) used to monitor performance indicators and how they can be utilised. Implications for failing to meet breeding performance indicators (financial loss, difficulty obtaining data, difficulty solving problems).	EC4, EC5, MC1, MC2, DC6

Rear livestock from birth to production standard (PO3)

For this performance outcome, learners are expected to acquire knowledge related to Livestock - cattle, sheep, pigs and poultry.

Animal health and welfare

1.15 Characteristics of livestock that indicate they are ready for **stages of production**.

Range:
Stages of production –
Cattle, sheep and pigs: Weaning, growing, finishing, service/insemination.
Poultry: Hatching, growing, finishing or point of lay.

What do learners need to learn?	Skills
Characteristics of livestock that indicate they are ready for different stages of production and how they are monitored: • age • weight • growth rates • suitability for breeding • comb colour/development (laying hens only) • milk yield (dairy cattle only).	EC1, EC4, MC1, MC2

1.16 Requirements of livestock **environment design**, **accommodation** and **feeding**

Range:
Environment design – Ventilation, lighting, temperature, humidity monitoring, bedding, stocking densities, access to feed and water, fencing, isolation facilities.
Accommodation – Indoor (pens, cubicles, crates) outdoor (fields, field shelter, huts, arcs).
Feeding – feeding techniques (individual, group, by hand, mechanical), feeding equipment (bottle, tube, bucket, nipple drinker, automatic water bowl/trough, hay rack, mechanical feeder, feed hopper).

What do learners need to learn?	Skills
How the types of accommodation, environment and design affect the different stages of production for all livestock species: • parturition • weaning • growing • finishing • service/insemination • rearing, point of lay, egg production in hens Potential hazards (toxic plants, biohazards, sharp objects, uneven flooring/steps) and how these are minimised in environment design. How the need to handle and move livestock and product (eggs, wool, meat milk) is considered and managed in handling and accommodation designs. Ensure the design minimises animal fear and distress and ensures optimisation of health and welfare for both livestock and humans.	EC4, EC5, MC2, DC4

Recognising the effects of poor accommodation on livestock growth/ performance. Types and uses of equipment required to optimise livestock performance and promote welfare (temperature control, shed alarms, ventilation including mechanical, natural and controlled, lighting, CCTV, enrichment, feed and water equipment, insulation). Techniques and equipment (barriers, gates, doors, fences, alarms, CCTV) used to monitor and maintain accommodation security and their suitability for different environments and species. Implications of poor security of accommodation (loss of livestock, theft, unwanted access, biosecurity issues). Techniques and equipment for feeding livestock at different life stages: • newborn • young animal • adult.	

1.17 **Mechanical** and **manual techniques**, and the **products** used in livestock environment management.

Range:
Mechanical – Tractor, loader, telehandler, skid steer, auto scraper, trailer.
Manual – Brush, shovel, fork, pressure washer, steam cleaner, wheelbarrow.
Techniques – Frequency of cleaning sheds, washing and disinfection techniques, range of bedding materials, mechanical and manual cleaning techniques.
Products – Disinfectant, sterilising materials, bedding.

What do learners need to learn?	**Skills**
Techniques used in livestock environment management and how these techniques are applied. Benefits and potential harms these techniques could bring to livestock when managing environments and livestock manure.	EC4, EC5

1.18 Factors affecting livestock achieving performance targets.

What do learners need to learn?	**Skills**
Factors that can affect livestock achieving performance targets and how to optimise them: • accommodation • nutrition and water • health status • environmental conditions • fertility of male and females • male female ratio • age of male • age of females • influence of breed and breeding	EC1, EC4, EC5, MC1, MC2

• number of young produced or reared • hatch dates, rearing, point of lay, egg production (poultry only) • spread of service (mixed age range of progeny) • weaning date (cattle, sheep and pigs only).	

Business management

1.19 **Performance indicators** and **methods** to monitor the rearing of livestock.

Range:
Performance indicators – Costings (feed, production, veterinary and medicine (vet & med)), growth rate, feed conversion rates, mortality, environmental impact.
Methods – Operating procedures, record keeping, data analysis.

What do learners need to learn?	**Skills**
How the performance indicators are used to make decisions regarding livestock during the stages of rearing. Calculations relating to rearing performance. Implications of failing to meet performance indicators (failure to comply with contracts, financial loss). Records to complete and retain in relation to the rearing of livestock: • identification (herd/flock, individual) • medicine (purchase, storage, usage, disposal) • movement/transportation • disposal (fallen stock, farmyard manure, slurry)	MC5, MC6, MC8

1.20 **Methods** that can be used to identify livestock.

Range:
Methods –
All species: Paint, non-digital tagging, observation, CCTV, tattoo, specific documents for pedigree livestock.
Cattle only: Freeze branding, passports, transponders, heat monitors, collars, tapes
Cattle and sheep only: EID technology.
Sheep only: Raddle marks.
Sheep and pigs: Ear notching.
Pigs only: Slap marking.
Poultry only: Leg rings.

What do learners need to learn?	**Skills**
Legal requirements and movement documents for livestock birth registration, sale and recording. Methods used to identify livestock, the importance of traceability and how this is managed. The suitability of the different methods in different situations and their impact on the health and welfare of the animal.	EC4, EC5

Optimise livestock production (PO4)

For this performance outcome, learners are expected to acquire knowledge related to livestock - cattle, sheep, pigs and poultry.

Machinery and equipment

1.21 **Equipment and machinery** used for livestock management.

Range:
Equipment and machinery – Tractors, trailers, loading equipment, storage equipment, GPS, hand tools, mechanical equipment, robotics (feeding, milking, handling facilities), livestock transport equipment, feeding equipment, water supply equipment, ventilation fans, scratching brushes, automated side curtains.

What do learners need to learn?	Skills
Types of equipment and machinery used for managing livestock, their characteristics, function, operation and suitability for tasks. Maintenance techniques (routine and non-routine) used to keep machinery and equipment in operational condition, and the implications of poor maintenance.	EC4, EC5, MC10

Animal production

1.22 Factors and **systems** used in livestock management.

Range:
Systems – Intensive, extensive.

What do learners need to learn?	Skills
Different systems used to manage livestock production, lifecycles, finishing processes. Factors that can affect performance of livestock: • nutrition, health status, age, breed and breeding, environmental conditions How these factors are managed to optimise performance.	EC4, EC5, MC2, MC10.

Business management

1.23 Key **performance indicators** of the production operation.

Range:
Performance indicators –
All species: Feed conversion efficiency, growth rates, carcass quality.
Cattle: Milk yield and quality (dairy cattle only), calving index, number of calves produced /reared, weaning weights.
Sheep: number of lambs produced /reared, weaning weights.
Pigs: litter size; numbers reared, pre-weaning mortality, weaning weights.
Poultry only: egg production (number, size and quality).

What do learners need to learn?	Skills
How the performance indicators are used and monitored to make decisions during the production stage. Implications to livestock and business for failing to meet performance indicators: • higher feed costs • lower price for livestock products (meat, milk, eggs, wool) • contractual obligations • impact on farm management and income.	EC4, EC5, MC5, MC6,

Maintain areas surrounding the Livestock Production Environment (PO5)

Business

1.24 **Legal and regulatory** requirements for maintaining species and habitats and encouraging wildlife.

Range:
Legal and regulatory – Food and Environment Protection Act 1985, Control of Pollution Act 1974, Wildlife and Countryside Act 1981, Protection of Badgers Act 1992, Weeds Act 1959, Countryside and Rights of Way Act 2000, The Hedgerows Regulations 1997, Environmental Land Management Scheme (ELMS), development of biodiversity plans.

What do learners need to learn?	Skills
Key requirements of environmental legislation, regulations, codes of practice and organisational policies and how they are applied to the maintenance of the production environment. Ecology of wildlife species (flora and fauna) that are present on farmland and the key characteristics of their habitats. Techniques (establishment of habitats) used to encourage habitats of beneficial species. Benefits and limitations of maintaining species and habitats in the production environments. Legal and regulatory requirements for maintaining species and habitats. Various grants schemes available to improve the environment.	EC4, EC5

1.25 Management of soil, air and water.

What do learners need to learn?	Skills
Principles of water, soil and air pollution codes of practice. Sources of pollution from livestock production environments. How to minimise pollution in livestock production environments. Storage and use of organic manures (slurry and farmyard manures). Implications to livestock production and maintenance of the environment: • stocking rates • avoiding run-off • manure management • waste management procedures • buffer zones	EC4, EC5, MC5, MC6

1.26 Management considerations of **maintaining** all areas surrounding the livestock production environment.

Range:
Maintenance – Paths, structural repairs, gates, fencing and boundaries, protection of habitats.
Resources – Human, financial, physical.
Factors – Site and situation, public access, wildlife, habitats.
Implications – Fines, prosecution, loss of scheme income, public perception.
Techniques – Field maps, photographs, digital software, species surveys.

What do learners need to learn?	Skills
Management considerations of maintaining all areas surrounding the livestock production environment. Maintenance requirements of an area and the factors that need to be considered when maintaining an area. Implications of management activities and how these are applied. Resources required for development and sustainability including ongoing maintenance of all areas surrounding the livestock production environment. Factors that affect short-and long-term planning and their impact on implementation of plans. Timescales involved in operational implementation of a plan. Techniques used to monitor and evaluate progress of a plan.	EC4, EC5, MC1, MC2, MC9.

1.27 **Records** to be produced and stored in relation to maintenance of all areas of the livestock production environment.

Range:
Records – Legislative, management.

What do learners need to learn?	Skills
Types of records to be produced and stored: Legislative records: • pesticide application • NVZ records • farm assurance compliance • environmental scheme compliance Management records: • field operations • seed labels • income • expenditure • fertiliser application • feed and grazing records Systems for management of information and data.	EC4, EC3 EC5, DC6.

1.28 **Malpractices** when undertaking non-livestock production activities.

Range:
Malpractices – Pollution, interfering with, and destruction of, habitats, incorrect timing of operations, non-certificated operators, obstruction of rights of way, noise disturbances, inappropriate disposal of waste.

What do learners need to learn?	Skills
Examples of malpractices (unethical, inefficient, illegal) and non-compliance when undertaking non-livestock production activities and the potential implications to the business and the production environment. • prosecution • loss of assurance status • public perception	EC4, EC5.

1.29 Cost implications of maintaining all areas of the livestock production environment.

What do learners need to learn?	Skills
Costs of maintenance (routine and non-routine) of all areas of the livestock production environment and implications for profitability and business success.	EC4, EC5, MC1, MC2, MC8, MC10, DC4

1.30 **Performance targets** for all areas of the livestock production environment.

Range:
Performance target – Scheme requirements, business requirements.

What do learners need to learn?	Skills
How performance targets are applied in different situations and production environments: Scheme requirements: • environmental scheme • assurance scheme. Business requirements: • physical performance • financial performance.	EC4, EC5, MC5, MC6,

1.31 **Alternative uses** of all areas of the livestock production environment.

Range:
Alternative uses – Land use schemes**:** Stewardship, environmental and land management scheme, diversification (recreational uses, alternative livestock enterprise, renewable energy).

What do learners need to learn?	**Skills**
Opportunities for use of all areas of the livestock production environment for financial benefit and implications for use. • allowing public access • planting areas with restrictions on cutting/grazing • creation of wildlife habitats – loss of production Meeting scheme requirements. Consideration and importance of natural capital.	CSA, CSB, CSE, EC4, EC5, EC6.

1.32 Features of all **areas** of the livestock production environment.

Range:
Areas – Roads, public rights of way, hedgerows and boundaries, ponds and lakes, water courses, woodland.
Standards – Stewardship scheme, assurance scheme, local authority, national park authority, felling license, Environment Agency.
Techniques – Cutting, spraying, strimming, planting, boundary maintenance, hedge laying, stone walling.

What do learners need to learn?	**Skills**
Standards for maintenance of all areas of the livestock production environment set by different standards setting bodies. Effects of techniques used to protect and enhance all areas of the livestock production environment: • creating habitats • enhancing existing habitats • removing undesirable weeds • protecting habitats.	EC4, EC5.

Maintenance

1.33 Maintenance of all **areas** of the livestock production environment.

Range:
Areas –
Ditches: Cleaning, ensuring free flow of water.
Boundaries: Repairs, installation (strained wire, electric fencing, wire netting, post/stake and rail, stone walls, gates, hedges (planting, trimming, laying)).

What do learners need to learn?	Skills
Maintenance techniques and materials used to maintain and repair boundaries, building fabric and habitats and how they are applied. Importance of considering constructing to local styles and traditions.	EC4, EC5, MC2, MC5, DC2, DC4

Machinery and equipment

1.34 Characteristics, **operation** and suitability of different types of **equipment and machinery** in non-production areas.

Range:
Operation – In accordance with manufacturers' guidance and by trained operators.
Equipment and machinery – Tractor, topper, mower, hedge cutter, post driver.

What do learners need to learn?	Skills
Characteristics, operation and suitability of different types of equipment and machinery used for maintenance of non-production areas. Routine (planned) and non-routine maintenance (dealing with breakdowns) techniques for equipment and machinery, including storage, cleaning, calibration, visual and technical checks.	EC1, EC2, EC4, EC5, MC2

Performance outcome 2

2. Establish conditions for animal breeding

For this performance outcome, learners are expected to acquire the skills to work with two from the following livestock: cattle, sheep and pigs.

2.1 Assess a situation for health and safety risks.

What do learners need to demonstrate?	Skills
Identify hazards. Use information gathered to complete a risk assessment. Assess the level of risk. Instruct others how to carry out a task.	EC1, EC2, EC3, EC6

2.2 Complete a **health assessment** on livestock.

Range:

Health assessment –

Cattle: Conformation, condition of coat/skin, condition of mouth, dentition, condition of eyes, ears, nose, condition of head, body and legs including hooves, condition of genitals, udder, teats, colour of mucous membranes, general mood, behaviour, group interaction, gait, movement, feeding and drinking behaviour, respiration, temperature, urine, faeces (consistency and effects on production).

Sheep: Conformation, condition of fleece, skin, condition of mouth, dentition, condition of eyes, ears, nose, condition of head, body and legs including hooves, condition of genitals, udder, teats, colour of mucous membranes, general mood, behaviour, group interaction, gait, movement, feeding and drinking behaviour, respiration, temperature, urine, faeces (consistency and effects on production).

Pigs: Conformation, condition of skin, condition of mouth, condition of eyes, ears, snout, condition of head, body and legs including feet/toes, condition of genitals, udder, teats, colour of mucous membranes, general mood, behaviour, group interaction, gait, movement, feeding and drinking behaviour, respiration, temperature, urine, faeces (consistency and effects on production).

What do learners need to demonstrate?	Skills
Visually assess the health of livestock and record findings. Correct identification of signs of good and poor health of livestock. Take an animal's temperature using appropriate technique. Apply identification markings for ease of management. Read and record an animal's ear tag. Use information to complete a health check form. Check the suitability of an animal for breeding. Draw conclusions with evidence from information analysis.	EC1, EC2, EC3, EC4, EC6, MC1, MC2, MC5, DC3, DC4

2.3 Restrain livestock using appropriate **equipment**.

Range:
Restraint equipment –
Cattle: Halter, race, crush, yoke, calf by hand, handling pens.
Sheep: Halter, race, weigh crate, dagging crate, crook, by hand, clamp, sheep handing pens.
Pigs: Race, handling pens, pig board, weigh crate.

What do learners need to demonstrate?	**Skills**
Use an animal's flight zone to aid movement of livestock. Segregate livestock from within a herd or flock. Apply physical dexterity with appropriate care when interacting with livestock. Restraining techniques and operation of restraining equipment.	EC1, EC2, EC4, EC6, MC5

2.4 Assess suitability of livestock for breeding.

What do learners need to demonstrate?	**Skills**
Assess suitability of livestock for breeding: • cattle: conformation, age, size, weight, body condition, growth rate, signs of heat (oestrus), time of year. • sheep: conformation, age, size, weight, body condition, growth rate, time of year. • pigs: conformation, age, size, weight, body condition, growth rate, days post weaning, signs of heat (oestrus).	EC4, EC5, MC1, MC2, MC5

2.5 Follow process to aid breeding for livestock.

What do learners need to demonstrate?	**Skills**
The process to aid breeding must include: • select breeding stock (male and female) • identify when livestock is ready for breeding (age, size, weight, condition, temperament) • identify signs of heat where appropriate • identify the method of breeding (natural, artificial insemination) • manage the mating process • assist with determining pregnancy • calculate parturition date • calculate nutritional requirements of the pregnant animal • management (feeding, housing, health and welfare) of the pregnant animal up to parturition • management (birthing process) at parturition	EC4, EC5, MC1, MC2, MC3.

Performance outcome 2

3. Rear livestock from birth to production standard

For this performance outcome, learners are expected to acquire the skills to work with two from the following livestock: cattle, sheep and pigs.

3.1 Use a weighing scale to weigh livestock.

What do learners need to demonstrate?	Skills
Check weighing equipment for accuracy. Use a weighing scale to weigh livestock. Confirm the weight of an animal and determine if any action needs to be taken.	EC4, EC5, MC1, MC2, MC3, MC4, MC5, DC4

3.2 Feed and water livestock using appropriate **equipment**.

Range:
Equipment – Nipple drinker, automatic water bowl/trough, bucket, feed trough.

What do learners need to demonstrate?	Skills
Clean equipment used for feed and water. Calculate feed as appropriate to the requirements of livestock. Prepare and mix feed (if required) as appropriate to the feeding equipment to be used. Feed livestock using the appropriate equipment. Follow safe working practices when applying knife skills during routine tasks.	EC4, EC5, MC1, MC2, MC3, MC4, MC5, DC4

3.3 Use **equipment** to maintain livestock indoor accommodation.

Range:
Equipment – Hand tools (brush, shovel, fork), scrapers, power washers.

What do learners need to demonstrate?	Skills
Apply disinfectant (hand sprayer or alternative) to livestock indoor accommodation and ensure cleansing process is followed. Use equipment to maintain livestock indoor accommodation cleanliness and hygiene.	EC4, EC5, MC1, MC2, DC1, DC2

3.4 **Restrain** and identify livestock safely.

Range:
Restrain –
Cattle: Halter, race, crush, yoke, calf by hand, handling pens.
Sheep: Halter, race, dagging crate, weigh crate, crook, by hand, clamp, handling pens.
Pigs: Race, pig boards, handling pens, weigh platform.

What do learners need to demonstrate?	Skills
Take the lead when working with a colleague to restrain livestock. Correctly restrain livestock safely and securely. Work with others to apply appropriate techniques to move a group of livestock whilst taking into account animal welfare. Apply physical dexterity with an appropriate application of care when interacting with livestock. Gather and interpret digital or numerical tagging data. Correctly tag livestock with consideration for welfare. Transcribe information from observation to a document.	EC4, EC5.

3.5 Prepare environment and accommodation for arrival and departure of livestock.

What do learners need to demonstrate?	Skills
Assess hygiene risks for the arrival and departure of livestock. Maintain personal hygiene and personal protective equipment. Measure livestock indoor accommodation and calculate space requirements according to the needs of the animal and legislative requirements. Calculate stocking densities for livestock. Ensure access to and provision of feed and water. Prepare accommodation for new arrivals/departing livestock depending on the needs and requirements of the livestock. Prepare accommodation using hygienic techniques and applying biosecurity measures. Update livestock records accordingly (registration documentation, passports).	EC1, EC4, EC5, MC1, MC2, MC3, MC5, DC2

3.6 Safe administration of treatments to livestock.

What do learners need to demonstrate?	Skills
Administer oral treatments to livestock as instructed and according to manufacturers' instructions. Measure with precision Apply topical treatments to livestock as instructed and according to manufacturers' instructions. Apply identification markings for ease of management. Complete medicine records once treatment has been administered.	EC1, EC4, EC5, MC1, MC2, MC3, MC5, DC2

3.7 **Grass, forage crop and weed** species.

Range:
Grass – Perennial rye grass, Italian rye grass, timothy, cocksfoot, meadow fescue.
Forage crops – Maize, turnips, forage rape, swede, fodder beet, mangolds, kale, whole crop silage.
Weeds – Thistles, docks, nettles, buttercups, dandelions, chickweed, nightshade, charlock, ragwort.

What do learners need to demonstrate?	**Skills**
Identification of grass and forage crop species. Identification of weeds. The impact of weeds on the production environment: • lower crop yield • less grazing area • contamination of feed • poisonous to livestock.	EC1, EC4, EC5, MC1, MC2, MC3, MC5, DC2.

3.8 Carry out **techniques** to test soil samples for key requirements.

Range:
Techniques – Depth, W pattern, areas to avoid, suitable timing.

What do learners need to demonstrate?	**Skills**
Take a representative soil sample using the appropriate techniques. Test a soil sample for nutrients. Test a soil sample for pH.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

Performance outcome 4

4. Optimise livestock production

For this performance outcome, learners are expected to acquire the skills to work with two of the following livestock: cattle, sheep and pigs.

4.1 Use farm **machinery** and **equipment** safely and correctly.

Range:
Machinery – Tractor with front end loader or materials handler.
Equipment – Trailer, bale spike/grab, pallet forks.

What do learners need to demonstrate?	Skills
Complete pre-use/pre-start checks on machinery and equipment. Hitch a trailer to a tractor. Reverse a tractor with a trailer 10 metres in a straight line. Reverse a tractor and trailer into a confined space. Reverse a tractor around a corner. Use mechanical equipment to load bales of forage, hay or straw or pallets onto a trailer. Use mechanical equipment to unload bales of hay or straw or pallets off a trailer. Operate mechanical equipment to feed livestock. Operate mechanical equipment to bed livestock.	EC1, EC2, EC4, EC5, EC6, MC2, MC10

4.2 Dispose of waste materials appropriately.

What do learners need to demonstrate?	Skills
Remove and dispose of wrap, net or string from a bale using the correct methods: • separate (segregate) • store in sacks/containers • pending disposal via a licensed waste disposal contractor.	EC1, EC2, EC4, EC5, EC6, MC2, MC10

4.3 Clean and prepare **equipment** for storage.

Equipment – Trailer, front end loader/materials handler, bale spike/grab, pallet forks.

What do learners need to demonstrate?	**Skills**
Clean and prepare equipment for storage. Apply biosecurity measures: • apply disinfectant (if required) • stored away from contamination.	EC1, EC2, EC4, EC5, EC6, MC2, MC10, DC3

4.4 Prepare and load livestock for transport.

What do learners need to demonstrate?	**Skills**
Apply protective equipment for transportation of livestock. Read and gather, check identity and movement information and complete species-specific legal transportation documentation. Visually assess condition of the transport for livestock safety and wellbeing: • adequate size for type of livestock • partitions (if required) • cleanliness • roadworthy / road legal • no sharp projections • no damage to floor, sides or roof • suitable ventilation Visually assess livestock for fitness for travel. Load and unload livestock onto and off transport.	EC1, EC2, EC4, EC5, EC6, MC2, MC5, MC10

4.5 Assess livestock during production.

What do learners need to demonstrate?	**Skills**
Determine body condition scores of livestock. Visually assess livestock for lameness. Weigh livestock using equipment (scales). Apply physical dexterity with precise and controlled movements. Process and validate livestock performance data. Assess growth against targets (feed conversion efficiency, mortality rate). Represent livestock performance data using mathematical diagrams.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

4.6 Carry out routine tasks for livestock production.

What do learners need to demonstrate?	**Skills**
Follow process and procedures for routine tasks depending on business requirements. Use an animal's flight zone to aid movement of livestock. Segregate livestock from within a herd or flock. Apply physical dexterity with appropriate care when interacting with livestock.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

Prepare livestock for sale.

- clean
- check identification markings/tags

Select finished livestock.

- review health/medical status
- review size and weight

Handle sheep or cattle through a race using the correct techniques.
Follow procedures to foot bath sheep or cattle.
Use appropriate techniques to clip cattle or crutch/dag sheep.

Performance outcome 5

5. Maintain areas surrounding the Livestock Production environment

5.1 Carry out site-specific risk assessment.

What do learners need to demonstrate?	Skills
Identify hazards. Assess risks associated with utilities in areas surrounding the production environment (electricity overhead cables, septic tanks). Implement appropriate control measures including PPE requirements.	EC1, EC4, EC5, EC6

5.2 Prepare and plan boundary maintenance.

What do learners need to demonstrate?	Skills
Identify sources of information to plan for boundary maintenance. • material suppliers • equipment suppliers • public access maps • planning permission (if required) Develop search criteria and questions to be answered and use questioning techniques to obtain and clarify information. Summarise information and ideas using text and diagrams. Estimate resource and material requirements for maintenance. Prepare and present a budget for boundary installation. Identify and use of online applications to communicate with others.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

5.3 Use relevant **equipment and materials** for boundary installation.

Range:

Equipment and materials – Post driver, hammer, fencing pliers, straining equipment, staples, nails, posts/stakes, plain and barbed wire, livestock wire mesh netting, rails, gate(s), electric wire, electric fence/stakes, fault finder voltage and current meter, electric fence energiser.

What do learners need to demonstrate?	Skills
Construct a fence using wood. Install a gate appropriate for the situation. Construct and test a wired (electric) fence. Construct a fence using livestock wire mesh netting. Maintain strained wired fencing using the appropriate equipment.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

5.4 Maintain the **production environment** using the appropriate **machinery**, **equipment** and **materials**.

Range:
Production environment – Hedges (planting, trimming and laying), stone walls, fences, dykes and ditches, areas of grass/scrub land.
Machinery – Tractor, topper/mower, hedge cutter.
Equipment and materials –
Hedges: Hedge cutter/trimmer, bill hook, stakes, twine, planting spade, plant guards.
Stone wall: Blocks/stones, mortar, hammer, chisel, trowel.
Fences: Post driver, hammer, fencing pliers, straining equipment, staples, nails, posts/stakes, wire, wire netting, gate(s), rails.
Dykes and ditches: Brush cutter/trimmer, slash hook, shovel, spade, drain rods.
Areas of grass/scrub land: Tractor, topper/mower.

What do learners need to demonstrate?	**Skills**
Maintain production environment boundaries according to specifications (legal requirements, scheme requirements) and use appropriate machinery, equipment and materials. Cut grassland for different purposes (zero grazing, grass topping, conservation).	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

5.5 Carry out tasks using **ironmongery**.

Range:
Ironmongery – Hinges, hangers, latches, locks, sliding bolts.

What do learners need to demonstrate?	**Skills**
Install ironmongery onto gates, posts or doors.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

5.6 Prepare **materials** for boundary installation and maintenance.

Range:
Materials – Wood or steel.

What do learners need to demonstrate?	**Skills**
Prepare materials for coating. Apply a coating to the material surface.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

5.7 Maintain paths and roadways using appropriate **equipment.**

Range:
Equipment – Shovel, spade, rake, brush cutter/trimmer.

What do learners need to demonstrate?	Skills
Clear paths and roadways of unwanted vegetation using appropriate equipment.	EC1, EC2, EC4, EC5, EC6

5.8 Carry out correct procedures for disposal of waste.

What do learners need to demonstrate?	Skills
Classify waste according to method of disposal: • separate (segregate) • store in sacks/containers • pending disposal via a licensed waste disposal contractor.	EC1, EC2, EC4, EC5, EC6, MC1, MC2, MC3, MC5, DC4

Guidance for delivery

The purpose of this specialism is for learners to know and undertake the theory and practice of Livestock Production. A range of classroom based and practical delivery methods should be used to ensure both theory and practice are delivered with strong linkage to vocational context. Centres are encouraged to introduce employers and specific professionals from the livestock industry to provide interesting and relevant information to the learner.

Throughout all practical tasks the focus 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. 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 and operator's manuals. Learners should understand the importance of maintaining an awareness of current legislation and Codes of Practice.

Thought should be put on the need for biosecurity and environmental protection measures throughout. The requirement for regular maintenance and use of the manufacturer's manuals should also be identified.

For the more theory-based outcomes it is anticipated that the delivery will be through formal lectures but it is recommended that they are linked directly with interactive lessons in a real environment and that visiting speakers are used where possible to provide a vocationally relevant context.

Wherever possible, it is expected that the learner is taught using methods and systems reflecting those used in a commercial sized enterprise.

Suggested learning resources

Books

Anatomy and Physiology of Farm Animals - Google Books

Fertiliser Manual (RB209)

- Section 1 Principles of Nutrient Management and Fertiliser Use
- Section 2 Organic Materials
- Section 3 Grass and Forage Crops

Nix Farm Management Pocketbook (The most recent edition) - Agro Business Consultants Ltd

HSBC benchmarking document

Cow Signals – a link to a range of books

XLVets Factsheets

- Colostrum Management
- Calf Pneumonia
- Dairy Cow Lameness
- The Oestrus Cycle
- Managing the Periparturient Cow
- Ovine Abortion

Websites

Welfare codes as published by DEFRA:

- Cattle code of recommendations and animal welfare guide: **https://www.gov.uk/government/publications/code-of-recommendations-for-the-welfare-of-livestock-cattle**
- Sheep and goats codes of recommendations and animal welfare guides: **https://www.gov.uk/government/publications/code-of-recommendations-for-the-welfare-of-livestock-sheep**
- Codes of recommendations and animal welfare guides for laying hens, broiler (meat) chickens, ducks and turkeys: **https://www.gov.uk/government/publications/poultry-on-farm-welfare**
- Pigs code of recommendations and animal welfare guide: **https://www.gov.uk/government/publications/pigs-on-farm-welfare**

RSPCA Assured UK: **https://www.rspcaassured.org.uk/**

- Chickens: **https://www.rspcaassured.org.uk/farmed-animal-welfare/chickens/**
- Egg-laying hens: **https://www.rspcaassured.org.uk/farmed-animal-welfare/egg-laying-hens/**
- Dairy cows: **https://www.rspcaassured.org.uk/farmed-animal-welfare/dairy-cows/**
- Beef cattle: **https://www.rspcaassured.org.uk/farmed-animal-welfare/beef-cattle/**
- Sheep: **https://business.rspcaassured.org.uk/media/atiluphr/sheep_welfare_standards_2023.pdf**
- Pigs: **https://www.rspcaassured.org.uk/farmed-animal-welfare/pigs/**

Red Tractor Standards: **https://redtractorassurance.org.uk/**

- Poultry: **https://redtractor.org.uk/our-standards/poultry/**
- Dairy Cattle: **https://redtractor.org.uk/our-standards/dairy/**
- Beef and Lamb: **https://redtractor.org.uk/our-standards/beef-lamb/**
- Pork: **https://redtractor.org.uk/our-standards/pork/**

Agriculture and Horticulture Development Board: **https://ahdb.org.uk/**

Keeping farmed animals detailed information: **www.gov.uk/topic/keeping-farmed-animals**

Farm animals: looking after their welfare: **https://www.gov.uk/guidance/farm-animals-looking-after-their-welfare**

Health and Safety Executive: **www.hse.gov.uk**

British Poultry Council: **https://britishpoultry.org.uk/**

National Statistics Chapter 8 Livestock: **GOV.UK (www.gov.uk)**

National Animal Disease Information Service: **NADIS - National Animal Disease Information Service**

TB Hub **TB hub - Bovine TB Advice & Tuberculosis Information for Cattle Farmers**

Environmental Land Management (ELM) update**: how government will pay for land-based environment and climate goods and services**

Stress-free stockmanship

AHDB webinar series - **AHDB webinars, events and online meeting recordings | AHDB**

AHDB knowledge library - Knowledge library

AHDB Better Returns Series:

- Reducing lameness in sheep
- Optimising sheep systems
- Growing and finishing lambs
- Managing ewes
- Improving ewe nutrition
- Healthy grassland soils
- Dairy beef production systems
- Feeding growing and finishing cattle
- Feeding growing and finishing pigs
- Husbandry and welfare of pigs
- Lameness in dairy cows
- Fertility in dairy cows
- Dairy breeding and genetics
- Dairy markets
- Mastitis in dairy cows
- Dairy calf management
- GREATSOILS
- Slurry storage
- Net Zero: a glossary of terms
- Wheat growth guide
- Barley growth guide
- Controlled environment for livestock
- Improving cattle handling
- Improving sheep handling
- Moving and handling pigs
- Fencing Handbook

Scheme of assessment additional information

The below tables illustrate how each performance outcome is assessed through the use of assessment themes along with how each assessment criteria including the knowledge criteria in outcome 1 is packaged into an assessment theme for assessment purposes.

Assessment criteria that appear more than once against an assessment theme is required so that content is assessed within the context of a specific performance outcome.

Performance Outcome	Assessment themes	Assessment criteria
PO2 Establish conditions for animal breeding (16%)	Health and welfare	1.1 Animal welfare frameworks and legislation 1.2 Hazards and risks associated with the livestock production environment 1.3 Human interaction with livestock 1.4 Handling and restraint equipment for all stages of production 1.5 Techniques to identify and monitor the health and wellbeing of livestock including signs of good and poor health 2.1 Assess a situation for health and safety risks 2.2 Complete a health assessment on livestock 2.3 Restrain livestock using appropriate equipment
	Breeding	1.13 Environmental requirements associated with livestock breeding 1.14 Performance indicators during breeding 2.4 Assess suitability for livestock breeding 2.5 Follow process to aid breeding for different livestock

Performance Outcome	Assessment themes	Assessment criteria
PO3 Rear livestock from birth to production standard (34%)	Health and welfare	1.1 Animal welfare frameworks and legislation 1.19 Performance indicators and methods to monitor the rearing of livestock 3.2 Feed and water livestock using appropriate equipment 3.6 Safe administration of treatments to livestock
	Handling	1.2 Hazards and risks associated with the livestock production environment 1.3 Human interaction with livestock 1.4 Handling and restraint equipment for all stages of production 1.20 Methods that can be used to identify livestock 3.1 Use a weighing scale to weigh livestock 3.4 Restrain and identify livestock safely
	Rearing	1.15 Characteristics of livestock that indicate they are ready for stages of production 1.16 Requirements of livestock environment design, accommodation and feeding 1.18 Factors affecting livestock achieving performance targets 1.19 Performance indicators and methods to monitor the rearing of livestock 1.20 Methods that can be used to identify livestock 3.1 Use a weighing scale to weigh livestock 3.2 Feed and water livestock using appropriate equipment. 3.4 Restrain and identify livestock safely
	Crop	1.8 Different types of grasses, legumes and herbal leys, forage crops and grazing techniques 1.9 Establishment, management and harvesting of grasses, legumes and herbal leys, cereal crops, forage crops 1.10 Different types of invasive plant and their characteristics 1.11 Soil types and their characteristics and properties 1.12 Factors to consider when conserving grass for feed 3.7 Grass, forage crop and weed species 3.8 Carry out techniques to test soil samples for key requirements
	Environment and accommodation	1.1 Animal welfare frameworks and legislation 1.3 Human interaction with livestock 1.6 Natural behaviour that optimises health and welfare of livestock 1.16 Requirements of livestock environment design, accommodation and feeding

		1.17 Mechanical and manual techniques and the products used in livestock environment management 3.3 Use equipment to maintain livestock indoor accommodation 3.5 Prepare environment and accommodation for arrival and departure of livestock

Performance Outcome	Assessment themes	Assessment criteria
PO4 Optimise livestock production (30%)	Health and welfare	1.1 Animal welfare frameworks and legislation 1.3 Human interaction with livestock 1.5 Techniques to identify and monitor the health and wellbeing of livestock including signs of good and poor health
	Transportation	1.4 Handling and restraint equipment for all stages of production 1.7 Factors that affect the movement and transportation of livestock 4.4 Prepare and load livestock for transport
	Production	1.6 Natural behaviour that optimises health and welfare of livestock 1.22 Factors and systems used in livestock management 1.23 Key performance indicators of the production operation 4.5 Assess livestock during production 4.6 Carry out routine tasks for livestock production
	Machinery and equipment	1.21 Equipment and machinery used for livestock management 4.1 Use farm machinery and equipment safely and correctly 4.2 Dispose of waste materials appropriately. 4.3 Clean and prepare equipment for storage.

Performance Outcome	Assessment themes	Assessment criteria
PO5 Maintain all areas surrounding livestock production (20%)	Health and safety	1.2 Hazards and risks associated with the livestock production environment 1.28 Malpractices when undertaking non-livestock production activities 5.1 Carry out site specific risk assessment
	Plan boundary maintenance	1.11 Soil types and their characteristics and properties. 1.24 Legal and regulatory requirements for maintaining species and habitats and encouraging wildlife 1.25 Management of soil, air and water. 1.26 Management considerations of maintaining all areas surrounding the livestock production environment 1.27 Records to be produced and stored in relation to maintenance of all areas of the livestock production environment 1.29 Cost implications of maintaining all areas of the livestock production environment 1.30 Performance targets for all areas of the livestock production environment 1.31 Alternative uses of all areas of the livestock production environment 1.32 Features of all areas of the livestock production environment 5.2 Prepare and plan boundary maintenance
	Carry out boundary maintenance	1.33 Maintenance of all areas of the livestock production environment 1.34 Characteristics, operation and suitability of different types of equipment and machinery in non-production areas. 5.3 Use relevant equipment and materials for boundary installation 5.4 Maintain the production environment using the appropriate machinery**,** equipment and materials 5.5 Carry out tasks using ironmongery 5.6 Prepare materials for boundary installation and maintenance 5.7 Maintain paths and roadways using appropriate equipment 5.8 Carry out correct procedures for disposal of waste

404 Ornamental and environmental horticulture and landscaping

Level:	3
GLH:	1000
Assessment method:	Practical assignment

What is this Occupational Specialism about?

The purpose of this specialism is for learners to know and undertake establishment, maintenance, and management of horticultural areas and designed landscapes, and the installation of landscape features. Learners will have the opportunity to plan, perform and evaluate their work whilst utilising a range of techniques, methods and resources.

Learners will develop their knowledge and understanding of, and skills in:

- knowledge of establishment, maintenance, installation and management of horticultural areas and designed landscapes
- knowledge of the tools, equipment and materials used in ornamental and environmental horticulture.
- skills in establishment and maintenance
- skills in the installation of landscape features
- skills in the planning and management of designed landscapes.

Learners may be introduced to this specialism by asking themselves questions such as:

- What different types of horticultural areas are there and what are they used for?
- What do horticulturists do on a daily basis?
- What areas of the industry do horticulturists work in?

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

1. Ornamental and environmental horticulture and landscaping knowledge criteria

Performance Outcomes

On completion of this specialism, learners will be able to:

2. Establish ornamental and environmental horticultural areas
3. Maintain ornamental and environmental horticultural areas
4. Install landscape features
5. Manage existing designed landscapes

Completion of this specialism will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented at the end of the specification.

Underpinning knowledge outcome 1

Common knowledge criteria

Ornamental and environmental horticulture and landscaping knowledge criteria

Ornamental and environmental horticulture areas

1.1 **Types, characteristics** and **purposes** of ornamental and environmental horticultural areas.

Range:
Types – Public, amenity, botanical, heritage, private, green space, urban pollution control.
Characteristics – Ownership, location, accessibility, finances.
Purposes – Green space provision, leisure, education, visitor attractions, scientific, historic, designed landscapes, pollution control.

What do learners need to learn?	Skills
The characteristics of different types of horticultural areas. Purposes of different types of horticultural areas. Similarities and differences between different types of horticultural areas. Benefits and limitations of the different types, characteristics and purposes of ornamental and environmental horticultural areas.	EC4, EC5

1.2 The **physical characteristics** of a site.

Range:
Physical characteristics – Drainage, aspect, topography, exposure and situation, microclimates, soil type.
Information sources – Surveys/observation, maps, plans, soil tests, orientation using compass, historical records, temperature records.

What do learners need to learn?	Skills
Physical characteristics of a site. Information required to determine the physical characteristics of a site. Sources used to acquire the information.	EC4, EC5

1.3 **Types** and **purposes** of common landscaping features.

Range:
Types of landscaping features – Hard: Horizontal (paving, paths, steps), vertical (walls, fencing, pergolas).
Soft: Planting beds, turf, trees, shrubs, hedges, water features.
Purposes – Aesthetic, functional, security, access, shelter, habitat.

What do learners need to learn?	**Skills**
Different types of common landscaping features including hard, soft and water features. Purposes of common landscaping features. Their suitability for different sites and horticultural situations – different aesthetic schemes, heritage styles and maintenance requirements.	EC4, EC5

1.4 **Types** and **purposes** of sustainable horticultural features.

Range:
Types – Rain gardens, green walls, green roofs, wildflower meadows, Sustainable Urban Drainage (SuDS).
Purposes – Climate mitigation: temperature control, pollution control, water management, wildlife.

What do learners need to learn?	**Skills**
The meaning of, and reasons for sustainable horticulture. Types of sustainable horticultural features, sourcing and construction materials. Purposes of sustainable horticultural features. Suitability of sustainable horticultural features for different sites and horticultural situations – different aesthetic schemes, heritage styles and maintenance requirements. Impacts of establishing sustainable ornamental and environmental horticultural areas.	EC4, EC5

Environmental

1.5 **Factors** that influence sourcing of plants and landscape materials.

Range:
Factors – Objectives for horticultural area, business values, biosecurity, supply chain, sustainable procurement, costs, availability.

What do learners need to learn?	**Skills**
How the range of factors can affect sourcing decisions. How provenance of plants and landscape materials are verified. How biosecurity is verified (e.g. plant passports, plant health checks). Economic, environmental and social importance of responsible and sustainable plant and landscape material sourcing/procurement.	EC4, EC5

Plant identification and classification

1.6 **Plant classification** and **techniques** for identification.

Range:
Plants – Live specimens, samples, images, variety of current occupationally relevant species including weeds and protected species.
Classification – Families, genera, species, varieties, cultivars (botanical and legal), hybrids, intergeneric, interspecific.
Techniques – Observation of characteristics and morphology, botanical keys, books, internet/software.

What do learners need to learn?	Skills
Plant taxonomy and hierarchical structure of classification – how plants are classified and the meaning of the different classifications. How characteristics and morphology are used to classify plants. Format for scientific names according to the international code of nomenclature. How to use different techniques and information sources to identify plants. Implications of inaccurate classification and use of nomenclature when establishing, maintaining and managing horticultural areas. Application and maintenance of plant records.	EC3, EC4, EC5

1.7 **Types** of plants and their key **characteristics**.

Range:
Types – Monocot, dicot/eudicot, hermaphrodite, evergreen, deciduous, hardy, tender, annuals, biennials, perennials, herbaceous, shrubs, trees, climbers, ferns, mosses.
Characteristics – Physical characteristics, lifecycle, morphology, native habitat.

What do learners need to learn?	Skills
Key characteristics of the different types of plants. Their uses and contribution to ornamental and environmental horticultural areas. Implications of these characteristics for inclusion in ornamental and environmental horticultural areas.	EC4, EC5

Plant growth and development

1.8 **Environmental factors** which affect plant growth.

Range:
Environmental factors – Microclimate, light (duration and intensity), rainfall, irrigation and water availability, drainage, soil type and structure, nutrients (deficiency/excess).
Site specific – Boggy, marginal, aquatic, dry, sunny, shady, sheltered, exposed, coastal, frost pockets.

What do learners need to learn?	Skills
How different environmental factors affect the morphology and physiology of plants and their growth and development. Issues arising in plant establishment and growth as a result of sub-optimal growing environments. Physiological and morphological symptoms and how these are identified. Remedial strategies used to rectify these issues.	EC4, EC5

Soils

1.9 **Soil types,** and **techniques** used to determine soil **characteristics**.

Range:

Soil types – Loams, clays, silts, sands, organic soils.

Characteristics – Texture, structure, pH, nutrient availability and cation exchange, drainage and water holding capacity, organic matter and living organisms in the soil, colour and heat retention, ease of cultivation, existing pollutants, horizons.

Techniques – Soil samples (W method), texture testing (particle size distribution), pH testing, digging and analysing a profile pit, determining drainage and water holding capacity.

What do learners need to learn?	Skills
Characteristics of different soils and soil types including their chemical and physical properties. Techniques used to take a representative soil sample. Physical and chemical techniques used to determine soil characteristics. How physical and chemical soil characteristics affect suitability for different types of plants in different types of ornamental and environmental horticultural areas. How previous land management affects soil characteristics. How physical and chemical soil characteristics affect plant health.	EC3, EC4, EC5 MC1, MC2 DC1

Plant health

1.10 **Quality characteristics** of healthy plants.

Range:

Quality characteristics – Vigour, form, balance, root condition, turgidity, certified seed/plants.

What do learners need to learn?	Skills
Methods used to identify quality characteristics (observation, records, certification). How plant quality affects planting decisions. How plant quality affects maintenance decisions.	EC4, EC5

1.11 **Biosecurity measures** and their application.

Range:
Biosecurity measures – Inspection, monitoring, regulation, plant passports, quarantine, movement control, isolation.

What do learners need to learn?	Skills
Biosecurity risk factors in different horticulture and landscaping situations. Biosecurity measures and their importance in maintaining healthy production, service and working environments. Reporting requirements for notifiable pests and diseases. How and when appropriate biosecurity measures are applied in different situations: • establishing ornamental and environmental horticultural areas • maintaining ornamental and environmental horticultural areas • installing hard landscape features in ornamental and environmental horticultural areas	EC4, EC5

1.12 **Typical pests** and **diseases** in ornamental and environmental horticulture areas, and **control methods** used.

Range:
Pests – Vertebrates (birds and mammals).
Invertebrates: Nematodes, molluscs, mites, insects (Hemiptera, Coleoptera, Lepidoptera, Hymenoptera).
Diseases – Fungal, viral, bacterial.
Control methods – Tolerance, cultural control, biological controls, chemical controls, Integrated Pest Management (IPM).

What do learners need to learn?	Skills
The biology of pests, diseases, disorders and weeds and the problems they cause, to include: • how pests and diseases enter horticultural areas • causes (conditions that encourage the pest, disease, disorder or weed) • life cycle, where relevant (e.g. duration and timing of each stage, reproduction methods and rates, life expectancy, effects of season, temperature, day length and other relevant environmental factors, dormant period, host plants) • abiotic and biotic symptoms and indicators (defects, damage, effects on growth) of the existence of pests and diseases • spread, where relevant (e.g. vectors, airborne, rain splash, flying, seed, rhizomes, offsets, stolons, runners, bulbs, corms) • the disease triangle (pathogen, host and environment) How to recognise the pathogen, host, and environmental factors required for different viral, bacterial and fungal diseases to occur. • Implications of the existence of pests and diseases to establishing and maintaining ornamental and environmental horticultural areas • Control methods that can be used and how these are applied, including Integrated Pest Management (IPM) and holistic approaches	EC4, EC5

• Factors that affect decisions about the use of control methods, including integrated pest management systems, and the potential impacts on non-target species and the environment	

1.13 Typical plant **disorders** and their **symptoms**.

Range:
Disorders – Nutrient deficiency/excess, waterlogging, wind scorch, drought, salt spray, frost damage, high/low light.
Symptoms – Wilting, chlorosis, distortion, leaf damage, stunted growth.

What do learners need to learn?	**Skills**
Typical plant disorders resulting from poor planning, planting and aftercare, their symptoms, and how to mitigate for these. Diagnosis of plant symptoms of disorders attributable to environmental issues. Implications of poor planning – the need for and importance of appropriate planting locations, mitigation of environmental effects. Methods for correction and avoidance of plant disorders including application of nutrients, irrigation, drainage, shelter.	EC4, EC5

Communication

1.14 **Types of plans** of ornamental and environmental horticultural areas.

Range:
Types of plans – Drawings (indicative drawings/sketches, scale drawings/site plans), hand drawn, digital.

What do learners need to learn?	**Skills**
Purposes for, and information shown on different types of plans of ornamental and environmental horticultural areas. Symbols and terminology used, and conventions to be applied. Suitability of different types of plans for different audiences and purposes. How to produce indicative drawings and sketches to communicate site/garden layouts and locations of different features, using hand drawn and digital methods.	EC1, EC2, EC5 MC1, MC3, MC4 DC1, DC2

Marking and setting out

1.15 **Techniques**, **processes, equipment** and **information** used to **set out** ornamental and environmental horticultural areas.

Range:
Techniques – Offsetting, triangulation, electronic plotting.
Processes – Conversion, measurement, marking out (shapes, lines, angles, right-angles).

Equipment – String line, tapes, line marking equipment, ranging rods/poles, tapes, compass, optical equipment, height measuring devices and electronic measuring devices, Global Positioning Systems (GPS), optical or laser levels and theodolites.

Information – Plans (scale drawings, sketches, electronic), layout, scale, dimensions, location of features, datum points and baseline, sequence of operations, applicability, methods of recording information.

Set out – Straight lines, curves, circles, irregular shapes.

What do learners need to learn?	Skills
Definition of the terms 'offsetting', 'triangulation' and 'electronic plotting'. Standard units of measurement (metric scale and units of measurement, bearings, grid references). Techniques for marking and setting out design requirements, including the use of mathematical rules and formulae (triangulation, trigonometry, Pythagoras' theorem). How information is presented (scale drawings, sketches, electronic). How to mark out sites from scaled plans. How to set out shapes on the ground from scaled plans. How to set out levels on the ground from scaled plans. How the techniques are applied accurately, safely and effectively including processes involved, equipment required, information and data required. Suitability of techniques for different environments and landscape features (access issues, time constraints, level of accuracy required, availability of equipment).	EC1, EC2, EC5 MC1, MC3, MC4 DC1, DC2

Business

1.16 The **principles** of project management.

Range:

Principles – Purpose and scope of the project, milestones and timescales, supply chain, people management, resources, budgeting, planning.

What do learners need to learn?	Skills
How to analyse project requirements, identification of purpose and scope. Importance of milestones and timescales and implications of failing to meet these. Components of the supply chain and implications of any delay or shortages. Importance of positive people management including effective communication. Methods for resource management, prioritisation and importance of timing, sourcing and minimisation of wastage. Basic budgeting techniques, importance of quantities and costs, implications of under or over budgeting. How projects are planned, including: • how to develop project plans for establishment of areas, maintenance of areas, installation of landscape features • tasks, actions, responsibilities, resource allocation and timescales	EC1, EC2, EC5 MC2, MC4, MC9 DC1, DC4

1.17 Site management **considerations**.

Range:

Considerations – Planning, site surveying, allocating tasks, task prioritisation, monitoring, setting timescales, checking quality, monitoring health and safety, teamwork, storage, security, access, employment rights and responsibilities (ERR), compliance with legislation (Construction Design and Management Regulations 2015), required standard of finish, removal of equipment and waste materials from site.

What do learners need to learn?	**Skills**
How site management considerations are applied in ornamental and environmental horticultural areas when managing establishment of areas/maintenance of areas/installation of landscape features (task prioritisation and appropriate staff/resource allocation, site day-to-day management, ERR). Importance of initial project planning. How to undertake a basic site analysis including identifying underground/overhead services and existing structures and vegetation. How projects are monitored throughout (quality control, health and safety, progress to timescales, efficient use of staffing and resources). Importance of contingency planning for weather, supply issues, staff sickness, budget constraints. Purpose and importance of the Construction Design and Management (CDM) Regulations 2015. Importance of meeting stakeholder expectations. Implications if these are not applied (financial, legal, reputation, resources (physical and human) success of the project).	EC3, EC5 MC1, MC9 DC1

1.18 How a site operates.

What do learners need to learn?	**Skills**
Private and public realm considerations (ownership, access, purpose of the site, visitor safety, budgets, themes, security). Logistics of transportation, access, delivery, storage, utilities, signage and use of people, materials and equipment, removal and disposal of waste material. Importance of accurate site surveys and plans, consideration of weather and environmental issues, storage options, site security and information dissemination methods. Importance of keeping a site clear and clean (health and safety, reduced wastage, impact on visitors, environmental impacts, better working procedures). Implications of not meeting timescales and specifications (extra staff costs, impact on other projects, delay in opening site and on visitor experience, damage to reputation). Implications for the relationship with client/customer, public and other colleagues (importance of establishing good relations, agreement on any changes, information dissemination in appropriate form, repeat business).	EC3, EC5 MC1 DC1, DC3

Health and safety

1.19 Typical **hazards** associated with establishment, maintenance, landscaping and management of ornamental and environmental horticultural areas.

Range:
Hazards – Adverse weather, chemicals, environmental issues, slips/trips/falls, slopes, utilities, access, lifting and loading, tools, machinery, vehicle movements, working near water, working at height, lone working, vibration (hand-arm vibration syndrome).

What do learners need to learn?	Skills
Hazards associated with working in ornamental and environmental horticultural areas and landscaped environments. Importance of controls (elimination, reduction, isolation, control, PPE, discipline) that need to be in place to maintain the safety of self, colleagues and visitors to the site. Importance of risk assessments and method statements, typical formats and content, implications for use and non-compliance: How to • carry out the risk assessment process on a site-specific basis • identify typical hazards • evaluate the risks • apply appropriate control measures • communicate safety procedures and information to others on site	EC1, EC3, EC5, EC6 DC2

1.20 Types of **personal protective equipment** (PPE).

Range:
Personal protective equipment – Safety boots/footwear, protective clothing (waterproofs, knee pads, protective trousers, high-visibility clothing), gloves, eye protection, hearing protection, head protection, breathing protection.

What do learners need to learn?	Skills
Types of PPE available for the establishment, maintenance, landscaping and management of ornamental and environmental horticultural areas. Purpose of appropriate PPE for the task (protect operator, protect public). Implications for incorrect use including risk to operator, public, environment, delays to job, legal action. PPE storage and maintenance requirements.	EC4, EC5

1.21 Manual handling **techniques.**

Range:
Techniques – Safe lifting techniques, use of appropriate lifting/moving aids.

What do learners need to learn?	Skills
Principles of posture and body mechanics and their application for safe and efficient installation of landscape features. How to apply safe lifting techniques. How to select and use appropriate lifting/moving aids (sack barrows, trolleys, pump trucks). Importance of taking into account individual capability when manually lifting objects. When to summon assistance to move objects/loads, including machinery.	EC4, EC5

Tools, equipment machinery and materials

1.22 **Tools, equipment, machinery** and materials used for different **operations.**

Range:
Tools – Spades, trowels, forks, rakes, hoes, pick axes, post knockers, soil augers, hammers, spanners, screwdrivers, pruning tools (knife, secateurs, pruning saw, loppers), cutting tools (saws, hand saw, hacksaw, blades), splitting tools (chisels, bolsters, hammers, stone splitting pins/shims and wedges), turf lifter.
Equipment – Wheelbarrows/trolleys, string line, tapes, line marking equipment, netting, geotextile, signage, portable storage, hoses, mist units, irrigation systems and controllers, sprayers, fertiliser spreaders, soil moisture sensors, weather stations, IT equipment.
Machinery – Rotary cultivator/rotavator, turf cutter, tractor, excavator, transport vehicles, trailers, hedge trimmers, shears, strimmers, brushcutters, mowers, drills, powered saws, abrasive wheels, angle grinders, soil augers.
Operations – Establishment, maintenance, assembling and installing landscape features, measuring, marking out, cutting, joining, levelling, shaping, installing, soil excavations, surveying, propagation.

What do learners need to learn?	Skills
Types of tools, equipment and materials used for different operations involved in ornamental and environmental horticulture and landscaping. Their characteristics, purpose and suitability for tasks. Operation and handling requirements. Their suitability (including limitations) for different tasks involved in ornamental and environmental horticulture and landscaping. Importance of following manufacturers' specifications for tools, equipment and materials and implications for failing to follow instructions and guidance. Importance of compliance with best practice and legislation when operating tools equipment and machinery including: the operations/machinery/equipment for which it is a legal requirement that the operator has completed a Certificate of Competence/Licence to Practice qualification and/or training.	EC4, EC5

1.23 **Maintenance** of tools equipment and machinery.

Range:
Maintenance – Cleaning, sharpening, greasing, calibration.

What do learners need to learn?	**Skills**
Importance of pre-start checks and reference to operators' manuals. Importance of pre-and post-use maintenance of tools, equipment and machinery – safe operation, safety of operator, reduced costs and downtime, maintaining to manufacturers' specifications, validity of warranties, legal requirements. Methods of maintenance – cleaning, calibration, sharpening, greasing, use of appropriate maintenance tools and techniques. Implications for poor maintenance to individuals, the landscape and installation tasks – safety risks to operators, downtime, replacement costs of machinery and tools, risk of poor workmanship, delays to project.	EC4, EC5

1.24 **Techniques** and **equipment** for movement and transfer of tools, equipment and materials across varied terrains and heights.

Range:
Techniques – Manual, mechanical.
Equipment – Hand, barrows/trucks/trolleys, ropes, bungees, straps, containers (crates, boxes, packing materials), powered machinery (tractor and trailer, forklift, quad bike/ATV, telehandler), PPE.

What do learners need to learn?	**Skills**
Techniques and equipment to be applied and their suitability for different terrains and heights. Hazards, risks and controls used – the need for risk assessment when moving tools, equipment and materials. Implications for inappropriate decisions – injury, damage or loss of tools and materials, project delays, replacement costs, damage to machinery, environmental damage, damage to soft and hard landscape components, damage to third party property, reputational damage.	EC4, EC5

1.25 **Storage facilities** required for different **tools, equipment and materials.**

Range:
Storage facilities – Secure containers, locked sheds/buildings, chemical stores, fuel stores.
Tools, equipment and materials – Hand and power tools, machinery, fuels, chemicals, landscaping materials.

What do learners need to learn?	**Skills**
Importance and methods of protection of valuable and dangerous tools, equipment and materials. Security and environmental requirements for valuable and dangerous tools, equipment and materials – including legal requirements. Implications of poor storage – loss and damage of tools, equipment and materials, delays to projects, cost of replacement, environmental damage.	EC4, EC5

Specific knowledge criteria for performance outcomes

Establish ornamental and environmental horticultural areas (PO2)

Ornamental and environmental horticulture areas

1.26 The implications of **site characteristics** when establishing ornamental and environmental horticultural areas.

Range:
Site characteristics – Drainage, aspect, topography, exposure and situation, microclimates, existing features, location of utilities, access, habitats, soil type.

What do learners need to learn?	Skills
How site characteristics can affect the design brief, plant selection, budget/costs, wildlife and sustainability for ornamental and environmental horticultural areas. Factors that need to be included in a site survey.	EC4, EC5

1.27 The implications of **landscaping features** on establishing ornamental and environmental horticultural areas.

Range:
Landscaping features
Hard: Horizontal (paving, paths, steps), vertical (walls, fencing, pergolas).
Soft: Planting beds, turf, trees, shrubs, hedges, water features.

What do learners need to learn?	Skills
How hard landscaping features can affect establishment of ornamental and environmental horticultural areas. Considerations relating to hard landscaping features including: • sustainability • wildlife considerations • budget • design • underlying rock/natural features • land use • health and safety How soft landscaping features can affect establishment of ornamental and environmental horticultural areas. Considerations relating to soft landscaping features including: • removal/renovation • wildlife considerations • usage plans • native/non-native species • relevant legislation • health and safety	EC4, EC5

1.28 Impacts of **sustainable horticultural features** when establishing ornamental and environmental horticultural areas.

Range:
Sustainable horticultural features - Rain gardens, green walls, green roofs, Sustainable Urban Drainage (SuDS), wildflower areas, habitat piles, wild areas.

What do learners need to learn?	**Skills**
Impacts of sustainable horticultural features on establishment of ornamental and environmental horticultural areas. Feasibility and practical limitations of the installation of sustainable features. Long-term impacts on drainage and water utilisation. Suitable plant species for sustainable horticultural features.	EC4, EC5

Environmental

1.29 The potential positive and negative impacts of establishing ornamental and environmental **horticultural areas**.

Range:
Horticultural areas – Public, amenity, botanical, heritage, private, green space, urban pollution control.

What do learners need to learn?	**Skills**
Potential positive and negative impacts on flora, fauna, soil and habitats. How impacts are identified and measured (environmental audits, site surveys, visitor surveys, soil surveys, visitor numbers, range of visitors, biodiversity surveys). Actions that can be taken to minimise and mitigate for negative impacts. Actions that can be taken to maximise positive impacts. Key government environmental policies and initiatives. Opportunities and risks policies and initiatives bring to the horticulture and landscaping industry. Associated environmental performance measures (water and energy use).	*E*C5, MC5

1.30 The **potential impacts** of establishing ornamental and environmental horticultural areas on protected plant species.

Range:
Potential impacts – Changes to drainage topography, cutting regimes, application of fertilisers, introduction of competing species, introduction of invasive species.

What do learners need to learn?	**Skills**
Potential impacts of establishing ornamental and environmental horticultural areas on protected plant species. How to prevent negative impacts of establishing ornamental and environmental horticultural areas on protected species (planning, detailed surveys, monitoring and reporting).	EC4, EC5

Actions required when protected species are identified (reporting procedures, production of a management plan, liaison with environmental groups and authorities).	

Plant growth and development

1.31 How **environmental factors** can be applied to the manipulation of indoor and outdoor plant establishment environments.

Range:
Environmental factors – Indoor: Light, irrigation, nutrients, temperature.
Outdoor: Microclimatic (light, dry, sunny, shady, sheltered, exposed, frost pockets), site specific (coastal, boggy, marginal, aquatic).

What do learners need to learn?	**Skills**
Indoor environments: • Range of factors that can be used to manipulate indoor plant establishment environments • How each of these factors are applied to manipulate a range of appropriate plants Outdoor environments: • Range of microclimatic and site specific factors that need to be considered for successful plant growth and development in outdoor horticultural environments • Methods for the creation, modification and improvement of site specific factors	EC5, DC1

Soils

1.32 Types of **soil cultivation,** their **purposes, applications** and **techniques,** and **factors** affecting suitability and scheduling.

Range:
Soil cultivation – Primary, secondary, reduced cultivation.
Purposes – Preparation for seeding/planting, weed control, improving soil conditions (compaction), environmental, access.
Applications – Seeding, turfing, planting (crumb structures, levelling, consolidation).
Techniques – Manual, mechanical.
Factors – Timing, weather, erosion, purpose of project, environmental issues, weed problems, correlation with planting schedules, availability of equipment, appropriate methods for pan removal.

What do learners need to learn?	Skills
Definitions of the terms ‘primary’, ‘secondary’ and ‘reduced cultivation’. Purposes and applications of different types of soil cultivation (preparation for seeding/planting, weed control, improving soil conditions (e.g. structure, compaction), environmental issues, access issues). Manual and mechanical techniques involved in different types of soil cultivation. Factors affecting the suitability and scheduling for different types of soil and pan removal. How they are applied for creating different types of tilth required for seeding, turfing and planting (crumb structures, levelling, consolidation).	EC4, EC5

1.33 Addition of **organic matter** and **soil amelioration methods**.

Range:
Organic matter – Manures, compost, recycled green waste, leaf litter, bark chippings.
Soil amelioration methods – Liming, use of hydrogels, use of mycorrhizae.

What do learners need to learn?	Skills
Types of organic matter and their uses. Importance of organic matter in soil dynamics and its effect on microflora, water retention and nutrient release. Appropriate timing of application of organic matter for maximum effect Definitions of the terms ‘liming’, ‘hydrogels’ and ‘mycorrhizae’, including: • how they are used for structure remediation (appropriate treatment for specific soil issues, application time and rates, health and safety considerations) • how they are used for pH remediation (timing, choice of method/chemical, quantities required, longevity of effect) • their suitability for the soil and optimum plant establishment (appropriate plants for the site, feasibility of application within planting schedules, cost/benefit, environmental considerations)	EC4, EC5 MC1, MC2

Establishing ornamental and environmental horticultural areas

1.34 **Utilities** that may be located in the environment, and **information sources** and **techniques** used to locate and avoid them.

Range:
Utilities and services – Gas supplies, electricity supplies (underground, overhead, solar), water supply and drainage, sewerage systems, data and communication cables (underground and overhead).
Information sources – Existing plans and surveys, network operators/service providers, landowners, local authority.
Techniques – Visual identification (above ground), electromagnetic location (EML), ground penetrating radar (GPR), Cable Avoidance Tool (CAT) and Genny.

What do learners need to learn?	Skills
Importance of establishing the exact locations of utilities. How they affect establishment plans and activities, safety, constraints on plant height/depth, drainage and excavations. Sources of information that can be used to locate utilities. Legal requirements and guidance (British Standards Institution PAS 128: Specification for underground utility detection, verification and location, Health and Safety Executive Guidance: HSG47 Avoiding danger from underground services). Consequences of damaging existing utilities and services.	EC4, EC5 MC1

1.35 **Common weeds** that can have an adverse effect on plant establishment.

Range:
Common weeds – Annual, biennial, perennial, ephemeral.

What do learners need to learn?	Skills
Common weeds affecting plant establishment, including: • their characteristics and morphology (life cycle, leaf, flower and seed characters, location, persistence) and how these are used to identify species • methods of spread (seed or vegetative, by rhizome, tuber, creeping roots, tillering) • implications for the growing environment and plant establishment activities (competition for light, water and nutrients, aesthetic issues, potential for harbouring pests and diseases, potentially harmful, removal issues) Purpose and appropriate use of stale seed beds. Purpose and appropriate use of geotextiles.	EC4, EC5

1.36 **Methods** of vegetation management.

Range:
Methods – Tolerance, hand, chemical, mechanical clearance, livestock grazing, heat and cold treatment.

What do learners need to learn?	Skills
How the different methods are applied. Factors affecting the suitability of methods according to site requirements (avoidance of chemicals in public areas, customer requirements, scale of project). Legal implications of their use – the need to protect operator, public and environment under the Health and Safety at Work Act, Wildlife and Countryside Act, COSHH. Specific requirements for operator qualifications (pesticide application).	EC4, EC5

1.37 **Considerations** for planting of **plants** and trees, including **sourcing**, **stock types** and planting **techniques**.

Range:
Considerations – Space, depth, orientation, soil, environment, condition, format and quality of stock, provenance of plant/seed stock.
Plants – Annual, herbaceous, perennial, shrubs, climbers, trees.
Sourcing – Reputable sources, cost, transport and quality issues, timing of supply, environmental implications such as peat-free, checking for pest and diseases and damage on arrival.
Stock types – Standards, whips, grafted specimens, different production methods (seed, bare root, containerised, container-grown, transplants, modular, specialist production methods).
Techniques – Preparation of soil, depth of planting, spacing, use of ameliorants, support systems (including support and protection for trees), watering, pruning, orientation.

What do learners need to learn?	Skills
Factors considered for the sourcing of plants including propagation plans. Legal framework around plant production including plant breeders' rights and restrictions on propagation of wild sourced plants. Different plant stock types available and their suitable uses. Processes and techniques to be applied when planting and how they differ in relation to the environment and different plants. How to select planting methods for the type of plant.	EC4, EC5 MC2

1.38 **Processes** involved in direct sowing annual and perennial mixes.

Range:
Processes – Selection, preparation, aftercare.

What do learners need to learn?	Skills
Range of appropriate mixes, and their selection for site and customer requirements. Methods for soil preparation to required standard, perennial weed removal, dealing with compaction issues. Comparison of sowing methods (hand, mechanical) and calculation of densities. How to select methods for appropriate aftercare (raking in, netting, watering and other aftercare considerations).	EC4, EC5

1.39 Different establishment **methods** for grass areas and benefits and limitations of each.

Range:
Methods – Preparation: Digging or rotovation, removal of large stones, perennial weeds, raking, consolidation, levelling, base dressing.
Establishment: Seed, turf.

What do learners need to learn?	Skills
Methods of soil preparation for establishment of grass areas. Benefits of seeding (reduced cost, labour input, enables specific mixes). Benefits of turfing (instant effect, not seasonally as constrained as seeding). Limitations of seeding (slower to establish, need for netting, seasonal). Limitations of turfing (cost, labour, planning, aftercare issues higher than for seed).	EC4, EC5

1.40 **Aftercare** required to support plant and turf establishment until they gain independence in the landscape.

Range:
Aftercare – Irrigation, nutrition, protection, support and protection.

What do learners need to learn?	Skills
Irrigation – the importance of appropriate irrigation, equipment, environmental implications, drainage. Nutrition – the range of fertiliser regimes for turf and seed according to season and requirements. Protection – methods to avoid bird and mammal damage (e.g. netting, fencing, other methods) and their environmental implications, methods to avoid pedestrian/vehicular damage (e.g. roping/cordoning off areas, barriers, signage). Support and protection – methods to support trees and larger plants, methods to protect from damage e.g. tubes, shelters, spirals, cages.	EC5, MC2

1.41 The different types of **turf surfaces,** grass mixes and key species.

Range:
Turf surfaces – Amenity, wildflower, shade tolerant, high-quality, sports.

What do learners need to learn?	Skills
Different uses for turf surfaces. Suitability of grass mixes to achieve objectives – seed mixes and key species for appropriate surface: • Key species include *Lolium perenne*, *Agrostis capillaris*, *Festuca rubra* subsp. *commutata* Maintenance requirements for different turf surfaces.	EC4, EC5

1.42 Manual and mechanical **techniques** used to sow grass seeds.

Range:
Techniques – Broadcast, mechanical spreader.

What do learners need to learn?	Skills
How grass seeds are sown using manual and mechanical techniques. Benefits and limitations of each method (labour required, seasonality, cost, accuracy). Their suitability for different purposes (scale of project, access, timing, labour availability). Types of equipment and materials required (seed, weighing systems, mechanical spreaders/applicators, labour).	EC4, EC5

1.43 **Processes** and **techniques** used to establish areas of grass by turf.

Range:
Processes – Preparation, laying, aftercare.
Techniques – Soil preparation, base dressing, levelling, perennial weed removal, stone removal, location and supply of turf, tamping, cutting to shape, watering in.

What do learners need to learn?	Skills
How processes and techniques are used to established grass areas by turf. Sequence of processes to be followed. Range of types of equipment, materials and resources required (turf sources, tools including levelling boards, cutting tools, wheelbarrows/trailers).	EC4, EC5

1.44 **Techniques** used to monitor the establishment of plants, trees and turf in ornamental and environmental horticultural areas against design specification.

Range:
Techniques – Visual inspections, site surveys, regular monitoring and maintenance inspections, tree surveys.

What do learners need to learn?	Skills
Range of methods used to monitor progress against specification. Range of methods used for identification of problems and issues.	EC4, EC5 MC10

Plant propagation

1.45 Suitability of different **soils and growing media** for propagation and growing on of plants.

Range:
Soils and growing media – Types of compost (seed, multi-purpose, ericaceous, soil based).
Loam, peat-based, peat alternatives (coir, composted bark, green waste).
Additives (vermiculite, perlite, grit and sand).
Non-soil growing environments (e.g. hydroponics, aquaponic, rockwool).

What do learners need to learn?	Skills
How the characteristics and properties of different types of growing media affect suitability for use in different situations when developing existing designed landscapes. How the characteristics and properties of different types of growing media affect their suitability for use in the propagation of plants when managing existing designed landscapes. Their implications for the environment: • environmental impacts of the use of different types of soils and growing media in horticulture • legislation/regulations in place to protect the environment • legislation/regulations in relation to the use and sale of peat in both amateur and professional horticulture	EC4, EC5

1.46 The **conditions**, **environments and facilities** required for plant propagation.

Range:
Conditions – Light, sterility, humidity, irrigation, heat, ventilation.
Environments and facilities – Polytunnels, glasshouses, cold frames, mists/fogging, outdoor, slips, tissue culture.

What do learners need to learn?	Skills
Conditions required for plant propagation.	EC4, EC5, DC1

Types of facilities, their characteristics, benefits and limitations for different purposes. Techniques and equipment used to monitor and adapt conditions to manipulate growth in protected environments.	

1.47 Techniques for propagation by seed and **aftercare requirements**.

Range:
Aftercare requirements – Mist benches, irrigation, transplanting.

What do learners need to learn?	**Skills**
Suitability of seed propagation for a range of plants. Timings of propagation by seed including seasons and germination times. Techniques for sowing seeds in containers and their application. Aftercare requirements for sown seeds for different types of seeds to support germination and their application.	EC4, EC5

1.48 Techniques for **propagation** by vegetative means, including **aftercare requirements**.

Range:
Propagation – Cuttings (soft tip, semi-ripe, leaf, hardwood), division, layering, grafting/budding, slips, tissue culture.
Aftercare requirements – Fogging units, controlled temperatures.

What do learners need to learn?	**Skills**
Techniques and suitability of the types of vegetative propagation methods for a range of plants. Timings of propagation by vegetative means including appropriate time of year and rooting periods. Types of propagation material and factors that influence the selection, including maturity and provenance. Aftercare requirements of vegetative propagation.	EC4, EC5

1.49 **Processes** and techniques for growing on plants in a production environment.

Range:
Processes – Potting on, irrigation, feeding.

What do learners need to learn?	**Skills**
Manual and machine-based techniques for potting on. Techniques for irrigation – hose (pipe), hose (trickle system), overhead. Techniques for feeding in a plant production environment including dosing pumps. Tools, equipment and materials required. Suitability of techniques to meet different management objectives.	EC4, EC5

Maintain ornamental and environmental horticultural areas (PO3)

Ornamental and environmental horticultural areas

1.50 The **types** and **site characteristics** of ornamental and environmental horticultural areas that affect maintenance requirements.

Range:

Types – Public, amenity, botanical, heritage, private.

Site characteristics – Drainage, aspect, topography, exposure and situation, microclimates, habitats, soil type.

What do learners need to learn?	Skills
How characteristics (use/purpose, size/area, location, ownership, access) of different types of ornamental and environmental horticultural area affects maintenance requirements. Implications of usage, access, seasonality, budgets and aesthetics on maintenance requirements. Implications of type of planting on maintenance requirements. Implications of site characteristics when maintaining ornamental and environmental horticultural areas for different situations – timing of maintenance activity, resources required, safety issues.	EC4, EC5

1.51 The impacts of **landscaping features** on maintaining ornamental and environmental horticultural areas.

Range:

Landscaping features – Hard: Horizontal (paving, paths, steps), vertical (walls, fencing, pergolas), water features.

Soft: Planting beds, turf, trees, shrubs, hedges.

What do learners need to learn?	Skills
Implications for maintenance of ornamental and environmental horticultural areas: safe use, wear and tear, costs, resources, maintenance of aesthetics and functionality, access issues. Hard landscaping features: • Need for different maintenance programmes for different materials • Importance of following material manufacturers' instructions • Safety and stability of structures Water features: • Safety considerations for maintenance staff and public (materials and water quality) Soft landscaping features: • Effect of size/area/height of features on maintenance activities and safety considerations • Seasonality and weather considerations • Importance of pest and disease control and monitoring to ensure health of plants • Weed control requirements	EC4, EC5

Environmental

1.52 The **environmental impacts** of maintaining ornamental and environmental horticultural areas on flora, fauna and habitats (including human).

Range:
Environmental impacts -
Negative impacts: Loss of biodiversity, effects on soil, introduction of invasive species.
Positive impacts: Increased biodiversity, improved soil health, sustainability.

What do learners need to learn?	Skills
Appropriate environmental protection measures used to minimise and mitigate for negative impacts when planning and carrying out maintenance activities. Contemporary measures used to maximise positive impacts including wildlife gardening, encouraging biodiversity, composting, reduced cultivation.	EC4, EC5

1.53 The **impacts** of maintaining ornamental and environmental horticultural areas on protected plant species.

Range:
Impacts – Damage, prosecution, loss of biodiversity.

What do learners need to learn?	Skills
How to identify the presence of protected plant species. How to mitigate for negative impacts of maintaining ornamental and environmental horticultural areas on protected species – planning of maintenance activities around the protected species (timing, methods used), communication and training (ensuring all staff follow measures in place). Actions required when protected species are identified, including reporting procedures. Legal requirements and how these affect maintenance planning and activity.	EC4, EC5

Plant identification and classification

1.54 The effect of **types and characteristics** of plants on maintenance requirements.

Range:
Types – Monoecious, dioecious, evergreen, deciduous, hardy, tender, annuals, biennials, perennials, herbaceous, shrubs, trees, climbers, invasive species, weeds.
Characteristics – Lifecycle, morphology, native habitat, usage in ornamental and environmental horticulture.

What do learners need to learn?	Skills
How the key characteristics of different types of plants affect maintenance of ornamental and environmental horticultural areas: • Replacement requirements of different types of plants • How height and spread affects maintenance • How compatibility of different plants affects maintenance • Implications of the presence of invasive species and weeds on maintenance	EC4, EC5

Plant growth and development

1.55 The implications of pruning and maintenance on **physical structures** of plants and **physiological processes** involved in plant growth on maintenance of ornamental and environmental horticultural areas.

Range:
Physical structures – Roots, stems, leaves, flowers, buds, bulbs, tubers, fruit, seeds.
Physiological processes – Photosynthesis, respiration, transpiration, osmosis, germination.

What do learners need to learn?	Skills
How the functions and morphology of the physical structures of plants affect the pruning and maintenance of horticultural areas. Understanding of the processes involved in plant growth (e.g. apical dominance) and their importance for pruning and maintenance activities. Their effect on plant growth and development (growth rate, water loss, seasonality). How pruning and maintenance activities can affect physiological processes. Methods used to ensure optimum light and water for the species.	EC4, EC5

1.56 **Environmental factors** which affect plant growth.

Range:
Environmental factors – Microclimate, light, irrigation and water availability, nutrients, site specific (including boggy, marginal, aquatic, dry, sunny, shady, sheltered, exposed, frost pockets).

What do learners need to learn?	Skills
How to identify issues arising in plant establishment and growth as a result of sub-optimal growing environments. How practical techniques used to remedy these issues are incorporated into maintenance planning.	EC4, EC5

Soils

1.57 Soil enhancement **methods**.

Range:
Methods – Mulching, organic matter, fertilisers, amelioration, drainage.

What do learners need to learn?	Skills
How the characteristics of different soil types affect plant health and growth rate. Types, uses and applications for different soil enhancement methods. Mulching including organic matter: • Different types of mulches, their properties, benefits and limitations of use • How they are used to enhance soil condition and maintain plant health • Their suitability for use with different soils in different seasons Fertilisers: • Different types of fertilisers (components, top dressing, base dressing, foliar feed) • Their properties, benefits and limitations of use • How they are applied Amelioration and drainage: • Symptoms of poor drainage (indicator species, restricted growth, disease, surface water) • Methods of rectifying poor drainage (sand, grit, hydrogels, adding organic matter) • Benefits of drainage (maintaining air-water balance within the soil for optimum growth, maintenance of soil microflora)	EC4, EC5

Maintaining ornamental and environmental horticultural areas

1.58 **Types** of maintenance and their suitability for different situations and environments.

Range:
Types – Planned maintenance, reactive maintenance.

What do learners need to learn?	Skills
Purpose of planned maintenance. Content and formats of planned maintenance programmes. Documentation required for maintenance and verification of maintenance activities. Types of planned and reactive actions required when issues are identified and implications to the environment and the business (invasive species, dangerous trees, overgrown paths, pest and disease infestation, extreme weather events).	EC1, EC3, EC5

1.59 Types of **maintenance activities** required for different features.

Range:
Maintenance activities – Turf: Mowing, scarification, aeration, repair, irrigation, feeding.
Trees and shrubs: Pruning to meet specific objectives e.g. winter colour, safety, optimum fruit and flowering, shape, disease control.
Herbaceous plants: Mulching, cutting back, feeding, irrigation, pest/disease control, staking, division.
Seasonal bedding: Irrigation, replacement, dead heading, pest and disease control.
Hard landscaping: Painting, repairs, renovation.

What do learners need to learn?	Skills
Types of maintenance activities required for different features and ornamental and environmental horticultural areas. Purpose of maintenance activities – aesthetics, to support establishment and growth, plant health, safety. Timing of maintenance activities for different types of features in different types of ornamental and environmental horticultural areas. How planned maintenance activities differ for low maintenance, limited access, limited resource, high profile areas and different types of ornamental and environmental horticultural areas.	EC4, EC5

1.60 Key signs that **unplanned maintenance** is required.

Range:
Unplanned maintenance – Hard landscaped features, soft landscaped features, trees, water features.

What do learners need to learn?	Skills
How to identify signs of damage to: • hard landscaped features (cracked paving, rotting wooden structures, damaged brickwork, subsidence, wind damage) • soft landscaped features (evidence of pest, disease, disorder weed infestation, sudden death, excessive growth) • trees (fallen branches, presence of fungi, evidence of pest, disease, disorder, physical defects, cracks, ground disturbance) • water features (leaks, infestation of weeds/pests, drainage problems, structural problems, blockages, machinery failure)	EC4, EC5

1.61 **Management requirements** for different types of water features and **aquatic environments** and their use in different landscape contexts.

Range:
Management requirements – Seasonal maintenance, water quality, safety and aesthetics, plants, sustainable drainage, climate change adaptions, water usage management.
Aquatic environments – Marginal, bog, ponds, water features, ditches.

What do learners need to learn?	Skills
Suitability of different types of plants for different aquatic environments. Management requirements of aquatic features including seasonal maintenance, water quality, safety and aesthetics, plants. Risk to aquatic environments from horticultural operations.	EC4, EC5

1.62 Common **weeds** that can have an adverse effect on the maintenance of ornamental and environmental horticultural areas.

Range:
Weeds – Annual, biennial, perennial, ephemeral.

What do learners need to learn?	Skills
Their characteristics and morphology and how these are used to identify species. Method of spread (seed, creeping, tillering, rhizome, stolons, fragmentation). Implications for the growing environment (competition for water, nutrients and light, risk of harbouring pests and diseases, appearance of area, increased maintenance and disposal requirements).	EC4, EC5

1.63 **Methods** of vegetation management.

Range:
Methods – Tolerance, cutting/clearance (hand, chemical, mechanical), livestock grazing, heat and cold treatment.

What do learners need to learn?	Skills
Suitability of methods according to site requirements (selection of appropriate method including holistic approaches, avoidance of chemicals in public areas, customer requirements, scale of project). Legal implications of their use (Health and Safety at Work Act, Wildlife and Countryside Act, Control of Substances Hazardous to Health Regulations (COSHH), Provision and Use of Work Equipment Regulations (PUWER), need to protect operator, public and environment). Specific requirements for operator qualifications (pesticide application).	EC4, EC5

1.64 **Maintenance requirements** of different types of **turf surfaces**.

Range:
Maintenance requirements – Water and nutritional input, mowing regimes, aeration practices, scarification practices, weed control, repair of areas.
Turf surfaces – Amenity, wildflower, shade tolerant, high quality, sports.

What do learners need to learn?	Skills
Different uses for turf surfaces (amenity, wildflower, shade tolerant, high quality, sports). Maintenance requirements of different turf surfaces, their applications and methods used.	EC4, EC5

1.65 Nutritional requirements of different **types of plants.**

Range:
Types of plants – Annual, perennial, ericaceous, bedding plants, trees and shrubs, turf.

What do learners need to learn?	Skills
Nutrients available on a site (from soil analysis). Sources of nutrient supplements (components and types of fertilisers). How to determine the correct feeding regime. Implications of over-and underfeeding (chlorosis, damage to appearance, scorching, soft growth leading to pests and diseases, wasted materials, environmental damage).	EC5 MC1, MC2 DC1

1.66 Different **types of irrigation**.

Range:
Types of irrigation – Outdoor: Natural rainfall, hoses, watering can, sprinklers, drip lines. Indoor: Capillary matting, flood benches, sand beds.

What do learners need to learn?	Skills
Critical irrigation periods – germination, establishment/transplanting, pre-harvest of fruit and vegetables. How irrigation is implemented to make the most efficient use of water, time and resources. Hazards and control measures associated with irrigation methods. Irrigation requirements of different types of plants and suitability of water sources to plants (hard water, water treatment, rainwater, grey water). How to apply the use of irrigation equipment without causing harm or damage to the plants and their environments. Implications of inappropriate irrigation – over watering, runoff, erosion, leeching of nutrients, spread of pests and diseases, increased cost.	EC4, EC5

1.67 Types of physical **protection** required by plants and trees and **methods** used.

Range:
Protection required – Protection against pests, weeds, environmental factors.
Methods – Protection during establishment: tree guards, shade protection, antitranspirants, geotextiles, wind protection, protection against pests.
Protection of established plants and trees: netting, pest barriers (fencing, meshes, enclosures, fruit cages), shade protection, grease bands.

What do learners need to learn?	Skills
Vulnerability of different types of plants in different locations and seasons. Methods used to protect plants and trees against pests, weeds and environmental factors. Their applications and suitability for different plants in different locations and seasons. Methods to limit the environmental impact during and after use.	EC4, EC5

1.68 **Techniques** used for the maintenance of **hard structures**.

Range:

Hard structures – Paving, paths, steps, walls, fences, ditches (drainage, boundary), water features.

Techniques – Inspection, appraisal, physical methods (replacement, repair, rebuild), chemical methods (herbicide, algicide, fungicide, detergent application).

What do learners need to learn?	Skills
How to appraise a maintenance issue and identify options (carry out repairs, call in specialist, isolate or remove the structure). Methods of maintenance used for different types of hard structures: • Re-laying of paving slabs/materials • Replacing masonry mortar and render • Replacing wooden structures • Applying coatings to wooden structures • Applying paint to hard structures • Clearing of water features and ditches • Cleaning and removal of vegetation including algae from water features How to apply methods safely, minimising environmental impact and using resources efficiently.	EC4, EC5

Plant health

1.69 **Causes** of **failure** in trees.

Range:

Causes – Pests and disease, wind damage (to roots and above ground structures), waterlogging, drought, competition, nutrient deficiency, root compaction, changes to soil level/ground conditions.

Failure – Branch failure, uprooting, summer branch drop.

What do learners need to learn?	Skills
Indicators of failure – dieback, premature leaf drop, stunted growth, branch drop, balanced crown, wounds on branch/stem greater than half the diameter of the branch/stem, presence of fungi, presence of pests, cracking of stem/branches, ground disturbance (root plate heave, root rock), evidence of mammal damage. Environmental considerations – risk of spread of pest or disease and procedures to minimise the spread, damage to ecosystems, loss of shelter/wind protection, effects on soil, notifiable disease reporting procedures. Health and safety issues arising from failure – risk of injury to public, risk of injury to workers, access issues, disposal of material, need to prevent access to danger area, machinery related issues, use of chemicals. Actions to be taken: • Preventive – biosecurity measures, tree safety inspections, regular pest and disease inspection, ensure soil conditions are optimal, checking and correcting signs of nutrient deficiency, consideration of tree health in any change of use of landscape • Following tree failure – signage and barriers, prevent public access to dangerous tree, removal and disposal of material, engage a professional arborist for tree work and maintenance plan	EC4, EC5

Pruning

1.70 The purposes of tree and shrub **pruning activities**.

Range

Pruning activities – Removal of dead, diseased, damaged, dangerous and displaced materials, atypical growth/ornamental concerns, formative pruning, pruning to support production of flowers and fruit.

What do learners need to learn?	Skills
How to apply formative, renovation and direct maintenance pruning. Different pruning requirements and correct pruning times of common plants (spring flowering, autumn flowering, winter colour). Techniques used for different purposes (hedge cutting, coppicing, pollarding, formative, pruning to natural shape, topiary). Tools and equipment required to carry out pruning activities (secateurs, loppers, pruning saws, bow saws, pole saws, hedge trimmers, chainsaws, ladders/platforms) PPE (safety boots, eye protection, gloves, safety helmet, ear protection, chainsaw trousers). Their suitability, use and safety implications.	EC4, EC5

1.71 Pruning **techniques** used for different applications and management **objectives**.

Range:
Techniques – Techniques for creating an ornamental specimen (topiary, cloud pruning, cones, balls) fruit in trees and bushes (cordons, espalier), winter colour, a specified foliage size and inclusion in a planting scheme, flowering, dead heading, pollarding, coppicing, formative pruning.
Techniques for manipulating, clinging, self-supporting climbing plants and well-trained shrubs including support techniques.
Techniques for maintaining existing hedges.
Objectives – Space, style, functionality, form, propagation, seasonal interest.

What do learners need to learn?	Skills
Methods and timing of pruning for seasonal flowering, wood and fruit. How techniques are applied safely and effectively including use of tools and equipment. Suitability of different plants for advanced pruning. Plant responses to pruning events – apical dominance, compartmentalisation. Disposal of material and hygiene.	EC4, EC5

Business

1.72 The **implications of budgets** on maintenance activities.

Range:
Implications of budgets – Maintenance options (low maintenance, high maintenance), availability of resources (human, time, materials, equipment).

What do learners need to learn?	Skills
How to cost maintenance activities including time and resources. Implications of budgets to maintenance activities: • Cost implications of decision making for maintenance activities • Prioritisation of maintenance in relation to available resources (importance of health and safety) • Impact on future planning including sourcing extra funding, identifying cost savings, identifying low impact/cost options	EC3, EC5 MC2, MC9, MC10

Install landscape features (PO4)

Ornamental and environmental horticultural areas

1.73 The use of **hard landscaping features** in different types of **ornamental and environmental horticultural areas**.

Range:
Hard landscaping features – Horizontal (paving, paths, steps), vertical (walls, fencing, pergolas).
Ornamental and environmental horticultural areas – Public, amenity, botanical, heritage, private, green space, urban pollution control.

What do learners need to learn?	Skills
How different hard landscaping features are used in different types of ornamental and environmental horticultural areas, including: • accessibility and inclusion • linking features • aesthetics • maximising use of space • boundaries • provision of recreational areas • as part of planted features	EC4, EC5

1.74 Implications of **site characteristics** to the installation of hard landscaping features.

Range:
Site characteristics – Drainage, aspect, topography, exposure and situation, microclimates, existing utilities/services, soil type, geology (e.g. presence of naturally occurring rock near the soil surface).

What do learners need to learn?	Skills
How to survey a site to determine characteristics and suitability for different hard landscaping features. How to interpret plans. How the range of site characteristics affect the installation of hard landscaping features – implications for what types of features can be installed and the methods used. How soil inspection pits are used to determine site soil profile and drainage characteristics.	EC3, EC5 MC1, MC3

1.75 Implications of existing landscaping features for installing **hard landscaping features**.

Range:
Hard landscaping features – Horizontal (paving, ditches, paths, steps), vertical (walls, fencing, pergolas).

What do learners need to learn?	Skills
How to survey a site to determine the existing landscaping features. How to interpret plans. Considerations for installing hard landscaping features in proximity to existing hard and soft (planting, beds, turf, trees, shrubs, hedges, water features) landscaping features, including: • removal of existing features • renovation • adaptation • linking of features • environmental impacts • knowledge of root protection zones for trees and other planting • legal considerations – protected plants, trees and features.	EC3, EC5 MC1, MC3

1.76 Types of **water environments**.

Range:
Water environments – Ponds, fountains, running water features.

What do learners need to learn?	Skills
Function of the range of water environments in different ornamental and environmental horticultural areas, including principles of their construction. Considerations for installing water features in proximity to existing landscaping features, including: • removal of existing features • renovation • adaptation • linking of features • environmental impacts – drainage, biodiversity • legal considerations – safety features, protected species, trees and features	EC3, EC5

Environmental

1.77 The **positive** and **negative impacts** of installing hard landscaping features on flora, fauna, and habitats (including human).

Range:

Positive impacts – Appearance, safety, security, provision of safe outdoor spaces for social use, opportunities for incorporating planting, lower maintenance requirements, provision of different habitats (shade, shelter).

Negative impacts – Drainage, soil compaction, safety of installation and maintenance, resources/costs, changes to microclimate, restriction of access, limitations on flora and fauna habitats, long-term implications for maintenance/removal.

What do learners need to learn?	Skills
Measures used to maximise positive impacts – appropriate siting and materials, minimising waste in construction, use of sustainable materials. Appropriate environmental protection measures used to minimise and mitigate for negative impacts when installing hard landscaping features – protection of the environment and existing soil, compliance with legislation, minimising waste, minimising disturbance to existing habitats, sourcing locally, timing of operations according to seasons, flora and fauna.	EC4, EC5

1.78 The potential **impacts** of installing hard landscape features on protected species.

Range:

Impacts – Damage, prosecution, loss of biodiversity, changes to biodiversity, cost and time implications of preventive measures, habitat creation.

What do learners need to learn?	Skills
How to identify the presence of protected species and their characteristics. Actions required when protected species are identified, including legal requirements and reporting procedures. How to mitigate for negative impacts of installing hard landscape features on protected species – planning of activities around the protected species (timing, methods used, type and location of features); communication and training (ensuring all staff follow measures in place). How to create environments to sustain protected species when installing hard landscape features.	EC4, EC5

Plant growth and development

1.79 How hard landscapes affect the physical processes involved in plant growth.

What do learners need to learn?	Skills
Implications of their installation and installation activities for plant growth and development. Potential effects on light, water and nutrient uptake on plant growth and development, effects on drainage, microclimate changes causing frost pockets, soil compaction, rooting structures, creation of wind tunnels, damage to plants affecting growth and development. Creating conditions for plant growth – climbing plants, rock plants, aquatic plants, shade plants.	EC4, EC5

Site environment

1.80 The implications of **existing site features** on the installation of hard landscape features.

Range:
Existing site features – Utilities, hard surfaces, soil condition, drainage, surrounding buildings and infrastructure, access, protected species and habitats, root protection zones.

What do learners need to learn?	Skills
How to assess the condition of existing features. How to plan for the installation working within the constraints of existing site features. Procedures and equipment used to protect and avoid damage to existing site features. Associated risks – health and safety considerations, environmental impacts, delays to work, restricting access for people and equipment. Levels of maintenance on existing site and impacts on installation.	EC4, EC5

1.81 The use of **soft landscape features** to provide architectural structure to the landscape.

Range:
Soft landscape features – Formal planting (hedges, standard trees, topiary, avenues), lawns, screens, ha-ha's, focal points, beds, borders, stumpery, vertical gardens.

What do learners need to learn?	Skills
How different soft landscape features are used to provide architectural structure to a landscape. How soft landscape features are used to improve the appearance of the landscape. How soft and hard landscaping features are integrated to maximise overall effect, including: • formality – hedges, topiary, avenues, lawns • perspective – ha-has, focal points • screening – hedges, topiary • style – beds, borders, stumpery, vertical gardens • balance – between hard and soft landscaping features appropriate to the landscape type	EC4, EC5

1.82 **Utilities and services** likely to be encountered when installing landscape features, and **information sources** and **techniques** used to locate and avoid them.

Range:
Utilities and services – Gas supplies, electricity supplies (underground, overhead, solar), water supply and drainage, sewerage systems, data and communication cables (underground and overhead).
Information sources – Existing plans and surveys, network operators/service providers, landowners, local authority.
Techniques – Visual identification (above ground), electromagnetic location (EML), ground penetrating radar (GPR), Cable Avoidance Tool (CAT) and Genny.

What do learners need to learn?	Skills
Importance of establishing the exact locations of utilities. Sources of information that can be used to locate utilities. Utilities required for installation and how they are located. Utilities detection and avoidance techniques. Legal requirements and guidance (BSI PAS 128: Specification for underground utility detection, verification and location, Health and Safety Executive guidance: HSG47 Avoiding danger from underground services). Consequences of damaging existing utilities and services.	EC1, EC5 MC1, MC3 DC1

1.83 **Techniques** for protection of the **site environment** when installing landscape features.

Range:
Techniques – Signage, barriers, protecting existing tree root zones, avoiding soil turning to mud, shielding paths and surfaces from damage (pedestrians, vehicles), 'heeling in' plants awaiting their final planting location, avoiding runoff, avoiding accidental contamination.
Site environment – Plants, trees, fauna, soils, growing media, building fabric, existing utilities/services, existing landscape features.

What do learners need to learn?	Skills
Protection requirements for features already in place and those that will be introduced to the landscape. Appropriate techniques to be applied. How techniques are applied including the effective and efficient use of tools, equipment, machinery and materials.	EC4, EC5

Hard landscape installation

1.84 **Types** of excavation.

Range:
Types – Digging, installation of trenches, installation of foundations, levelling and land formation, mechanical excavation (mini diggers, specialist machinery).

What do learners need to learn?	Skills
Different types of excavation for specific installation purposes, and how they are carried out. Function and suitability of different types of excavation for achieving specified outcomes. Appropriate tools, equipment and machinery for the range of methods. Methods to minimise damage from excavations, including environmental damage. Appropriate methods for disposal of arisings. Health and safety requirements.	EC4, EC5

1.85 Types of **surfaces**, **surface materials,** and **sub-base/foundation/bedding materials**.

Range:
Surfaces – Patios, paths, paving, decking, edging.
Surface materials – Loose aggregates, wood chip, concrete, cold asphalt, blocks, slabs, timber, composites, play area materials.
Sub-base/foundation/bedding materials – Aggregate/hardcore, geotextiles, ballast, sand, lime, concrete, cement.

What do learners need to learn?	**Skills**
Different types of surfaces for ground level construction and their suitability for varying locations. Implications and benefits of different surface materials for the installation of new hard landscape features. Environmental impacts and sustainability of different surface materials. Applications for, and preparation of, sub-bases/foundations/bedding and use of geotextiles. Importance of edging to the overall finish of surfaces. Requirements to make good following installation of new landscape features. Safe use and disposal of materials. Health and safety requirements.	EC4, EC5

1.86 Types of **vertical level construction** and **materials** used.

Range:
Vertical level construction – Fences, walls, steps, pergolas, arches, planters, gazebos, seating, posts.
Materials – Timber, composites, stone, paving slabs, metal, natural materials.

What do learners need to learn?	**Skills**
Different types of vertical level construction: Their purpose – including security, garden features, displaying plants, dividing up the area, aesthetics. Techniques for their effective implementation into landscapes – appropriate materials and siting, linking of garden elements, integration of plants by creating appropriate growing environments, painting or treatment of new features to blend with existing landscape. Range of materials used and their appropriateness for the purpose – cost, sustainability, maintenance requirements, ease of installation. Requirements to make good following installation of new landscape features. Safe use and disposal of materials. Health and safety requirements.	EC4, EC5

1.87 Cutting **methods, tools and equipment** for different types of **materials**.

Range:
Methods – Hand tools, power tools.
Tools and equipment – Saws (hand saw, hacksaw), blades, powered equipment (drills, powered saws, abrasive wheels, angle grinders) splitting tools (chisels, bolsters, hammers, stone splitting pins/shims and wedges).
Materials – Wood, masonry, stone, metal, composites, geotextiles, artificial grass.

What do learners need to learn?	Skills
Different types of cutting methods for different types of materials.	EC4, EC5
Appropriate tools and equipment required for carrying out the methods.	MC1, MC2
How to operate tools and equipment safely and effectively to achieve required outcomes.	
Training and certification requirements for use in industry (e.g. abrasive wheels).	
Health and safety requirements (including for materials).	
PPE requirements.	

1.88 Joining **methods** and **materials** for different materials and **structures**.

Range:
Methods – Adhesion, mechanical, temporary, permanent.
Joining materials – Adhesives, mortar, nails, screws, bolts.
Structures – Wood, metal, stone, concrete, composite structures, geotextiles, artificial grass.

What do learners need to learn?	Skills
Different joining methods for wood, metal, stone concrete and composite structures:	EC4, EC5
Tools and equipment required for carrying out the techniques and their effectiveness in differing environmental situations.	MC1, MC2, MC3
Associated bonding materials.	
Mix ratios and consistencies for mortar and concrete required to achieve specific requirements and how they are mixed.	
Techniques for application of joining methods for horizontal and vertical surfaces.	
Temporary and permanent methods of fixing wooden joints/structures.	
How to operate tools and equipment safely and effectively to achieve required outcomes.	
Safe use and disposal of materials.	
Health and safety requirements (including for materials).	
PPE requirements.	

1.89 **Irrigation equipment** used to water plants and **equipment required to create water features**.

Range:
Irrigation equipment – Hoses, sprinklers, drip lines.
Equipment required to create water features – Hoses, tanks, pumps, filters, fountains, power sources.

What do learners need to learn?	**Skills**
Efficient methods and equipment for watering plants to maximise impact and minimise water use. Efficient methods and equipment for creating water features. Techniques for installation of irrigation/water feature equipment – planning, measuring, digging trenches, levelling, installation of drains, water recycling systems, water storage, control systems for automatic irrigation including sensors, pumps, filters. Implications of installation of equipment – sourcing, minimising waste, aesthetics, access and logistical limitations, health and safety considerations, environmental and sustainability considerations.	EC4, EC5

Manage existing designed landscapes (PO5)

Designed landscapes

1.90 **Types** of designed landscapes.

Range:
Types – Public, amenity, botanical, heritage, private.

What do learners need to learn?	Skills
Characteristics of different types of designed landscapes, including their purposes and: • benefits – including environmental, health and wellbeing, society and community, economic (employment, GDP) • limitations – cost, availability of suitable materials, access, planning restrictions, health and safety	EC4, EC5

1.91 The ideological characteristics of a designed landscape.

What do learners need to learn?	Skills
Concept of what makes a site unique (local distinctiveness, aesthetic scheme, heritage styles, environmental, location). Relationship and conflicts between local distinctiveness and functionality, economics, ownership/trusteeship and specific objectives of a designed landscape. How this relationship influences the management of existing designed landscapes.	EC4, EC5

1.92 The relationship between landscaping features and the local distinctiveness of a site.

What do learners need to learn?	Skills
Different types of features including historical features. Purposes of different features within the landscape. Suitability of existing and proposed features for different types of designed landscapes.	EC4, EC5

1.93 **Factors** which influence the management of designed landscapes.

Range:
Factors – Legal status, protected status, visitor requirements, functionality, use, accessibility, sustainability, aims and objectives (environmental improvement, social wellbeing), maintenance requirements, finances, resources.

What do learners need to learn?	Skills
Influence of different factors on the management of designed landscapes. Opportunities and challenges these present for the development of designed landscapes. Legal status and protected status of landscape features including buildings, trees and habitats and the effect on the management of designed landscapes.	EC4, EC5

1.94 Considerations for the management of designed landscapes.

What do learners need to learn?	Skills
Resources (human, financial, physical) required for development and sustainability including ongoing maintenance. Factors that affect long-term planning – climate, funding, unexpected findings. Factors that affect short-term planning – weather, breakages, staffing. Their impact on implementation of management plans.	EC4, EC5

1.95 Considerations for the maintenance activities of an area to support medium-and long-term development.

What do learners need to learn?	Skills
Factors that need to be taken into account (site and situation, public access and wildlife, style and maturity of planting). Implications for management activities and how these are managed, including financial. Timescales involved in operational implementation of a plan. Techniques (including the use of digital software e.g. spreadsheet and scheduling applications) used to monitor and evaluate progress of the management plan.	EC3, EC5 MC10 DC1, DC2, DC4

Environmental

1.96 The use of environmental risk assessments to assess potential positive and negative **impacts** of managing existing designed landscapes on the environment.

Range:
Impacts – Impacts on flora, fauna, habitats (including human).

What do learners need to learn?	Skills
Purpose and content of environmental risk assessments and how they are conducted. Range of potential positive and negative impacts of managing existing designed landscapes. How management of the landscape can be used to maximise the positive and mitigate for the negative impacts.	EC4, EC5

1.97 The potential impact of developing existing designed landscapes on protected species.

What do learners need to learn?	Skills
Legal requirements and how these affect management planning and activity. Actions required when protected species are identified in an existing designed landscape including reporting procedures. How to mitigate for negative impacts when managing existing designed landscapes on protected species: planning of activities around the protected species (timing, methods used); communication and training (ensuring all staff follow measures in place).	EC4, EC5

1.98 **Implications** of finding invasive species in an environment to the management of existing designed landscapes.

Range:
Implications – The potential need for hygiene, containment, and control measures, and the impact of these on existing management objectives (planning, prioritisation, timescales).

What do learners need to learn?	Skills
Duties under legislation – current relevant legislation. Notification to relevant authorities. Control measures – control of existing invasive species on site (hygiene, containment and disposal). How to mitigate for invasive species in an environment when managing existing designed landscapes – methods of preventing spread/introduction of invasive species.	EC4, EC5

Plant identification and classification

1.99 **Types** of plants found in existing designed landscapes.

Range:
Types – Evergreen, deciduous, hardy, tender, annuals, biennials, perennials, herbaceous, shrubs, trees, climbers.

What do learners need to learn?	Skills
Their contribution to existing designed landscapes. Implications for inclusion when managing existing designed landscapes.	EC4, EC5

Plant growth and development

1.100 **Environmental factors** which affect plant growth in existing designed landscapes.

Range:
Environmental factors – Microclimate, light, irrigation, nutrients, site specific (boggy, marginal, aquatic, dry, sunny, shady, sheltered, exposed, frost pockets).

What do learners need to learn?	Skills
Issues arising in plant establishment and growth as a result of sub-optimal growing environments. How these issues are identified. Techniques used to remedy these issues. Methods of manipulation of microclimates that can be used when developing existing designed landscapes (improving drainage, adding windbreaks, creating shade/shelter, removal/repair/replacement).	EC4, EC5

Performance outcome 2

2. Establish ornamental and environmental horticultural areas

2.1 **Identify plants** using different **methods**.

Range:
Identify – Annuals and bedding plants, food plants, grasses and bamboos, hardy herbaceous perennials, house plants, shrubs, trees, weeds.
Plants – Minimum of fifteen (15) plants as appropriate to industry setting. Live specimens, either growing or as classroom samples, are preferred, but high-quality images may be used to assist out-of-season identification.
Methods – Observation, botanical keys, internet/apps.

What do learners need to demonstrate?	Skills
Identify a minimum of 15 relevant plant species through observation of features and characteristics. Identify plants through use of research tools. Use correct scientific names according to the international code of nomenclature.	EC1, EC5 DC1

2.2 Assess an ornamental and environmental horticultural area for establishment.

What do learners need to demonstrate?	Skills
Undertake a site survey to assess existing physical characteristics, using a site survey pro-forma. Take a soil sample using an appropriate method. Analyse a soil sample to determine texture, pH and water-holding capacity. Interpret findings to identify challenges and opportunities for establishment of an ornamental and environmental horticultural area.	EC1, EC5 MC1, MC2, MC3 DC1

2.3 Assess health and safety risks.

What do learners need to demonstrate?	Skills
Identify hazards on site. Complete written risk assessments for practical tasks. Apply health and safety controls to activities.	EC1, EC3 DC1

2.4 Assess biosecurity risks.

What do learners need to demonstrate?	Skills
Identify biosecurity risks. Recommend appropriate biosecurity measures. Apply biosecurity measures.	EC1, EC3 DC1

2.5 Situate garden features and **set out shapes** from a plan.

Range:
Set out shapes – Straight line, curve, irregular shape.

What do learners need to demonstrate?	**Skills**
Interpret maps and garden design plans. Use rules and formulae to precisely set out shapes and measurements. Accurately set out shapes on the ground.	EC5 MC1, MC2, MC3, MC4 DC1

2.6 Identify and remove weeds from cultivated areas.

What do learners need to demonstrate?	**Skills**
Identify weeds within cultivated areas. Use hand tools to remove weeds from cultivated areas. Use a mechanical device to remove weeds from a cultivated area. Safely dispose of materials.	EC5 DC1

2.7 Carry out primary soil **cultivation** and incorporation of organic matter.

Range:
Cultivation methods – By hand/mechanical**.**

What do learners need to demonstrate?	**Skills**
Carry out primary soil cultivation using an appropriate technique. Incorporation of organic matter using an appropriate technique. Safe and appropriate use of tools / pedestrian machinery. Keep work area tidy. Correct disposal of materials.	EC5 MC1

2.8 Carry out secondary soil **cultivation** using hand tools.

Range:
Cultivation – Method suitable to end use: planting trees, sowing seeds, laying turf.

What do learners need to demonstrate?	Skills
Roughly level soil using hand tools. Add ameliorants appropriate to end use. Consolidate soil using an appropriate technique. Level soil using hand tools. Create a tilth suitable for purpose.	EC5

2.9 Calculate **sowing requirements**.

Range:
Sowing requirements – For seeds, bulbs, tubers.

What do learners need to demonstrate?	Skills
Accurately measure the area. Source information to determine appropriate sowing/planting density. Calculate sowing requirements.	EC5 MC1, MC2, MC3, MC4

2.10 Carry out an appropriate **sowing method** in open ground using hand tools.

Range:
Sowing – Seeds, bulbs, tubers.
Methods – Continuous sowing, station sowing, broadcast.

What do learners need to demonstrate?	Skills
Sow seeds, bulbs or tubers for determined spacing, depth and orientation: • Set out a straight line with a string or other marker • Create a drill (furrow) for continuous sowing • Create holes for station sowing • Broadcast seed for determined rate • Cover with soil • Label planting	EC5 MC1, MC2, MC3, MC4

2.11 Plant in open ground.

What do learners need to demonstrate?	Skills
Mark out planting locations on the site. Dig appropriately sized holes using hand tools. Insert plant, backfill, add ameliorants appropriate to end use and firm in plants adequately.	EC5 MC1, MC2, MC3

2.12 Apply aftercare for seeds and plants.

What do learners need to demonstrate?	Skills
Irrigate seedlings/plants. Apply protection for seedlings/plants. Erect supports for seedlings and/or plants. Label as appropriate. Check for pests and diseases. Remove weeds from growing plants.	EC5

2.13 Plant a tree in open ground.

What do learners need to demonstrate?	Skills
Assess the quality of a tree for planting. Mark out planting location on the site. Dig a hole for tree planting, loosen the sides of the planting pit. Appropriately loosen and spread out the roots of the tree and position the tree in the planting pit to the correct depth/nursery mark. Add ameliorants appropriate to end use. Backfill the hole with soil and firm the tree into the hole.	EC5 MC1

2.14 Apply aftercare for a planted tree.

What do learners need to demonstrate?	Skills
Stake the tree. Apply tree ties and pest guards to the tree. Irrigate the tree. Mulch the tree.	EC5

2.15 Lay turf.

What do learners need to demonstrate?	Skills
Lay turf according to specification: • Check turf health • Check all appropriate tools and equipment • Safely transport and store materials • Lay turf onto soil and butt joints together • Stagger joints in subsequent rows while using boards to walk on • Cut turf to correct size and shape using hand tools • Firm the turves • Irrigate turf • Top dress as required • Apply suitable protection method	EC5 MC1, MC2, MC3

2.16 **Propagate plants**.

Range:
Propagate plants – By seed in pots, containers or modules.
Using types of seasonal cutting: soft tip, semi-ripe, leaf, hardwood.

What do learners need to demonstrate?	Skills
Select appropriate growing media and containers for the seed/technique being used. Seeds: • Aerate growing media, fill and firm growing media in containers • Sow and cover seeds to required depth • Water seeds and place trays/containers into appropriate environment • Prick out seedlings into correct sized containers in appropriate compost • Ensure all pots/trays/containers are correctly labelled Cuttings: • Collect cutting material, ensuring it is free from pests and diseases • Ensure material is kept undamaged • Prepare cuttings using correct tools and techniques • Insert cuttings at appropriate depth into growing media • Place trays/containers into appropriate environment • Ensure all pots/trays/containers are correctly labelled Apply precise and controlled movements with delicacy. Make effective use of personal space. Dispose of waste according to requirements. Leave work area in a safe and tidy condition.	EC5 MC1

2.17 Potting on plants.

What do learners need to demonstrate?	**Skills**
Select plants that require potting on: • Select suitable growing media and pot size • Safely knock the plant out of the pot avoiding damage to the plant • Tease roots as required • Re-pot plant into new pot as required • Backfill growing media • Place pot into appropriate environment • Ensure all pots/trays/containers are correctly labelled Follow all safe working practices using appropriate PPE. Dispose of waste according to requirements. Leave work area in a safe and tidy condition.	EC5 MC1

Performance outcome 3

3. Maintain ornamental and environmental horticultural areas

3.1 Plan for the maintenance of a given area.

What do learners need to demonstrate?	Skills
Assess maintenance requirements for hard and soft landscaping features in a given area. Identify, sequence and prioritise the steps involved in completing the maintenance task. Allocate resources (time, equipment, materials, labour). Optimise work processes and manage own time to meet objectives.	EC2, EC3, EC5 MC10 DC1

3.2 Assess the health of plants.

What do learners need to demonstrate?	Skills
Identify pests, diseases or disorders. Assess risks to plant health. Recommend a strategy to remedy the risk.	EC2, EC5 DC1

3.3 Identify and remove **weeds**.

Range:
Weeds – Refer to plants list (annex A).

What do learners need to demonstrate?	Skills
Identify weeds. Recommend a strategy to manage the weeds. Remove annual weeds by hoeing. Remove perennial weeds by digging. Dispose of weeds according to good working practices and legal requirements.	EC2, EC5 DC1

3.4 Identify a suitable area and carry out mulch application.

What do learners need to demonstrate?	Skills
Prepare an area for mulch. Select an appropriate mulch for the area. Apply mulch to an area using correct tools and to the correct depth, leaving an appropriate finish.	EC5

3.5 **Maintain** turf surfaces.

Range:
Maintain – Water and nutritional input, mowing regimes, aeration practices, scarification practices, weed control, repair of areas.

What do learners need to demonstrate?	Skills
Identify methods required to maintain a given area of turf. Carry out turf maintenance task on a given area of turf. Mow an area of turf in straight lines using a rotary mower. Improve the health of the turf surface mechanically or using hand tools. Dispose of waste according to good working practices and legal requirements.	EC5

3.6 Identify irrigation requirements and irrigate plants.

What do learners need to demonstrate?	Skills
Identify appropriate timing, method and quantity of application. Irrigate plants with a hose or watering can, taking into account safety and environmental considerations.	EC5

3.7 Carry out maintenance **pruning** activities using appropriate **tools and equipment**.

Range:
Pruning – Prune a plant to encourage winter stem colour, prune a plant to maintain its natural form, hedge maintenance, pruning for flowers/fruit.
Tools and equipment – Hedge trimmers, secateurs, pruning shears, pruning saws, loppers.

What do learners need to demonstrate?	Skills
Identify pruning requirements and appropriate tools and methods. Safe and correct use tools and equipment. Dispose of waste according to good working practices and legal requirements.	EC5

3.8 Apply **advanced pruning** to meet specified objectives.

Range:
Advanced pruning – Topiary, cloud pruning, cordons, espalier, cones, balls.

What do learners need to demonstrate?	**Skills**
Select correct tools. Prune a trained form of shrub or tree to required specification. Follow all safe working practices using appropriate PPE. Apply precise and controlled movements with delicacy. Maintain safe working distances from others. Apply a logical approach to resolving issues/problems. Clean tools. Dispose of arisings according to requirements. Leave work area in a safe and tidy condition.	EC5

Performance outcome 4

4. Install landscape features

4.1 Plan for the installation of landscape features.

What do learners need to demonstrate?	Skills
Assess existing landscape features, faults and challenges for development. Assess the project for potential risks. Draft a site plan and adapt drawings to reflect actual features and dimensions of a site.	EC5 MC1, MC3, MC4 DC1, DC2

4.2 Cost an installation project.

What do learners need to demonstrate?	Skills
Estimate resources required (including time, people, equipment, materials) to complete installation project. Calculate the volumes of materials required for the installation. Allocate resources (including time, people, equipment, materials) to installation tasks. Calculate the overall cost of the installation project.	EC3, EC5 MC1, MC2, MC9 DC1, DC2

4.3 Dynamically assess a site for health and safety risks.

What do learners need to demonstrate?	Skills
Complete a site-specific risk assessment. Instruct others on health and safety practices required for completion of installation project. Monitor and update the risk assessment during activities. Apply health and safety controls to activities. Apply appropriate posture, safe lifting and loading techniques when completing activities.	EC1, EC3, EC5, EC6 DC1, DC2

4.4 Locate existing **utilities and services** using **approved methods**.

Range:
Utilities and services – Gas, water, electricity, communications.
Approved methods – Maps/plans, CAT and Genny, GPR, electromagnetic detection.

What do learners need to demonstrate?	Skills
Interpret plans to locate existing features and services e.g. gas, water, electricity.	EC5
Use approved methods to locate underground utilities.	MC1, MC2, MC3
Adapt drawings to reflect actual features and dimensions of a site.	DC1, DC2

4.5 Set out installation requirements from information in a construction drawing.

What do learners need to demonstrate?	Skills
Measure lines, curves and areas on a site.	EC5
Use levelling tools to set out depths, falls and position of features.	MC1, MC2, MC3, MC4
	DC1

4.6 Prepare working environment for installation of hard landscape features.

What do learners need to demonstrate?	Skills
Inspect quality of materials e.g. timber-based products, masonry.	EC5
Apply protection to the environment surrounding the installation.	
Remove concrete and debris using hand tools e.g. hammer, bolster.	
Maintain a clean and safe working environment.	

4.7 Prepare and compact a **sub-base/foundation/bedding**.

Range:
Sub-base/foundation/bedding – Paving/paths/patios, steps, walls.

What do learners need to demonstrate?	Skills
Prepare tools for use.	EC5
Dig site area/apply shovelling techniques to prepare mixes.	MC1, MC2, MC3
Create and compact the sub-base/foundation/bedding according to requirements, following all safe working practices and using appropriate tools, equipment and PPE.	
Level the sub-base/foundation/bedding according to requirements.	
Clean tools following use.	

4.8 Install **masonry features**.

Range:
Masonry features – Paving/paths/patios, steps, walls.

What do learners need to demonstrate?	Skills
Select and prepare tools for use.	EC5
Confirm alignment of masonry by sight and measurement/marking.	MC1, MC2, MC3
Mark masonry materials with scribing tools.	
Cut masonry materials using hand and power tools.	
Apply manual handling techniques when carrying masonry materials.	
Safely and accurately mix materials (aggregates, cement, water) for application.	
Apply mortar and lay masonry materials to specified configurations.	
Tap/tamp masonry materials to achieve levels.	
Point gaps between masonry materials.	
Follow all safe working practices using appropriate PPE.	
Clean tools.	
Leave work area in a safe and tidy condition.	

4.9 Install **timber-based features**.

Range:
Timber-based features – Fencing, pergolas, decking.

What do learners need to demonstrate?	Skills
Select and prepare tools for use.	EC5
Confirm alignment of wood products by sight and measurement/marking.	MC1, MC2, MC3
Cut timber-based materials using hand and power tools.	
Join timber-based materials with temporary and permanent fixings using hand and power tools.	
Secure timber-based materials for permanent fixing.	
Apply coatings to timber-based materials.	
Follow all safe working practices using appropriate PPE.	
Clean tools.	
Leave work area in a safe and tidy condition.	

Performance outcome 5

5. Manage existing designed landscapes

5.1 Assess the management requirements of a horticultural area in a designed landscape.

What do learners need to demonstrate?	Skills
Define the unique characteristics and local distinctiveness of an area. Identify the management requirements for the area. Assess the environmental impact of a proposed horticultural activity on a given site. Assess a situation for potential adverse effects. Assess suitability of provided information and data.	EC4, EC5

5.2 Plan the management of a designed landscape.

What do learners need to demonstrate?	Skills
Interpret a designed landscape plan. Synthesise information from different site assessment techniques. Create a management plan including: • schedule of work for an operational plan • a logical approach to resolving issues/problems Convey technical information to different audiences e.g. staff, members of the public. Present information orally. Create digital media to enhance work.	EC1, EC2, EC3, EC4, EC5, EC6 MC10 DC1, DC2, DC3

Guidance for delivery

The purpose of this specialism is for learners to know and undertake the theory and practice of Ornamental and Environmental Horticulture and Landscaping. A range of classroom-based and practical delivery methods should be employed to ensure both theory and practice are delivered with strong linkage to vocational context. Centres are encouraged to introduce employers and specific professionals from the horticulture and landscaping industry to provide interesting and relevant information to the learner.

All practical delivery should focus 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. Learners should understand the importance of maintaining an awareness of current legislation and Codes of Practice.

Machinery use outcomes are best initially delivered in a workshop context with eventual move to a working woodland or worksite environment. Reference should also be made to biosecurity and environmental protection measures throughout. The requirement for regular maintenance and use of the manufacturers' manuals should also be identified. Pre-start checks and safe starting techniques will form part of these outcomes.

For the more theory-based outcomes it is anticipated that the delivery will be through formal lectures but it is recommended that they are linked directly with interactive lessons in a real environment and that visiting speakers are used where possible to provide a vocationally relevant context. Laboratory and field-based practical sessions will be essential to help learners to explore soil characteristics, plant physiology and structure, and a series of visits to nurseries, botanical collections, gardens and established designed landscapes could help learners better understand factors affecting the establishment, maintenance and development of ornamental and environmental horticultural areas. Learners should also have access to a range of soils, as well as appropriate equipment and resources to undertake soil testing.

Suggested learning resources

Books

- Adams, C.R.; and Early, M.; Brook J.; Bamford K. (2014) Principles of Horticulture Level 2 (7th edn.) London: Routledge
- Adams, C.R.; Early, M.; Brook J.; Bamford K. (2014) Principles of Horticulture Level 3 (1st edn.) London: Routledge
- Alexander, R. (2017) The Essential Garden Design Workbook (3rd edn.). London: Timber Press
- Allaby, M. (2019) Dictionary of Plant Sciences) Oxford: Oxford University Press
- Brickell, C. (2012) RHS Encyclopaedia of Gardening. Harlow: Dorling Kindersley
- Thomas, G.S. (2004) Perennial Garden Plants. London: Frances Lincoln
- Hartmann & Kester's Plant Propagation: Principles and Practices: (2013) Pearson International
- Brown, L (2002) Applied Principles of Horticultural Science (2nd edn) Butterworth-Heinemann
- Ingram, D S., Vince-Prue, D., Gregory P J., (2015) Science and the Garden: The Scientific Basis of Horticultural Practice (3rd edn) Wiley-Blackwell

- Brickell, C., Joyce, D. 2006. RHS Pruning and Training. Essex: Dorling Kindersley Publishers
- Bhavikatti, S.S. 2008. Surveying and Levelling. New Delhi: I K International
- Knight, B.H., Brend, H.J. 1968. Surveying and Levelling for Students. 4th ed. Glasgow: Maclaren and Sons
- Subramanian, R. 2008. Surveying and Levelling (Oxford Higher Education). New Delhi: OUP India
- Tate, T. 2008. Principles of Geometry, Mensuration, Trigonometry, Land Surveying and Levelling. Charleston: Bibliobazaar
- Bird.C. ed. 2014. The Fundamentals of Horticulture: Theory and Practice, Cambridge University Press
- HortWeek
- The Horticulturist

Websites

- Royal Horticultural Society – **www.rhs.org.uk**
- The Soil Association – **www.soilassociation.org**
- Department for Environment Food and Rural Affairs (DEFRA) – **www.gov.uk/government/organisations/department-for-environment-food-rural-affairs**
- DEFRA Plant Health Portal – **https://planthealthportal.defra.gov.uk**
- Protected plants, GOV.UK - **www.gov.uk**
- Invasive non-native (alien) plant species: rules in England and Wales, GOV.UK - **www.gov.uk**
- Environment Agency – **www.gov.uk/government/organisations/environment-agency**
- Health and Safety Executive – **www.hse.gov.uk**

Scheme of assessment additional information

The below tables illustrate how each performance outcome is assessed through the use of assessment themes along with how each assessment criteria including the knowledge criteria in outcome 1 is packaged into an assessment theme for assessment purposes.

Assessment criteria that appear more than once against an assessment theme is required so that content is assessed within the context of a specific performance outcome.

Performance Outcome	Assessment themes	Assessment criteria
PO2. Establish ornamental and environmental horticultural areas (30%)	Health and safety	1.19 Typical hazards associated with establishment, maintenance, landscaping and management of ornamental and environmental horticultural areas 1.20 Types of Personal Protective Equipment (PPE) 1.21 Manual handling techniques 1.24 Techniques and equipment for movement and transfer of tools, equipment and materials across varied terrains and heights 1.25 Storage facilities required for different tools, equipment and materials 1.34 Utilities that may be located in the environment, and information sources and techniques used to locate and avoid them 2.3 Assess health and safety risks
	Environment	1.8 Environmental factors which affect plant growth 1.11 Biosecurity measures and their application 1.12 Typical pests and diseases in ornamental and environmental horticulture areas, and control methods used 113 Typical plant disorders and their symptoms 1.29 The potential positive and negative impacts of establishing ornamental and environmental horticultural areas 1.30 The potential impacts of establishing ornamental and environmental horticultural areas on protected plant species 1.31 How environmental factors can be applied to the manipulation of indoor and outdoor plant establishment environments

		2.4 Assess biosecurity risks
	Identify features and characteristics	1.1 Types, characteristics and purposes of ornamental and environmental horticultural areas 1.2 The physical characteristics of a site 1.3 Types and purposes of common landscaping features 1.4 Types and purposes of sustainable horticultural features 1.6 Plant classification and techniques for identification 1.7 Types of plants and their key characteristics 1.9 Soil types, and techniques used to determine soil characteristics and their textures 2.1 Identify plants using different methods
	Plan for establishment	1.5 Factors that influence sourcing of plants and landscape materials 1.14 Types of plans of ornamental and environmental horticultural areas 1.16 The principles of project management 1.17 Site management considerations 1.18 How a site operates 1.26 The implications of site characteristics when establishing ornamental and environmental horticultural areas 1.27 The implications of landscaping features on establishing ornamental and environmental horticultural areas 1.28 Impacts of sustainable horticultural features when establishing ornamental and environmental horticultural areas 1.35 Common weeds that can have an adverse effect on plant establishment 1.37 Considerations for planting of plants and trees, including sourcing, stock types and planting 2.2 Assess an ornamental and environmental horticultural area for establishment 2.9 Calculate sowing requirements
	Establish planted areas	1.15 Techniques, processes, equipment and information used to set out ornamental and environmental horticultural areas 1.32 Types of soil cultivation, their purposes, applications and techniques, and factors affecting suitability and scheduling 1.33 Addition of organic matter and soil amelioration methods 1.36 Methods of vegetation management

		2.5 Situate garden features and set out shapes from a plan 2.6 Identify and remove weeds from cultivated areas 2.7 Carry out primary soil cultivation and incorporation of organic matter 2.8 Carry out secondary soil cultivation using hand tools 1.10 Quality characteristics of healthy plants 1.22 Tools, equipment, machinery and materials used for different operations 1.23 Maintenance of tools equipment and machinery 1.38 Processes involved in direct sowing annual and perennial mixes 1.39 Different establishment methods for grass areas and benefits and limitations of each 1.40 Aftercare required to support plant and turf establishment until they gain independence in the landscape 1.41 The different types of turf surfaces, grass mixes and key species 1.42 Manual and mechanical techniques used to sow grass seeds 1.43 Processes and techniques used to establish areas of grass by turf 1.44 Techniques used to monitor the establishment of plants, trees and turf in ornamental and environmental horticultural areas against design specification 1.45 Suitability of different soils and growing media for propagation and growing on of plants 1.46 The conditions, environments and facilities required for plant propagation 1.47 Techniques for propagation by seed and aftercare requirements 1.48 Techniques for propagation by vegetative means, including aftercare requirements 1.49 Processes and techniques for growing on plants in a production environment 2.10 Carry out an appropriate sowing method in open ground using hand tools 2.11 Plant in open ground 2.12 Apply aftercare for seeds and plants 2.13 Plant a tree in open ground 2.14 Apply aftercare for a planted tree 2.15 Lay turf 2.16 Propagate plants 2.17 Potting on plants

Performance Outcome	Assessment themes	Assessment criteria
PO3. Maintain ornamental and environmental horticultural areas (20%)	Environment	1.8 Environmental factors which affect plant growth 1.11 Biosecurity measures and their application 1.12 Typical pests and diseases in ornamental and environmental horticulture areas, and control methods used 1.52 The environmental impacts of maintaining ornamental and environmental horticultural areas on flora, fauna and habitats (including human) 1.53 The impacts of maintaining ornamental and environmental horticultural areas on protected plant species 1.56 Environmental factors which affect plant growth
	Identify requirements and plan maintenance	1.50 The types and site characteristics of ornamental and environmental horticultural areas that affect maintenance requirements 1.51 The impacts of landscaping features on maintaining ornamental and environmental horticultural areas 1.54 The effect of types, characteristics of plants on maintenance requirements 1.55 The implications of pruning and maintenance on physical structures of plants and physiological processes involved in plant growth on maintenance of ornamental and environmental horticultural areas 1.58 Types of maintenance and their suitability for different situations and environment 1.59 Types of maintenance activities required for different features 1.60 Key signs that unplanned maintenance is required 1.70 The purposes of tree and shrub pruning activities 1.62 Common weeds that can have an adverse effect on the maintenance of ornamental and environmental horticultural areas 1.64 Maintenance requirements of different types of turf surfaces 1.65 Nutritional requirements of different types of plants 1.67 Types of physical protection required by plants and trees and methods used 1.69 Causes of failure in trees 1.72 The implications of budgets on maintenance activities 3.2 Assess the health of plants
	Perform maintenance	1.22 Tools, equipment, machinery and materials used for different operations

		1.23 Maintenance of tools equipment and machinery 1.57 Soil enhancement methods 1.63 Methods of vegetation management 1.66 Different types of irrigation 1.68 Techniques used for the maintenance of hard structures 1.71 Pruning techniques used for different applications and management objectives 1.61 Management requirements for different types of water features and aquatic environments and their use in different landscape contexts 3.3 Identify and remove weeds 3.4 Identify a suitable area and carry out mulch application 3.5 Maintain turf surfaces 3.6 Identify irrigation requirements and irrigate plants 3.7 Carry out maintenance pruning activities 3.8 Apply advanced pruning to meet specified objectives

Performance Outcome	Assessment themes	Assessment criteria
PO4. Install landscape features (30%)	Health and safety	1.19 Typical hazards associated with establishment, maintenance, landscaping and management of ornamental and environmental horticultural areas 1.20 Types of Personal Protective Equipment (PPE) 1.21 Manual handling techniques 1.24 Techniques and equipment for movement and transfer of tools, equipment and materials across varied terrains and heights 1.25 Storage facilities required for different tools, equipment and materials 1.82 Utilities and services likely to be encountered when installing landscape features, and information sources and techniques used to locate and avoid them 4.3 Dynamically assess a site for health and safety risks 4.4 Locate existing utilities and services using approved methods
	Environment	1.76 Types of water environments 1.77 The positive and negative impacts of installing hard landscaping features on flora, fauna, and habitats (including human) 1.78 The potential impacts of installing hard landscape features on protected species

	Plan for installation	1.73 The use of hard landscaping features in different types of ornamental and environmental horticultural areas 1.74 Implications of site characteristics to the installation of hard landscaping features 1.75 Implications of existing landscaping features for installing hard landscaping features 1.79 How hard landscapes affect the physical processes involved in plant growth 1.80 The implications of existing site features on the installation of hard landscape features 1.81 The use of soft landscape features to provide architectural structure to the landscape 4.1 Plan for the installation of landscape features 4.2 Cost an installation project
	Install hard landscaping features	1.83 Techniques for protection of the site environment when installing landscape features 1.84 Types of excavation 4.5 4.5 Set out installation requirements from information in a construction drawing 4.6 Prepare working environment for installation of hard landscape features 4.7 Prepare and compact a sub-base / foundation / bedding 1.22 Tools, equipment, machinery and materials used for different operations 1.23 Maintenance of tools equipment and machinery 1.85 Types of surfaces, surface materials, and sub-base/foundation/bedding materials 1.86 Types of vertical level construction and materials used 1.87 Cutting methods, tools and equipment for different types of materials 1.88 Joining methods and materials for different materials and structures 1.89 Irrigation equipment used to water plants and equipment required to create water features 4.8 Install masonry features 4.9 Install timber-based features

Performance Outcome	Assessment themes	Assessment criteria
	Environment	1.8 Environmental factors which affect plant growth 1.11 Biosecurity measures and their application

PO5. Manage existing designed landscapes (20%)		1.12 Typical pests and diseases in ornamental and environmental horticulture areas, and control methods used 1.96 The use of environmental risk assessments to assess potential positive and negative impacts of managing existing designed landscapes on the environment 1.97 The potential impact of developing existing designed landscapes on protected species
	Identify designed landscape features and characteristics	1.90 Types of designed landscapes 1.91 The ideological characteristics of a designed landscape 1.92 The relationship between landscaping features and the local distinctiveness of a site 1.99 Types of plants found in existing designed landscapes
	Landscape management planning	1.93 Factors which influence the management of designed landscapes 1.94 Considerations for the management of designed landscapes 1.95 Considerations for the maintenance activities of an area to support medium and long-term development 1.98 Implications of finding invasive species in an environment to the management of existing designed landscapes 1.100 Environmental factors which affect plant growth in existing designed landscapes 5.1 Assess the management requirements of a horticultural area in a designed landscape 5.2 Plan the management of a designed landscape

405/406 Tree and woodland management and maintenance

Level:	3
GLH:	405 Forestry: 1000 406 Arboriculture: 1000
Assessment method:	Practical assignment

What is this component about?

The purpose of this specialism is for learners to know and undertake the theory and practice of Tree and Woodland Management and Maintenance.

Learners will have the opportunity to plan, perform and evaluate their work whilst utilising a range of techniques, methods and resources.

Learners will develop their knowledge and understanding of, and skills in:

- knowledge of theories and methods used to grow, maintain and manage trees and woodlands
- knowledge of the tools, equipment and materials used in tree and woodland management and maintenance
- knowledge of machinery used in tree and woodland management and maintenance
- skills in growing trees and woodlands
- skills in operating and maintaining tools, equipment and machinery used in tree and woodland management and maintenance

Learners will select an option and will develop their knowledge, understanding and skills further in either:

405 Forestry:

- Knowledge of theories and methods used to manage, maintain and harvest trees and woodlands
- Skills in managing trees and woodlands
- Skills in maintaining woodlands
- Skills in forestry felling operations

406 Arboriculture:

- Knowledge of theories and methods used to manage and maintain trees and tree populations, and arboricultural operations
- Skills managing trees and tree populations
- Skills in maintaining trees
- Skills in arboricultural tree work operations

Learners may be introduced to this specialism by asking themselves questions such as:

- What different types of trees and woodlands are there and what are they used for?
- What do forestry workers and arborists do on a daily basis?
- What areas of the industry do forestry workers and arborists work in?

Common:

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

1. Tree and woodland management and maintenance knowledge criteria (Common)

Performance Outcomes

On completion of this specialism, learners will be able to:

2. Grow trees and woodlands

3. Operate and maintain forestry and arboriculture machinery

Forestry option (405):

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

2. Tree and woodland management and maintenance knowledge criteria (Specific to performance outcomes 4–6)

Performance Outcomes

On completion of this specialism, learners will be able to:

4. Manage woodlands to meet objectives.

5. Maintain woodlands to meet prescribed objectives.

6. Undertake complex felling operations.

Arboriculture option (406):

Underpinning knowledge outcomes

On completion of this specialism, learners will understand:

3. Tree and woodland management and maintenance knowledge criteria (Specific to performance outcomes 7–9)

Performance Outcomes

On completion of this specialism, learners will be able to:

7. Manage tree populations to meet objectives
8. Maintain trees to meet prescribed objectives
9. Undertake complex arboriculture operations

Completion of this specialism will give learners the opportunity to develop their Maths, English and Digital Skills. Details are presented at the end of the specification.

Underpinning knowledge outcomes

Common knowledge criteria

Tree and woodland management and maintenance knowledge criteria

1.1 Characteristics of ecosystems found in different **landscapes**.

Range:
Landscapes – Urban, parks, woodlands, agricultural, rural.

What do learners need to learn?	Skills
Contribution made by trees to ecosystems and habitats including ecosystems services. Role of trees, wood and woodlands in the carbon, water and nutrient cycles. How ecosystems affect tree planting decisions. How ecosystems affect tree and woodland establishment, maintenance, management and felling decisions.	EC4, EC5

1.2 The health, social, environmental and economic benefits and limitations of trees, woodland and forests.

What do learners need to learn?	Skills
How benefits are increased. How limitations are minimised. Uses of trees and woodlands (timber production, recreation, learning, conservation). How health, social, environmental and economic benefits and limitations affect tree planting decisions. How health, social, environmental and economic benefits and limitations affect tree and woodland establishment, maintenance, management and felling decisions.	EC4, EC5

Tree and plant identification

1.3 Principles of tree and plant **species identification**, nomenclature and taxonomy systems.

Range:
Identification – Techniques: Use of botanical keys, identification literature, digital technology.
Species – Refer to Annex A: Tree and plant/shrub species.

What do learners need to learn?	Skills
Tree and woodland plant species commonly found in the UK including: • purpose of nomenclature and taxonomy systems • position of trees and shrubs within the taxonomy of the wider kingdom	EC4, EC5 DC1

• characteristics and morphology of common tree and shrub families, genera, species and variety at differing life stages • techniques (including botanical keys) and information sources (e.g. literature, digital technology) to aid correct identification • importance of scientific names and implications of incorrect use • types and use of tree tags and signs	

Plant growth, development and health

1.4 **Factors** affecting plant growth and development.

Range:
Factors – Environmental, microclimate, availability of light, water, nutrients, soil properties and characteristics.

What do learners need to learn?	**Skills**
Range of factors affecting plant growth and development. Typical plant responses to these factors: their effect on plant health, tree root growth and morphology, tree growth and survival during establishment.	EC4, EC5

1.5 **Abiotic** and **biotic** causes of ill health and damage to trees.

Range:
Abiotic – Abiotic disorders: wind, lightning, frost, drought, flooding, nutrient deficiencies, herbicides, pollution (airborne, waterborne, soilborne), planting failure.
Biotic – Biotic pathogens: bacteria, fungi, vertebrate pests, invertebrate pests, invasive plants, Human: vandalism, vehicle impact, fire damage, incorrect pruning cuts, mower damage, strimmer damage, root severance, lowered gradient, raised gradient and pollution.

What do learners need to learn?	**Skills**
Abiotic and biotic causes of ill health and damage to trees, including: • their symptoms • implications for growth and development • predisposing factors • methods of control	EC4, EC5

1.6 Typical **pests**.

Range:
Pests – Invertebrate pests: Hemiptera, Hymenoptera, Lepidoptera, Coleoptera (moths, beetles, aphids).
Vertebrate pests: Mammals (squirrels, rabbits, deer hares and voles).

What do learners need to learn?	**Skills**
Invertebrate and vertebrate pests, including: • their characteristics (life cycle, dispersal, signs and symptoms of their presence on trees/sites)	EC4, EC5

• how pests can be introduced to a site • methods of prevention • implications of pests to tree growth and development • benefits and limitations of treatment options • monitoring and risks of spread/contagion to other trees and the local environment • emerging pests threatening UK tree species	

1.7 Typical **pathogens** affecting trees and woodlands.

Range:

Pathogens – Fungi: Examples of Ascomycetes (*Nectria spp, Dothistroma septosporum, Hymenoscyphus fraxineus*), Basidiomycetes (rusts, Ar*millaria spp, Meripilus giganteus, Ganoderma spp, Laetiporus sulphureus*) and Oomycetes (*Phytophthora spp*).

Bacterial: *Xanthomonas populi*.

What do learners need to learn?	**Skills**
Types of fungi and bacterial pathogens (e.g. rusts, blotches, bracket fungi, phytophthora, ash dieback) including: • their characteristics (life cycle, dispersal) • implications to tree growth and development • how pathogens can be introduced to a site • methods of prevention • benefits and limitations of treatment options • monitoring and risks of spread/contagion to other trees and the local environment • emerging pathogens threatening UK tree species	EC4, EC5

1.8 Consequences of **pests, diseases** and **disorders** including:

Range:
Pests, diseases and disorders – Current and emerging pests, diseases and disorders threatening tree species grown in the UK should be covered.

What do learners need to learn?	**Skills**
Potential 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 need for risk assessment	EC4, EC5

1.9 Key responsibilities under plant health **legislation**.

Range:
Legislation – Plant Health Act 1967 (as amended), The Official Controls (Plant Health and Genetically Modified Organisms) (England) Regulations.

What do learners need to learn?	**Skills**
Key responsibilities under plant health legislation relating to all stages of the plant/tree/woodland lifecycle (sourcing of plants, establishment, maintenance, felling/harvesting, movement/sale/disposal of timber and wood products).	EC4, EC5

1.10 **Types** of tests.

Range:
Types – Soil sampling, foliar sampling, chlorophyll fluorimeter.

What do learners need to learn?	**Skills**
Available tests for identification/management of pests, diseases and disorders, including sampling and associated technology. Information provided by samples on ill health.	EC4, EC5 MC1 DC1

Business

1.11 Similarities and differences in how arboriculture and forestry organisations obtain **revenue**.

Range:
Revenue – From products, services, grants schemes, funding.

What do learners need to learn?	Skills
Range of revenue sources for arboriculture and forestry organisations. How arboriculture and forestry organisations maximise revenue generation opportunities.	EC4, EC5

Specific knowledge criteria for common performance outcomes

Grow trees and woodlands (PO2)

Health and safety

1.12 Typical **hazards and risks** associated with growing trees and woodlands.

Range:
Hazards and risks – Associated with planting, tools, equipment and machinery, site-specific hazards, lone working.

What do learners need to learn?	Skills
Soil and water-borne diseases and control measures to be put in place to mitigate these risks. Risks associated with lone working and control measures to mitigate for these.	EC4, EC5

Soils and growing media

1.13 **Properties and characteristics** of different types of **soils**.

Range:
Properties and characteristics – Soil texture (sand/silt/clay), soil structure, pH, nutrient availability, drainage and water holding capacity, organic matter and living organisms in the soil, colour and heat retention, ease of cultivation, existing pollutants, horizons, soil depth.
Soils – Brown earth, podzols, gleys, peat, iron pans, reclaimed soils.

What do learners need to learn?	Skills
Typical characteristics and properties of the range of soil types: • How soils and growing media are formed • Their influence on tree selection and growth • Techniques used to determine soil characteristics including texture testing, pH testing, digging a profile pit	EC4, EC5 MC1 DC1

1.14 **Techniques** for preparing, cultivating, protecting and manipulating soils and growing media for tree growth.

Range:
Techniques –
Preparing: Drainage, vegetation clearance, brash management, brash recovery.
Cultivating: Scarification, mounding, mechanical planting, screefing, ripping, sub-soiling.
Protecting: Mulching, erosion prevention.
Manipulating: Fertilisation, aeration.

What do learners need to learn?	Skills
Suitability of techniques for different soils and growing media, environments and tree species. How they are applied in practice.	EC4, EC5

Types of machinery and equipment used for the different techniques: • mechanised: e.g. excavators/tractors, forwarders, chippers, ground preparation machinery (including scarifiers, continuous mounding machines, mechanical planting machines), mulchers, boom sprayers • motor-manual: e.g. chainsaws, clearing saw/brush cutter/trimmer • manual: e.g. hand tools, knapsack sprayers	

Nursery and propagation practices

1.15 Different **types** of propagation.

Range:
Types – Seed, cuttings, grafting, budding, layering.

What do learners need to learn?	**Skills**
Basic understanding of the different propagation practices used in tree and plant production/nurseries, including: • how materials (seeds, cuttings) are obtained • the processes involved • the benefits and limitations of each type • their suitability for different species and environments • identifying features of each type used	EC4, EC5

1.16 **Organisations** in the tree planting stock supply chain.

Range:
Organisations – Plant nurseries, suppliers/retailers, hauliers, regulators.

What do learners need to learn?	**Skills**
Role of different organisations in the tree planting stock supply chain. Role of the marketplace in determining price. Factors that affect price. How this is used to support tree planting decisions.	EC4, EC5

1.17 **Characteristics** of responsible sources for tree stocks.

Range:
Characteristics – Biosecurity measures, sustainable propagation, working practices of labour.

What do learners need to learn?	**Skills**
Standards and assurance schemes for responsibly sourced and grown trees. Their function and purpose.	EC4, EC5

Tree stocks and tree planting

1.18 Tree planting stock **types**.

Range:
Types – Containerised, container grown, bare root, root ball, whips, plugs, chemically treated.

What do learners need to learn?	Skills
Characteristics of different tree planting stock types and their suitability for different environments. The difference between, and importance of, 'provenance' and 'origin' of stock: • Provenance: the geographic locality of a stand of trees from where the seed was collected • Origin: the geographic locality within the natural range of a species where the parent seed source or its wild ancestors grew	EC4, EC5

1.19 **Characteristics** of good quality stock plants.

Range:
Characteristics – Health, size, root stock, condition.

What do learners need to learn?	Skills
How to recognise characteristics of good quality stock plants. How to recognise characteristics of poor quality stock plants. How these are used to assess the condition of plants and materials against specification.	EC4, EC5

1.20 Tree planting **techniques** including support and protection.

Range:
Techniques – Planting: Pit, notch, mound.
Support and protection: Stakes, shelters, guards, fencing.

What do learners need to learn?	Skills
Correct plant handling methods used during planting operations to maintain tree quality and viability – protecting roots/foliage/growing media. Techniques for planting, support and protection. Their suitability for different stock types (transplants, whips, standards, semi mature) and environments (exposure/aspect, public access/vandalism) and purpose (restocking, afforestation, specimen plants, amenity plantings). When and how they are applied, including: • importance of planting position respective to ground preparation – position on mound/scarifying row • importance of correct planting depth • equipment and materials required	EC4, EC5 MC1

Tools, equipment and materials

1.21 **Types** of tools, materials and equipment required for tree planting and related operations.

Range:
Types – Tools**:** Planting spades, 'tube' planting tools, hammers/stake bumpers
Materials: Stakes, ties, tree tubes/shelters/guards (of different types and materials).
Equipment: Planting bags, clearing saw, brushcutter, GPS unit.

What do learners need to learn?	Skills
Different types of planting equipment, including: • their characteristics • function • preparation requirements – checks/inspections, adding materials (plant handling), cleaning/biosecurity • operation • suitability for carrying out tasks in different environments • maintenance and storage requirements to manufacturers' specification	EC4, EC5

Establishment planning

1.22 **Factors** that influence the choice of tree species.

Range:
Factors – Biological, ecological, economic, climate, provenance of tree stocks, origin of tree stocks.

What do learners need to learn?	Skills
How they affect decision making for different environments (urban, parkland, woodland). How they impact on meeting different management objectives (timber, amenity, shade, habitat, resilience). The use of Ecological Site Classification (ESC) to aid species selection.	EC4, EC5

1.23 Tree planting plans in arboriculture and forestry.

What do learners need to learn?	Skills
Information required from site survey to recommend species, stock, ground preparation, protection, support and aftercare. UK Forestry Standard (UKFS) requirements. Methods used to determine planting density, required quantities and spacing. Site constraints to consider (cultural, archaeological, heritage features, watercourses, buffer zones, protected species (EPS), utilities/services). Design and format of plans and sketches including specifications for planting stock, locations of trees, stocking density and planting specifications. Marking out of site.	EC4, EC5 MC1, MC2, MC3 DC1, DC2

1.24 Growing trees by artificial and natural regeneration.

What do learners need to learn?	Skills
Benefits and limitations of each approach to meet different management and site objectives such as improving timber quality and/or timber quantity. Factors such as economics, competition, light, shade, pests and disease that affect successful establishment and how these are used to support management decision making.	EC4, EC5

1.25 **Types** of management through the establishment period for trees in both forestry and arboriculture environments.

Range:
Types – Formative pruning, tie and stake adjustment, stocking density/beat up assessment on forestry sites, pest and disease monitoring and management, application of pesticides.

What do learners need to learn?	Skills
How they encourage independence in the landscape, growth and development. Their implications for long-term tree management, function and wood quality. Factors affecting their application (such as terrain, aspect, stock type). How they are applied after tree planting.	EC4, EC5

Business

1.26 Financial **considerations** for tree establishment and maintenance.

Range:
Considerations – Establishment costs (plants, planting, maintenance), survival/mortality rates, beat up costs, products, revenue.

What do learners need to learn?	Skills
Factors that can affect profitable tree and woodland operations (additional time, increased waste, damage to the environment). Financial considerations around tree establishment and maintenance. Methods used to minimise negative factors during preparation, operation and post operation.	EC4, EC5 MC2, MC5, MC9 DC1

Information

1.27 Types of **information** required for tree planting and establishment operations.

Range:
Information – Work specifications, tree planting plans, constraints plans, different types of maps (including Ordnance Survey (OS), sketches, computer aided (CAD), Global Information Systems (GIS)).

What do learners need to learn?	Skills
Types of information required for tree planting and establishment operations, including: • their content and format • conventions and symbols • how they are produced • how they are used in planning and carrying out operations	EC3, EC4, EC5 DC1, DC2

Operate and maintain forestry and arboriculture machinery (PO3)

Health and safety

1.28 Health and Safety **legislation**, **industry guidance** and best practice.

Range:

Legislation – Management of Health and Safety at Work Regulations 1999, Provision and Use of Work Equipment Regulations (PUWER) 1998, The Personal Protective Equipment at Work (Amendment) Regulations 2022, Work (Health, Safety and Welfare) Regulations 1992, Manual Handling Operation Regulations 1992, Control of Substances Hazardous to Health Regulations (COSHH) 2002, Health and Safety (First Aid) Regulations 2013.

Industry and HSE Guidance: Arboricultural Association guidance documents, FISA safety guides (804, 802 & 806), HSE Five Steps to Risk Assessment INDG163, FISA Managing Health and Safety in Forestry, FISA Managing Public Health and Safety on Harvesting Sites.

What do learners need to learn?	Skills
Relevant health and safety legislation. Relevant industry guidance and best practice – Forestry Industry Safety Accord (FISA) guides, Health and Safety Executive guidance, Arboricultural Association (AA) guidance. Risk assessment process and how to carry out a site-specific risk assessment. Required content of an emergency procedure. PPE requirements according to risk assessment findings and relevant industry and HSE guidance. First aid requirements for forestry and arboricultural sites and machinery, including training and certification requirements (including requirement for +F first aid training), first aid equipment which must be available on sites. Regulations and best practice regarding lone working and tasks/situations where lone working is not permitted. Safe manual handling whilst operating forestry and arboricultural machinery. How to set up a safe site when operating machinery.	EC3, EC4, EC5 DC2

Forestry and arboricultural machinery

Chainsaws

1.29 Chainsaw **maintenance**.

Range:

Maintenance – Maintenance of spark plug, air filter, chain brake, cooling system, exhaust system, clutch/drive system, sprocket, starter mechanism, greasing/ lubrication, fuel filter, oil filter, guide bar, chain.

Chainsaw maintenance to comply with industry guidance and best practice: FISA 301, 304, HSE Chainsaws at Work INDG3.

What do learners need to learn?	Skills
Importance of maintaining chainsaws to manufacturers' recommendations. Function of all chainsaw safety features; learners must know and be able to explain the function of each.	EC4, EC5 MC1

Hazards associated with battery powered chainsaws and their maintenance. PPE requirements. Function and maintenance of individual components. Function and maintenance of individual chain components. Information required to replace the chainsaw chain. Methods to identify different cutter types and their application. How to select the correct filing information for sharpening the chain and why this is important. Consequences of incorrect sharpening. Problems associated with a worn, damaged or badly maintained guide bar. Problems and risks associated with a chain that is too tight or too slack. Steps to take when a chainsaw is not repairable, faulty or non-operational. Correct methods of disposing of waste in line with legislation.	

1.30 **Cross cutting** timber using a chainsaw.

Range:

Cross-cutting – Concepts: Tension, compression, torsion (twisting).

Function of: Felling levers, wedges, timber tongs and pulp hook.

Cross-cutting to comply with industry guidance and best practice: FISA 301, 304, HSE Chainsaws at Work INDG3.

What do learners need to learn?	**Skills**
Appropriate compliant personal protective equipment (PPE). How to identify the hazards, risks and controls associated with the site, task and machine. Environmental considerations specific to cross-cutting. Safe working distances from other operators during cross-cutting. Routine bio-security controls. Be able to explain tension, compression and torsion in timber. Procedure for removing a trapped saw. Recognised methods used to cross-cut timber. Understand the use of ergonomic working methods. Considerations for stacking timber. Methods to avoid uncontrolled timber movement. Correct methods of disposing of waste in line with legislation.	EC4, EC5 MC1

1.31 **Techniques** and **equipment** for felling small trees (less than 380 mm diameter) using a chainsaw.

Range:

Techniques – Brashing, conventional felling cut, split level cut, dogs tooth cut, holding cut (Danish cut, safe corner cut), techniques for trees under 200 mm dia. (step cut, double v-cut, 80% cut, spear cut), snedding, de-limbing.

Equipment – Chainsaw, aid tools (felling lever, wedges, turning strap).

Techniques and equipment to be compliant with industry and HSE Guidance: FISA 302, 303, 802, 804 HSE Chainsaws at Work INDG3.

What do learners need to learn?	**Skills**
Personal protective equipment and the standards it must meet when felling a tree. How to identify the hazards, risks and controls associated with the site, task and machine. Advantages of setting up bench felling systems and brash mats prior to felling. Describe the range of felling techniques and when they would be used for a range of trees (different species/leaning/damaged, etc.) and tree sizes up 380 mm. Describe the range of aid tools to assist in felling and how they can be used. Methods used to deal with trees that have 'sat back'. Methods used to deal with hung up trees, including what hand tools can be used to assist. What not to do with a hung-up tree and the process to follow if the tree can't be brought down using hand tools. Risks to be considered when removing branches once the tree has been felled. Recognised methods of removing branches. Reasons for leaving a clean stem. How brash can be dealt with after felling. Methods used to cross-cut timber according to specification and stack safely.	EC4, EC5 MC1, MC2

Winches

1.32 Hand winching **equipment, systems,** maintenance and operation.

Range:

Equipment and systems – Equipment: Trifor type winch (using a separate cable), lugall winch (incorporating cable), slings, D and bow shackles, snatch block, wire rope.

Systems: Single line pull, double purchase pull, offset pull.

Equipment, systems and operation to be compliant with industry and HSE guidance, technical guide – winching operations in forestry (Forest Research), HSE – compliance with PUWER for treework winching operations.

What do learners need to learn?	**Skills**
Appropriate personal protective equipment (PPE). How to identify the hazards, risks and controls associated with the site, task and machine (including danger zones).	EC4, EC5 MC1, MC2

Suitable uses and applications for hand winches in forestry and arboriculture. Considerations for preparing a work site. Understand safe working load (SWL) and be able to identify SWL of equipment to ensure compatibility and that it is suitable for the task/load. Function and operation of winching equipment. Maintenance requirements of winching equipment. Appropriate additional equipment to be used with the winch and how it is configured correctly. Methods to increase winch force. How to select and use suitable anchor points. Identification, function and operation of overload protection features of a winch. Winch set up and safe practice. Systems and operational techniques.	

Wood chippers

1.33 **Wood-chipper** maintenance and operation.

Range:

Wood-chippers – Tracked, towed, three-point linkage mounted, fly wheel mounted or drum mounted blades.

Maintenance and operation to be compliant with industry and HSE Guidance - FISA 604 Wood Chippers.

HSE AIS38 (Revision 1) - Power-fed mobile wood-chippers: operator protection at infeed chutes.

What do learners need to learn?	**Skills**
How to identify the hazards, risks and controls associated with the site, task, and machine. Principle HSE legislation and industry guidance for woodchippers. Identification and function of the safety features of a woodchipper. Maintenance requirements of a woodchipper. Correct procedure for clearing blockages. Safety and environmental factors associated with the disposal of woodchips and the end uses of woodchip.	EC4, EC5

Performance outcome 2

2. Grow trees and woodlands

2.1 Select suitable tree species and stock types for planting.

What do learners need to demonstrate?	Skills
Collect a soil sample from a profile pit. Assess soil type and condition. Obtain information on sources of tree stocks from different information sources. Recommend suitable species and stock type for the site. Convey technical information to different audiences.	EC1, EC4, EC5.

2.2 Prepare **resources** for planting.

Range:
Resources – Tools and equipment, plants, support and protection materials.

What do learners need to demonstrate?	Skills
Prepare tools, equipment and resources including planting stock. Assess condition of tree stock. Measure quantities of materials with precision.	EC5 MC1

2.3 **Prepare** site for planting.

Range:
Prepare – Remove unwanted vegetation, prepare soil (screefing, cultivation).

What do learners need to demonstrate?	Skills
Clear sites for tree growth operations using hand tools or mechanical equipment. Prepare soils for tree planting.	EC5

2.4 Plant **trees** according to planting specification.

Range:
Trees – Containerised, bare root, whips, standards.

What do learners need to demonstrate?	Skills
Interpret planting specifications and plans to determine planting locations/spacing. Handle plants correctly during the planting operation. Dig planting pits. Position tree to planting plan and specification. Plant trees using suitable technique, to the appropriate depth, according to the ground conditions and stock type. Irrigate using suitable methods as and when appropriate.	EC5 MC1

2.5 Apply **support and protection** to planted trees.

Range:
Support and protection – Mulch, stakes and tubes/guards, geotextile, cages, guying, fencing.

What do learners need to demonstrate?	Skills
Apply tree support and protection materials appropriate to site conditions and stock type, ensuring planted trees are not damaged in the process.	EC5

Performance outcome 3

3. Operate and maintain forestry and arboriculture machinery

Health and safety

3.1 Carry out a site-specific risk assessment.

What do learners need to demonstrate?	Skills
Identify hazards, risks, and controls associated with site, task, machinery and equipment. Record in a written format which can be understood by all personnel on site. Brief personnel on site on the content of the risk assessment.	EC1, EC3, EC5, EC6

3.2 Produce an **emergency procedure**.

Range:
Emergency procedure – As per FISA802 Emergency Planning.

What do learners need to demonstrate?	Skills
Collate all necessary information to be used in the event of potential emergencies – e.g. injury/illness, environmental, fire, utilities. Record in a written format which can be understood by all personnel on site. Brief personnel on site on the content of the emergency procedure.	EC1, EC3, EC5, EC6

Chainsaws

3.3 **Maintain** chainsaws.

Range:
Maintain - One of: power unit, guide bar and chain.

What do learners need to demonstrate?	Skills
Select appropriate tools and PPE for the maintenance of both the chainsaw and power unit. Carry out the maintenance of the power unit including spark plug, air filter, chain brake, cooling system, exhaust system, clutch/drive system (inboard and outboard clutch), sprocket, starter mechanism, greasing and lubrication, fuel filter, oil filter. Select appropriate tools and PPE for the maintenance of the guide bar and chain. Carry out maintenance of the guide bar – clean groove, straightness, even rails and burrs removed, inspect sprocket and grease if required. Turn bar to promote even wear. Maintain and sharpen the chain using correct file size, ensuring cutters are filed at the correct angle and the depth gauge is filed to the correct height.	EC5 MC1

Reassemble the chainsaw and ensure that the chain is tensioned correctly. Carry out work to always maintain health and safety and in line with legislation and industry good practice**.**	

3.4 Cross-cut timber using a chainsaw.

What do learners need to demonstrate?	**Skills**
Identify hazards, risks and controls associated with site and task machine.	EC5
Select and wear appropriate compliant personal protective equipment (PPE).	MC1
Select an appropriate fuelling site and fill the saw with petrol and oil.	
Carry out pre-start checks and settings of the chainsaw.	
Select an appropriate location and start the chainsaw safely.	
Carry out post-start checks.	
Carry out cross-cutting of the timber using recognised methods and demonstrate how to deal with tension and compression in timber.	
Demonstrate when and how a boring cut is used.	
Ensure the timber is cut to specification.	
Be able to move and stack timber safely using appropriate tools and good manual handling techniques.	
Ensure site is left safe, to specification, and waste is removed in line with legislation.	
Carry out work to always maintain health and safety and in line with legislation and industry good practice**.**	

3.5 **Fell trees** up to 380 mm diameter using a chainsaw.

Range:
Fell trees – Upright tree, tree leaning back from the direction of fall, tree leaning heavily in the direction of fall.

What do learners need to demonstrate?	**Skills**
Identify hazards, risks and controls associated with site and task machine.	EC5
Select and wear appropriate compliant personal protective equipment (PPE).	MC1
Select an appropriate fuelling site and fill the saw with petrol and oil.	
Carry out pre-start checks and settings of the chainsaw.	
Select an appropriate location and start the chainsaw safely.	
Carry out post-start checks.	
Establish felling direction considering tree form and site conditions.	
Prepare and establish escape routes and identify danger zones.	
Prepare tree prior to felling – brashing.	
Fell tree using a conventional felling cut.	
Fell one other tree either leaning back from the direction of fall or leaning heavily in the direction of fall using a recognised felling cut.	
Process the trees using a recognised method of snedding or de-limbing.	
Cross-cut the timber according to specification and stack.	
Demonstrate how to deal, using recognised techniques, with a hung-up tree safely.	
Leave the site in a safe condition and as per job specification.	

Carry out work to always maintain health and safety and in line with legislation and industry good practice.	

Winching

3.6 Use winching equipment to move **trees** or **timber**.

Range:
Trees – Standing tree (as part of an assisted fell), felled tree (to move/roll a stem).
Timber – Processed timber (to move logs/products).

What do learners need to demonstrate?	**Skills**
Identify hazards, risks and controls associated with site and task machine. Select and wear appropriate compliant personal protective equipment (PPE). Select and appropriate hand winch and associated compatible equipment-slings, snatch block, shackles, wire cable. Check that all equipment is fit for purpose and explain the process. Select a suitable anchor point. Set the winch system up considering the load to be moved. Winch the timber or tree ensuring good communication with everyone on site at all times. On completion of the winching operation equipment must be dismantled, checked and stored. Ensure the site is left in a safe condition and as per job specification.	EC5 MC1, MC2.

3.7 Load a manually-fed wood chipper.

What do learners need to demonstrate?	**Skills**
Select and use the correct PPE. Identify and check operation of the safety features of the woodchipper. Safely operate the woodchipper. Safely load material into the woodchipper. Follow the correct procedure for clearing blockages. Ensure the site is left in a safe condition and as per job specification. Maintenance and operation to be compliant with industry and HSE Guidance: FISA 604, HSE AIS38 (Revision 1) Power-fed mobile wood-chippers: Operator protection at infeed chutes.	EC5

Underpinning knowledge outcome 2

Specific knowledge criteria for Forestry performance outcomes

Manage woodlands to meet objectives (PO4)

Health and safety

1.34 Health and safety **legislation, regulations** and **guidance** for woodland management.

Range:
Legislation and Regulations – Management of Health and Safety at Work Regulations, Occupiers Liability Act 1957 and 1984, Highways Act 1980, Countryside Rights of Way Act 2000 (CROW).
Guidance – Health and Safety Executive publications, Forestry Commission: Managing Public Health and Safety on Harvesting Sites, FISA Guidance on Managing Health and Safety in Forestry. FISA 802, 806, 805, 804, 702, 701, 607, 604, 501, 310, 304, 303, 302, 301, 204, 203, 202, 104.

What do learners need to learn?	**Skills**
Legal responsibilities associated with health and safety, including the protection of lawful and unlawful visitors. Hazards and risks associated with managing trees and woodlands, including awareness of lone working procedures. Control measures that can be put in place to mitigate these risks, including how to implement them and monitor them once work has commenced. Responsibilities for the key roles on forestry sites in relation to the FISA Guidance on Managing Health and Safety in Forestry document. How to set up a safe site prior to undertaking woodland management activities.	EC4, EC5

Environment

1.35 **Characteristics** and **features** of tree and woodland ecosystems and **habitats**.

Range:
Characteristics – Designations of woodland: Ancient Semi-Natural Woodland (ASNW), Plantations on Ancient Woodland Sites (PAWS), recent semi-natural, recent plantation.
Woodland classification: National Vegetation Classification (NVC) woodland types.
Woodland structure and strata: below ground, ground, stand composition, the shrub, sub and upper canopy strata.
Features – Woodland name, boundary shape, wood banks, out-grown hedges, ditches, pits, charcoal hearths, saw pits, tracks and indicator species, archaeological and historical features.
Tree and woodland habitats – Glades, rides, woodland edges, veteran trees, veteranisation, deadwood, ponds, streams, bog, thicket and dense shade, nesting and roosting sites, earths, setts.

What do learners need to learn?	Skills
Characteristics of tree and woodland ecosystems. Ecosystem services provided by trees and woodlands: Water storage and retention, erosion control, carbon and oxygen cycles, nitrogen cycle, species refuge, energy transformation, carbon sequestration, genetic reservoir, particulate deposition, food production. How different tree and woodland habitats affect tree and woodland management decision making and objectives setting. Stand composition and woodland canopy structure. Importance of woodlands for regionally or internationally significant flora and fauna. Woodland habitats and their relevant management techniques: planting/sowing (trees, shrubs and ground flora), natural regeneration, thinning, clearance, coppice, agroforestry and silvicultural systems. How improvements can be made to woodland habitats.	EC4, EC5

1.36 The **benefits** of trees, woodland, forests and green infrastructure.

Range:
Benefits – health, environmental, economic.

What do learners need to learn?	Skills
The health, environmental and economic benefits of trees, woodland and forests and green infrastructure to society. Health: urban greening, improved air quality, increased access to the countryside, recreation opportunities, healthier lifestyles, Environmental: increased bio-diversity, carbon sequestration and absorption of gasses, regeneration of derelict and industrial land, flood prevention, improved landscapes and increased wildlife habitat and diversity. Economic: Timber products, increased employment prospects, sustainable wood-fuel initiatives, increased visitors, increased property values, financial benefits (grants). Financial support opportunities to increase woodland and green infrastructure – planting and management grants (restocking, woodland creation), commercial loans, sponsorship, fundraising. Differences and similarities between rural and urban woodland infrastructure, their management requirements and priorities. How the benefits affect management decision making and objectives setting.	EC4, EC5

1.37 **Woodland management plans**.

Range:
Woodland management plans –Typical objectives: Timber production, conservation/wildlife, amenity/community use, landscape, recreation, sporting game/management.
Structure: Vision, objectives, management strategy, plan of operations.
Typical content: Property details, vision and objectives, plan review (achievements to date), woodland survey, woodland protection (risks and mitigations), management strategy, inventory

and plan of operations (including mapping of compartments/sub-compartments, planned felling and restocking), stakeholder engagement, monitoring (how progress towards objectives will be monitored and reported), review.

Typical data used: Woodland survey including mapping (description, inventory, features, designations, protected/priority species, historic environment, veteran trees, landscape and people, water, habitat types, woodland structure), physical/topography, meteorological and climate data, soil data.

What do learners need to learn?	**Skills**
The purpose of woodland management plans: • Enable an owner to make coherent decisions to manage the woodland to reach their objectives, monitor activities and to pass on information about ongoing management of a woodland to contractors or subsequent owners • Allows an owner to provide evidence of compliance with the legal obligations associated with woodland ownership such as obtaining felling licenses or management of protected habitat • Provides evidence of ongoing activities to support applications for independent certification (e.g. FSC, UKWAS) • Is a requirement for the payment of a number of Forestry Commission grant schemes Typical structure, content and how to interpret the information. Typical objectives. Typical factors and data considered/used in the development of management plans. Associated standards and certifications (UK Forest Standard, UK Woodland Assurance Standard, Forest Stewardship Council certification) and current industry and government guidance. Associated legislative and regulatory requirements for woodlands and management activities at different sizes/scales, including: • Forestry Act 1967 • felling licenses • role of the Forestry Commission as regulator	EC4, EC5

1.38 Environmental risk assessments.

What do learners need to learn?	**Skills**
The purpose of environmental risk assessments, including: • content of an environmental risk assessment • relationship with woodland management plans and operational decision making • how environmental risk assessments are conducted • how site variables and characteristics affect environmental risk assessment, woodland management planning and decision making – terrain and slope, ground conditions, vegetation, soil, geology, access, drainage, exposure, season, climate and weather	EC4, EC5

Business

1.39 **Factors** that can affect profitable tree and woodland operations.

Range:

Factors – Stakeholders: Land/tree owners, land agents, contractors, subcontractors, Forest Works Manager, visitors, neighbours.

Price: Timber prices and fluctuations, contractor rates, haulage rates.

Product: Species characteristics, timber and non-timber, quality and market requirements.

Site: Access, terrain/obstacles, extraction routes, haulage routes, distance to market.

What do learners need to learn?	Skills
Stakeholders in the supply chain and their roles. Similarities and differences in how arboriculture and forestry organisations obtain revenue. How forestry organisations maximise revenue generation opportunities. How tree and woodland management contributes to revenue generation, including interim and future revenue. Role of the marketplace in determining price and the factors that affect price (such as local markets for certain products). Relationship between price and management decisions. How long-and short-term woodland management objectives are set and incorporated within woodland management plans. How management objectives affect the profitability of woodland operations. Options available to reduce costs during preparation, operation and post operation (tools, equipment, labour, consumables). Factors affecting the quality and quantity of timber and forest products and how these are optimised through management activities to maximise yield and quality. Factors affecting non-market benefits and services (recreation, wellbeing, air quality, biodiversity, water management) of woodland to society and how these are optimised through management activities and decisions.	EC4, EC5 MC2, MC10

Tree biology physiology and health

1.40 Influence of **tree physiology and health** on woodland management objectives and operations.

Range:

Tree physiology and health – Factors: Abiotic, biotic, human, fungi.

Management options: Irrigation, feeding, approved repellents, physical barriers, fencing, tree shelters, breeding for natural resistance, species selection, cultural, chemical, biological, natural population control.

Legislation: Environmental Protection Act 1990 (as amended), Control of Substances Hazardous to Health Regulations (COSHH), Wildlife and Countryside Act 1981 (as amended), Pests Act 1954 (as amended), Plant Health Act 1967 (as amended).

What do learners need to learn?	Skills
Influence of tree physiology and health on woodland management objectives and operations. Characteristics of defects in trees, including unhealthy or structurally weak trees.	EC4, EC5

Characteristics of unhealthy stands of trees (signs and symptoms of pests and pathogens). Abiotic, biotic and human causes of ill health and damage to trees and options for management and prevention. Factors that predispose trees to ill health. Implications of tree health for the management of tree populations and woodlands. Suitability of different management options to promote health, tree growth, alleviate or improve condition. Biosecurity requirements and reporting of potential tree health issues. Legislation relating to practice and products for controlling tree pests and pathogens, including recognition of non-target species, protocols for plant passports and import requirements.	

1.41 **Techniques and technology** to monitor health of stands and individual trees.

Range:

Techniques and technology – Non-invasive (visual assessment), semi-invasive (soil, water and foliar sampling), invasive (increment borer).

Equipment: Rangefinder, vertex, portable computers and mobile devices, compass, measuring tape, clinometers, field notebook, binoculars, sample containers, PPE.

Geographic information technologies: Global Positioning System (GPS), Geographic Information Systems (GIS), remote sensing (drones, photography, imagery).

What do learners need to learn?	**Skills**
Techniques and associated technology and equipment used to monitor tree health. Their use in decision making and setting of woodland management objectives. Monitoring: • Purpose and objectives of monitoring • Procedures for monitoring tree/stand health – visual assessment • Use of geographic information technologies to monitor stand/tree health • Timing and frequency of planned monitoring (according to stand age, growth stage, season) and unplanned monitoring (reactive – following storms/outbreaks/infestations) Sampling: • Samples that can be taken and their purpose. • Processes followed to take samples • Timing of sample collection • Biosecurity measures to be followed	EC1, EC3, EC5 MC1 DC1, DC2

Silviculture

1.42 Common **silvicultural systems** and woodland establishment.

Range:

Silvicultural systems – Clear-cutting system, selection systems, shelterwood systems, agroforestry systems, coppice systems, Lower-Impact Silvicultural Systems (LISS).

Artificial and natural regeneration systems: High forest systems, even aged/uniform/regular systems, uneven aged/irregular systems, species mixtures, nurse crops, underplanting, direct seeding, coppice systems, natural colonisation

What do learners need to learn?	**Skills**
Common silvicultural systems, including: • characteristics of different silvicultural systems including regeneration systems • their benefits and limitations to different environments and objectives • considerations – marketing, harvesting, extraction, regeneration • applications of different silvicultural systems and reasons for their selection • benefits and limitations of artificial and natural regeneration systems • suitability and limitations of thinning regimes and harvesting techniques for different silvicultural systems • methods used to extract harvested trees and their suitability for different silvicultural systems • how silvicultural systems are applied to create habitats, timber and other products	EC4, EC5

1.43 Silvicultural **characteristics** of tree and shrub **species**.

Range:

Characteristics – Identification features, site requirements (soil type, moisture regime, temperature regime, shelter, shade tolerance), pests and pathogens, appropriate silvicultural systems, timber properties and uses.

Species – Refer to Annex A: Tree and plant/shrub species.

What do learners need to learn?	**Skills**
Silvicultural characteristics of common woodland tree species, including: • site requirements (soil type, moisture regime, temperature regime, shelter, shade tolerance) • susceptibility to pests and pathogens • appropriate silvicultural systems for different species • timber properties and uses of different species • factors that affect successful tree establishment and growth and how these are used to support management decision making	EC4, EC5

Timber and forest products

1.44 **Factors** affecting the quality and quantity of timber.

Range:

Factors – Factors: Stocking density and spacing, plant quality, establishment practices, competition, pests and pathogens, climate, species selection.

Management techniques: Brashing and pruning (formative pruning, high pruning), respacing and thinning.

What do learners need to learn?	Skills
How different factors affect the quality and quantity of timber produced from a woodland. Range of management techniques available, how and why they are used to maximise yield and quality.	EC4, EC5

1.45 **Timber products** and their **marketing**.

Range:

Timber products – Marketable products: Paper, decking, veneer, particles, fencing, firewood, construction, niche products.

Wood characteristics: Natural durability, sapwood/heartwood ratio, ease of preservative penetration, natural strength, proportion of knots.

Marketing – Marketing methods: Internet marketing, local and national press, specialist press.

Sale methods: Direct sales, auction and tender, standing/roadside sales.

What do learners need to learn?	Skills
Range of products and markets into which timber can be sold, including: • classification of hardwood and softwood timber according to size and quality (sawlogs (green/red softwood), bars, fencing, firewood, chip, wood fuel) • concept of product breakout – a tree can be processed into more than one product type • characteristics of timber that affect quality, potential value and suitability for end use • how wood characteristics influence timber processing and conversion • how timber is marketed and sold.	EC4, EC5

1.46 **Defects** and **grading** of timber.

Range:

Defects – Proportion of knots, dead and live knots, shake, stain, decay, splits and checks, seasoning defects, bark, sapwood.

Grading – Machine strength grading, visual strength grading, visual appearance grading.

What do learners need to learn?	Skills
Characteristics of defects in timber, including: • relationship between defects and woodland management decisions and operations • reasons for grading of timber and methods used • potential uses of timber of different grades – load bearing and non-structural	EC4, EC5

General surveying and management

1.47 Surveying woodland **features**.

Range:
Features – Terrain and slope, infrastructure, overground and underground services, buildings/ structures, ground conditions, climate and microclimate, geology, soil, hydrology, existing tree species, access, timing, species and habitats, cultural historical and archaeological features.
Technology used: Digital maps, measuring tapes, CAD, GIS, drones.

What do learners need to learn?	**Skills**
How and why woodlands and woodland features are surveyed – to inform woodland management plans, monitor operations, monitor trees/stands for growth/health. Features of woodland sites and their effect on: • woodland operations that can be undertaken • woodland management planning and setting objectives Plans, sketches and mapping, including: • types of equipment and technology used to support surveying and tree and woodland management • how they are used to compile and analyse data and monitor operations • benefits and limitations of technology • techniques for digitally creating and editing (including scaling, identifying specific trees and features) • hand-drawn styles and appropriate use • their content and format • conventions and symbols • how they are used in planning, reporting and undertaking practical operations	EC4, EC5 DC2

1.48 Woodland **sampling and surveying techniques**.

Range:
Sampling and surveying techniques – Survey techniques: Field walking, transects, plots, triangulation, remote sensing.
Equipment: Rangefinder, identification guides, maps, portable computers and mobile devices, compass, measuring tape, girth tape, clinometer/hypsometer, vertex, field notebook, relascope, binoculars.
Sampling units: Point, transect and plot (plot size and plot shape).
Sampling methods: Systematic sampling, simple random sampling and stratified random sampling.
Scheme components: Sampling method, sampling unit, sampling intensity and location of sampling units (e.g. plot locations).

What do learners need to learn?	**Skills**
Reasons to survey and sample woodlands – tree condition, valuation (commercial potential, aesthetics), insurance, species diversity and distribution, pest, diseases and disorders, boundary demarcation, to aid	EC4, EC5

operational planning.
Techniques used to survey woodlands.
Methods and units used for woodland sampling.
Equipment used for woodland surveying and sampling.
Suitability of the survey or sampling method to the management objectives – suitability of sampling methods for the level of detail required, and the objective of the survey.
Components of woodland sampling schemes.
Procedures and equipment required to apply the sampling methods.

1.49 **Tree, stand** and **timber measurement**.

Range:
Tree measurement – Individual tree parameters: stem diameter (dbh – diameter at breast height), basal area, height (total height, form height and timber height).
Stand measurement – Stand parameters: Stocking density, stand basal area, stand top height.
Timber volume estimation: Relascope sweeps, abbreviated tariff methods (including plots), full tariff methods, inventory survey.
Timber measurement – Felled timber: Individual logs, stacked timber.

What do learners need to learn?

Reasons for measuring trees, woodland stands and timber:

- valuation
- to assess harvestable volume
- to compile and maintain an inventory
- to describe the area distribution by species, age class, stocking and yield class, land use type and any selective systems for continuous sustainable yield
- to estimate/measure felled timber volume

Principles of tree, stand and timber measurement:
Individual tree and stand parameters.
Suitability of measurements for different purposes.
Suitability of methods of estimating timber volumes for different purposes – relascope sweeps, abbreviated tariff, full tariff, inventory survey, log measurement (Huber's formula), stack measurement.
How these are applied in the field to collect data
How to apply conventions and calculations to estimate timber volumes.

Measurement conventions and equipment:
Basic mensuration conventions, measurements, calculations and terminology.
Equipment required, pre-use checks and calibration.
Information sources available including guidance documents, single-tree tariff charts (alignment charts), volume tables, yield tables and yield models.

Tree measurement

- Conventions: Record keeping, over-bark and under-bark measurements, rounding down, accuracy and precision, diameter classes, units of measurement

Skills
EC3, EC5
MC1, MC2, MC3, MC4, MC5
DC1, DC3, DC4

- Conventions for measuring height and dbh: Forked trees, leaning trees, trees on slopes, deformed trees, coppiced stools
- Equipment: Girth tapes, callipers, measuring tapes, clinometers/hypsometers, relascopes

Stand measurement

- Conventions: Record keeping (suitable forms and conventions for efficient and accurate recording of data)
- Timber volume: Felled timber, individual trees, forest stands

Timber measurement

- Measurement conventions: Record keeping, over-bark and under-bark measurements, rounding down and accuracy and precision
- Equipment: Girth tapes, callipers, measuring tapes

Guidance:
Forestry Commission publications:

- Timber Measurement Field Guide
- Forest Mensuration: A Handbook for Practitioners
- Thinning Control Field Guide
- Forest Yield: A Handbook on Forest Growth and Yield Tables for British Forestry

Tree inspections

1.50 **Tree inspections** from the ground.

Range:

Tree inspections – Reasons for inspection: Occupier's liability, risk assessment, tree condition, amenity valuation, insurance purposes, presence of protected species.

Factors to consider: Defect identification, timing, decay or damage detection, hazard evaluation, habitat potential, presence of targets, age, species, dimensions, historical significance, pests and pathogens.

Equipment: Rangefinder, nylon hammer, identification guides, portable computers and mobile devices, compass, measuring tape, clinometer/hypsometer, field notebook, binoculars.

Recommendations: Risk mitigation, tree pruning, remedial work or removal, signage or access restriction/ management, further monitoring, detailed or aerial inspection, prioritisation and timescale.

Guidance: Arboricultural Association Guidance Notes, species identification guides, Forestry Commission publications.

What do learners need to learn?	Skills
Reasons to inspect trees from the ground. How to carry out a basic visual tree assessment including: • factors to consider • tree inspection equipment • data gathering • qualitative and quantitative approaches to assessing risks from trees • reporting of findings and recommendations	EC1, EC3, EC5 MC1 DC1, DC2

Managing woodlands

1.51 Woodland maintenance **operations**.

Range:

Operations – Brashing and pruning: Access, fire prevention, formative, financial, amenity, timber quality

Thinning and respacing: To reduce competition (space, nutrients, light), influence characteristics of final crop, financial considerations, fire control, access, amenity.

Thinning types and regimes: Systematic, selective, no-thin, crown, low, intermediate.

Drainage maintenance: Clearing blocked or obstructed drain, redirect inappropriate route, digging/ re-profiling.

Reasons for drainage: Minimise soil erosion, soil aeration, tree establishment and growth, prevention of water logging, prevention of wind throw.

Fencing types: Deer, rabbit, post and rail, post and wire, stock, electric.

Reasons for fencing: Shelter, security, exclude public and control access, protection from grazing and livestock damage/contain livestock, amenity and landscape value, boundary demarcation.

Resources required: Time, labour, tools, equipment, machinery, materials, consumables.

Management of unwanted vegetation: Competing, invasive, injurious, maintenance of hedges and rides.

Unwanted vegetation techniques: Mechanised (tractor with implements/attachments), motor-manual (chainsaw, brushcutter, clearing saw), manual, cultural, application of herbicides, mulching.

What do learners need to learn?	Skills
Woodland maintenance operations used to meet management objectives, reasons for: • brashing and pruning of trees/stands • different types of thinning operations • types of fencing, their applications and maintenance requirements Potential drainage problems and benefits of maintaining an open drainage system. Management of vegetation. Techniques and resources required. Time periods when different maintenance operations are best undertaken to meet management objectives. How to avoid negative environmental impacts of woodland maintenance operations.	EC4, EC5

Information

1.52 **Types** and **sources** of information.

Range:

Types – Work specifications, images/photography, different types of maps (including stock maps, constraints maps, Ordnance Survey (OS), sketches, computer aided design (CAD), geographic information technology (GIS, remote sensing), reference books and publications.

Sources – Health and Safety Executive, UK Forestry Standard (UKFS), UKWAS, Industry Codes of Practice (ICOPs), FISA Guidance (Forest Industry Safety Accord), manufacturers' guidance, company guidance, industry guidance and best practice publications (Forestry Commission, Forest Research).

What do learners need to learn?	**Skills**
Types of information required for planning and monitoring woodland management operations, including: • their content and format • conventions and symbols • how they are produced • how they are used in planning and carrying out operations	EC4, EC5

Maintain woodlands to meet prescribed objectives (PO5)

Health and safety

1.53 Health and safety **legislation, regulations** and **guidance** for woodland maintenance.

Range:
Legislation and Regulations – Management of Health and Safety at Work Regulations 1999, Occupiers Liability Act 1957 and 1984, Highways Act 1980, Countryside Rights of Way Act 2000 (CROW).
Guidance: Health and Safety Executive publications, Managing Public Health and Safety on Harvesting Sites, FISA Guidance on Managing Health and Safety in Forestry. FISA 802, 806, 805, 804, 702, 701, 607, 604, 501, 310, 304, 303, 302, 301, 204, 203, 202, 104.

What do learners need to learn?	**Skills**
Understand the legal responsibilities associated with health and safety, including the protection of lawful and unlawful visitors. Hazards and risks associated with undertaking maintenance of trees and woodlands. Control measures that can be put in place to mitigate these risks, including how to implement control measures and monitor them once work has commenced. Know and understand the responsibilities for the key roles on forestry sites in relation to the FISA Guidance on Managing Health and Safety in Forestry document. How to set up a safe site prior to undertaking woodland maintenance operations.	EC4, EC5

Business

1.54 **Factors** affecting profitable woodland maintenance operations.

Range:
Factors – Stakeholders: Land/tree owners, land agents, contractors, subcontractors, Forest Works Manager, visitors, neighbours.
Price: Timber prices, contractor rates, haulage rates.
Product: Species characteristics, timber and non-timber, quality and market requirements.
Site: Access, terrain/obstacles, extraction routes, haulage routes, distance to market.

What do learners need to learn?	Skills
Stakeholders in the supply chain and their roles. Similarities and differences in how arboriculture and forestry organisations obtain revenue. How forestry organisations maximise revenue generation opportunities. How tree and woodland maintenance contributes to revenue generation, including interim and future revenue. Role of the marketplace in determining price and the factors that affect price. Relationship between price and management decisions. How long-and short-term woodland management objectives affect the profitability of maintenance operations. Options available to reduce costs during preparation, operation and post operation (tools, equipment, labour, consumables). Factors affecting the quality and quantity of timber and forest products and how these are optimised through maintenance activities to maximise yield and quality. How pruning (including brashing, high pruning, formative pruning) can minimise defects in timber. Factors affecting non-market benefits and services (recreation, wellbeing, air quality, biodiversity, water management) of woodland to society and how these are optimised through maintenance activities.	EC4, EC5 MC2, MC10

Tools equipment and machinery

1.55 **Tools, equipment** and **machinery** required for woodland maintenance.

Range:
Tools and equipment – Pruning saws, digging tools, hand cutting tools, hand-held power tools, fencing tools, felling bar, wedges, hand winches, associated personal protective equipment.
Machinery – Chainsaws, brushcutters, clearing saws, pedestrian mowers, tractors and attachments/implements, powered pole pruners, associated personal protective equipment.

What do learners need to learn?	Skills
Tools, equipment and machinery required for tree work and forest maintenance, including: • their characteristics • function and capabilities • suitability for carrying out tasks in different environments • preparation requirements including checks/inspections, adding materials, calibration • safe operation • maintenance and storage requirements to manufacturers' requirements	EC4, EC5

1.56 Brush cutter, clearing saw and trimmer operating **techniques**, maintenance and **equipment**.

Range:

Techniques – Scything, swatting, felling saplings up to 6 cm left and right, overlapping technique material 6 to 12 cm, felling cut for material greater than 13 cm.

Equipment – Trimmer cord, clearing saw blades, brush cutter blade, grass blade, harness.

Operating techniques, maintenance and equipment to comply with industry & HSE Guidance – FISA 203, Husqvarna – Forestry techniques for clearing saws.

What do learners need to learn?	**Skills**
Health and safety legislation and industry guidance for these operations. Function and maintenance of individual components. Methods used to check and sharpen brush cutter and clearing saw blades according to manufacturer's recommendations. PPE required for brush cutter, trimmer or clearing saw operations. Guarding requirements for the machine depending on the operation being carried out. Identification of the required decals on a machine and their meaning. Identification and function of all controls of the machine. Safety precautions to be taken when operating the machine. Maximum blade or head speed for their machine. Knowledge of poisonous plant material and its implications for operators. Which parts of the clearing saw blade to use and where the kickback zone is. Advantages of cleaning and inspecting the machine after use.	EC4, EC5 MC1

Tree biology, physiology and health

1.57 Influence of tree physiology and health on woodland maintenance operations.

What do learners need to learn?	**Skills**
Characteristics of defects in trees, unhealthy or structurally weak trees. Characteristics of unhealthy stands of trees (signs and symptoms of pests/diseases). Implications for tree and woodland maintenance planning and operations. Suitability of different management options to alleviate or improve condition. Biosecurity requirements and reporting of potential tree health issues. How poorly planned or executed maintenance can negatively impact on tree physiology and health.	EC4, EC5

Preparing for woodland maintenance operations

1.58 Roles and responsibilities of **people** on woodland sites.

Range:
People – Forest workers, volunteers, visitors.

What do learners need to learn?	Skills
Key roles and responsibilities of people on woodland sites. Importance of coordination and communication between different teams/individuals on site including visitors and public. Guidance – FISA Guidance on Managing Health and Safety in Forestry.	EC4, EC5

1.59 Principles of site management.

What do learners need to learn?	Skills
Principles of site management including: • importance and methods of managing public access to work sites by landowners • allocation of resources and logistics (time, labour, tools and equipment, machinery, materials, storage, signage, security) • importance of biosecurity and keeping a site clear, clean and environmentally sound • decision-making and problem-solving responsibilities • maintenance activities to be undertaken and their application in woodland contexts (vegetation management, management of diseased or damaged trees/stands, surface maintenance, boundary maintenance, brashing, pruning, cleaning/re-spacing)	EC4, EC5 MC10

1.60 The principles of **access management**.

Range:
Access management – Surface materials: Aggregate, concrete, paving, woodchip, timber.
Structures and furniture: Gates, bridges, boardwalks, benches, bins, toilets, signage.
Access types: Vehicular, cycling, horse riding, pedestrian, all-access.

What do learners need to learn?	Skills
Principles of access management. Legal status of a Right of Way and open access to the countryside legislation. Different types of surfaces and furniture/structures and their suitability for different areas and usage such as multi-user access paths. Best practice in design – path width, surface usability, zoning, management of desire-lines. Maintenance activities to be undertaken and their application in woodland contexts (surface maintenance, structure/furniture maintenance, vegetation management).	EC4, EC5

1.61 Types of **infrastructure, features** and **designations**.

Range:
Infrastructure – Public and non-public highways, surfaces, railways, watercourses/ waterways, overhead and underground services, buildings/structures, furniture, boundaries and fences.
Features – Terrain and slope, ground conditions, climate and microclimate, geology, hydrology, existing tree species, access, timing, habitats.
Designations – UKFS/UKWAS, SSSI's, protected species, cultural, historical and archaeological features.

What do learners need to learn?	**Skills**
Types of infrastructure that may be encountered when carrying out woodland maintenance operations. Key requirements of related legislation, regulations, guidance, and best practice. Regulatory bodies and/or service providers to contact and consult with prior to starting operations. What permits/permissions must be in place prior to starting work. Sources of information used to support identification e.g. local heritage list. Implications for planning and preparation for maintenance operations. Types and timing of operations that can be undertaken. Features and designations of sites where woodland maintenance operations take place. Different types of boundaries and their relationship to their locations, usage and site characteristics. Be able to interpret information from maps such as constraints maps.	EC4, EC5

1.62 Potential **damage** to the environment.

Range:
Damage – Pollution (spills, run off), contamination, soil damage (rutting/gullying, compaction), watercourses (blockage from debris), damage to standing crop and vegetation, wildlife and habitat disturbance.
Legislation – Wildlife and Countryside Act 1981 (as amended), Environmental Protection Act 1990 (as amended), Countryside Rights of Way Act 2000, Protected Species legislation.

What do learners need to learn?	**Skills**
Potential damage to the environment and forest caused by maintenance operations, including: • types of damage • causes of damage • how damage can be eliminated, prevented, or mitigated • legislation and penalties for causing damage	EC4, EC5

Information

1.63 **Types** and **sources** of information.

Range:

Types – Work specifications, images/photography, different types of maps (including stock maps, constraints maps, Ordnance Survey (OS), sketches, computer aided design (CAD), geographic information technology (GIS, remote sensing).

Sources – Health and Safety Executive, UK Forestry Standard (UKFS), UKWAS, Industry Codes of Practice (ICOPs), FISA Guidance (Forest Industry Safety Accord), manufacturers' guidance, company guidance, industry guidance and best practice publications (Forestry Commission, Forest Research).

What do learners need to learn?	**Skills**
Types of information required for forest management and operations, including: • their content and format • conventions and symbols • how they are produced • how they are used in planning and carrying out operations	EC4, EC5

Woodland maintenance

1.64 **Maintenance** planning.

Range:

Maintenance – Vegetation, boundaries, access routes and surfaces, structures and furniture.

What do learners need to learn?	**Skills**
Types of maintenance and their suitability for different situations and environments. Purpose of planned maintenance. Relationship between maintenance activities and silvicultural systems. Content and formats of planned maintenance programmes. Process involved in developing maintenance programmes. Documentation required for maintenance activities. Preparations for planned and unplanned (including emergency) maintenance and repair.	EC4, EC5 MC10

1.65 **Vegetation** management **techniques**.

Range:
Vegetation – Competing, invasive, injurious.
Techniques – Mechanised (tractor with implements/attachments), motor-manual (chainsaw, brushcutter, clearing saw), manual, cultural, application of herbicides, mulching.

What do learners need to learn?	**Skills**
Techniques for control of unwanted woodland vegetation. Purposes for removing unwanted vegetation, including legal obligations. Legal and environmental implications of techniques available. Suitability of techniques for different situations and environments. Benefits and limitations of those techniques to different trees in different environments to meet different management objectives. How to apply techniques safely, to specified quality standards and guidance, minimising risks to the environment both undertaking and supporting each technique. The treatment of work arisings – left in situ, chipping, stacking, burning, disposal by licenced waste contractor.	EC4, EC5

1.66 **Infrastructure** maintenance and repair **techniques**.

Range:
Infrastructure – Boundaries: Hedgerows, ditches, fences (post and wire, post and rail, electric), walls (stone and brick).
Access routes and surfaces: Roads, paths, boardwalks, car parks/hard standing.
Structures and furniture: Gates, benches, bins, toilets, signage.
Techniques – Mechanised (tractor with implements/attachments), motor-manual, manual, chemical (paint, preservatives), no intervention.

What do learners need to learn?	**Skills**
Techniques used to maintain and repair woodland environments and infrastructure. Infrastructure features. Indications of infrastructure defects. How appropriate techniques are selected and applied. Tools, equipment, machinery and materials required. Suitability of techniques to meet sustainable and heritage management. Risks to the environment from maintenance activities including biosecurity and damage to residual habitat.	EC4, EC5

Undertake complex felling operations (PO6)

Health and safety

1.67 Health and safety on felling sites.

Range:

Legislation and Regulations – Management of Health and Safety at Work Regulations, Highways Act 1980, Roads and Street works Act 1980.

Guidance – Managing Public Health and Safety on Harvesting Sites, FISA Guidance on Managing Health and Safety in Forestry. FISA 804, 802, 806, 605, 603, 506, 504, 502, 503, 501, 310, 705,703, 505. Safety at Street Works and Rad Works: A code of practice 2013.

What do learners need to learn?	**Skills**
Hazards and risks associated with undertaking complex felling operations. Control measures that can be put in place to mitigate these risks, including how to implement them and monitor them once work has commenced. Know and understand the responsibilities for the key roles on felling sites in relation to the FISA Guidance on Managing Health and Safety in Forestry document. How to set up a safe site prior to the felling operations including surveying the site, identifying and risk assessing hazards and constraints and communicating this to operators using documents, maps and physical markings/barriers on site (e.g. by marking trees, barrier tape, warning signs).	EC4, EC5

Environment

1.68 Environmental **legislation, regulations,** and **codes of practice**.

Range:

Legislation, regulations, and codes of practice – Environment Act 1995, Environment Act 2021**,** Forestry Act 1967, UK Woodland Assurance Standard (UKWAS), UK Forestry Standard – - Forest and Water, Forest and Soil, Managing Forest operations to protect the water environment operator cab card (Forest Research), Countryside Rights of Way Act 2000, Habitat Regulations, Protected Species legislation.

What do learners need to learn?	**Skills**
Environmental legislation, regulations and codes of practice relating to conservation, plant health, wildlife, pollution and water quality in forestry. Relationship between legislation, regulations and codes of practice and how they complement each other. Responsibilities placed on organisations by environmental legislation, regulations and codes of practice when planning and carrying out felling activities. Permissions required before felling operations can be carried out related to protected species, habitats. Regulators and their role in granting and enforcing permissions (Natural England, Environment Agency, Office for Environmental Protection).	EC4, EC5

1.69 **Environmental risk assessments.**

Range:

Environmental risk assessments – Codes of practice – Government guidelines for environmental risk assessment and management – Green leaves III.

Site factors – Terrain, slope, ground conditions, vegetation type, season, weather, proposed operations, management approach, uncontrolled or unintended emissions, noise/vibration.

What do learners need to learn?	**Skills**
Purpose of environmental risk assessments and their relationship with other documents, for example Woodland Management Plan. Content of an environmental risk assessment – formulate the problem, assess risk, apprise options, address risk. How environmental risk assessments are conducted in a forestry context. Site factors that need to be incorporated into an environmental risk assessment, their interrelationships and how they are managed.	EC4, EC5

Woodland management considerations

1.70 Harvesting **techniques, machinery** and **systems**.

Range:

Techniques, machinery and **systems** – Machinery: Chainsaws, harvesters - purpose built or excavator base, powered winches.

Systems: Whole-tree system, pole-length system, shortwood system.

Guidance: Planned Forestry Work (Husqvarna), Organised Thinning and Organised Felling (Husqvarna forestry techniques), Working with Chainsaws Part 1 (Husqvarna).

FISA guides – 608 Tree Shear Grapple Saw, 705 Steep Slope Working, 603 Mechanical Harvesting, 804 Electricity at Work: Forestry.

What do learners need to learn?	**Skills**
Concept of tree harvesting and techniques that can be used (including motor-manual, mechanised). Their suitability for different species, age, quantity, value, environment and timber uses. Equipment, machinery and materials required and their advantages and disadvantages. Silvicultural systems – Clear Fell, Lower-Impact Silvicultural Systems (LISS) and their advantages and disadvantages for felling operations. Different forestry thinning regimes – Systematic, selective, intermediate, no-thin and their advantages and disadvantages for felling operations. Correct presentation of felled timber for the chosen extraction method.	EC4, EC5

1.71 Timber **extraction methods and machinery**.

Range:

Extraction methods and machinery – Forwarder (tractor/trailer or purpose built), skidder (line/grapple or clam-bunk), forestry tractor, timber trailer, powered winch, skyline (excavator based or lorry based), horse logging.

Guidance: FISA 501 Tractors Units in Tree Work, 502 Extraction by Skidder, 503 Extraction by Forwarder, 504 Extraction by Cable Crane, 506 Extraction by Horse.

What do learners need to learn?	**Skills**
Methods used to extract harvested trees, including: • choice of extraction method, suitability for different site conditions, species, environments and timber uses • equipment, machinery and materials required • advantages and disadvantages of the different systems for extraction of timber	EC4, EC5

1.72 Factors to consider and associated **standards** when planning and preparing for felling activities.

Range:

Standards – UK Forestry Standard (UKFS) and UK Woodland Assurance Scheme (UKWAS).

What do learners need to learn?	**Skills**
Understand the overall purpose and general requirements of standards for felling in the UK under the UK Forestry Standard (UKFS) and UK Woodland Assurance Scheme (UKWAS). Factors to consider when carrying out felling activities including: • timber and products • landscape • cost • access • ownership • woodland management plans • habitats, protected species and seasons • cultural, historical and archaeological features • permissions: tree felling, species permissions, habitat permissions	EC4, EC5

Business

1.73 **Factors** that can affect profitable felling operations.

Range:

Factors – Price: Timber prices, contractor rates, haulage rates.

Product: Species, product breakout, timber quality.

Site: Extraction routes, haulage routes, distance to market.

What do learners need to learn?	Skills
Factors that affect price, including: • implications of management decisions on profitability of felling operations – thinning vs. clear felling • planning and ways of working on felling sites to maximise efficiency • machine and equipment maintenance minimising downtime • site organisation	EC4, EC5

Tools, equipment and machinery

1.74 Types of **tools, equipment** and **machinery** required for tree felling, tree work, and woodland work-related operations.

Range:
Tools and equipment – Felling bar, wedges, personal protective equipment and hand winches.
Machinery – Chainsaws, harvesters, forwarders, high lead, cable cranes, skidder.

What do learners need to learn?	Skills
Types of tools and equipment available for felling operations. Machinery available for tree felling operations, including: • their characteristics • function and capabilities of different machines • suitability for carrying out tasks in different environments • preparation requirements – checks/inspections that are required prior to operation Understand that some machinery such as harvesters need to be calibrated before work commences and during operation. Basic principles and understanding of the operation of forest machinery. Maintenance and storage to manufacturers' requirements.	EC4, EC5

Preparing for felling operations

1.75 Principles of site management according to industry **guidance**.

Range:
Guidance – FISA: Guidance on Managing Health and Safety in Forestry, Forestry Commission: FCPN019 Managing Public Safety on Harvesting Sites.

What do learners need to learn?	**Skills**
The principles of site management including: • allocation of resources and logistics (time, labour, equipment/machinery, materials) • welfare requirements for forestry sites • decision-making and problem-solving responsibilities • forestry work roles and their duties and responsibilities as per FISA Guidance on Managing Public Health and Safety in Forestry • activities to be undertaken and their application during felling operations	EC4, EC5

1.76 Types of **infrastructure**, **features** and **designations**.

Range:
Infrastructure – Public and non-public highways, railways, watercourses, overhead and underground services, buildings/structures.
Features – Terrain, buildings, ground conditions, climate and microclimate, geology, hydrology, existing tree species, access, timing, habitats.
Designations – UKFS/UKWAS, SSSIs, protected species, cultural, historical and archaeological features.
Guidance – FISA 804 Electricity at Work: Forestry.

What do learners need to learn?	**Skills**
Features and designations of sites where felling operations take place. Types of infrastructure that may be encountered when carrying out felling operations. Key requirements of related legislation, regulations, guidance and best practice. Regulatory bodies (e.g. Forestry Commission, Environment Agency, Natural England, local authorities) and/or service providers (e.g. electricity/gas/water companies) to contact and consult with prior to operations starting. What permits/permissions must be in place prior to operations starting (e.g. for work near utilities/services including power lines). Implications for planning and completing felling operations. How to interpret information sources – maps, work specifications, industry guidance. How to interpret and update/annotate information on maps such as constraints maps in order to: • locate trees to be felled • locate site constraints • identify where signage is to be located How to organise and set out the felling site including worksite signage and controls including:	EC4, EC5 MC1, MC2 DC1, DC2

• warning signs • exclusion zones around constraints (e.g. power lines, protected areas, rights of way) • marking of trees in the red and amber zones of overhead powerlines • definitions of the terms ‘vicinity zone’, ‘red zone’ and ‘amber zone’ as per FISA 804 Electricity at Work: Forestry • how the zones are identified and marked on site, and what these markings mean – PL ‘powerline’ = tree is within the amber zone of an OHPL; RZ ‘red zone’ = tree is within the red zone of an OHPL How all of these factors affect the types of felling operations that can be undertaken.	

1.77 Potential **damage** to the environment.

Range:
Damage – Pollution (spills, run off), contamination, soil damage (rutting/gullying, compaction), watercourses (blockage from debris), damage to standing crop and vegetation.

What do learners need to learn?	**Skills**
Potential damage to the environment caused by tree and woodland felling operations, including: • types of damage • causes of damage	EC4, EC5

1.78 How damage can be eliminated, prevented or mitigated including planning, **techniques, materials and equipment** to be used.

Range:
Techniques, materials and equipment – Ground protection: Brash mats, boards, steel plates. Watercourse protection: Silt traps, catch pits, brash mats, existing vegetation.

What do learners need to learn?	**Skills**
Different forms of ground protection. Different forms of watercourse protection. Why are they used – avoiding diffuse pollution, protecting infrastructure, preventing soil damage. Why they are selected and how they are applied. Implications for route planning and tree felling operations.	EC4, EC5

Information

1.79 Types and **sources** of **information**.

Range:

Sources – UK Forestry Standard (UKFS), UKWAS, Industry Codes of Practice (ICOPs), FISA Guidance (Forest Industry Safety Accord), manufacturers' guidance, company guidance, industry guidance and best practice publications (Forestry Commission, Forest Research), HSE Approved Codes of Practice (ACOPs).

Information – Work specifications, images/photography, different types of maps (including stock maps, constraints maps, Ordnance Survey (OS), sketches, computer aided design (CAD), geographic information technology (GIS, remote sensing).

What do learners need to learn?	Skills
Types of information required for tree felling operations including: • their content and format • conventions and symbols • how they are produced • how they are used in planning and carrying out operations	EC4, EC5

Felling operations

1.80 Different **purposes** for felling trees.

Range:

Purposes – Timber production, habitat management, pest and disease control, public safety, construction projects, transport and infrastructure creation/maintenance (highway, railways, services).

What do learners need to learn?	Skills
Different purposes for felling trees. How the purpose affects the felling technique to be applied and associated operations. Biosecurity that may be required.	EC4, EC5

1.81 **Techniques** used to fell and process trees.

Range:

Techniques – Whole-tree, pole-length, short wood.

What do learners need to learn?	Skills
Techniques used to fell trees and their suitability for different trees, environments and management objectives. Techniques used to process trees and their suitability for different trees, environments and management objectives.	EC4, EC5

1.82 **Felling** of trees with chainsaws.

Range:
Felling – Cuts: Double v cut, dogs tooth cut, conventional felling cut, split level or Danish cut, 80% cut, step cut.

What do learners need to learn?	Skills
Techniques used to fell trees up to 200 mm. Techniques used to fell trees up to 380 mm. Techniques for cross cutting, snedding and de-limbing. How to apply techniques safely, to recognised standards and guidance, minimising risks to the operator, others and the environment. Efficient working methods to maximise productivity, minimise manual handling and manage arisings – bench felling techniques, establishment of timber zones and brash zones. Methods to maximise value of felled timber – techniques used to prevent damage to timber from felling: sapwood cuts, felling onto brash, felling on slopes. Ensuring the work is carried out to specification.	EC4, EC5 MC1, MC2

1.83 Tree **defects** affecting felling operations.

Range:
Defects – Basal decay, splits, dead/dying trees, deadwood, storm damaged, heavy lean, branching habit, multiple stems.

What do learners need to learn?	Skills
Characteristics of defects in trees that affect felling operations and how this affects felling decisions and techniques.	EC4, EC5

1.84 **Assisted felling** techniques including winching.

Range:
Assisted felling – Guidance: FISA 310, Winching Operations in Forestry Technical Guide (Forest Research).
Equipment: Hand winches, ropes, cables, slings, carabiners, shackles, pulleys/snatch blocks, wedges, felling levers.
Systems: Single line pull, double purchase pull, offset pull.
Factors: Tree: lean, crown weighting/form/branching habit, species, size, health, condition.
Site: location, targets, suitable anchor points, winds (strength/speed, direction).

What do learners need to learn?	Skills
Learners will have knowledge of assisted felling techniques for trees up to 380 mm diameter, including: • situations when assisted felling is required • different types of equipment and machinery available • advantages and disadvantages of these • maintenance and inspection requirements of the equipment • configuration and compatibility of equipment to be used • assisted felling systems that can be set up • how to get a rope or cable into a tree and what is the optimum height • forces that can be put onto the anchors and the equipment and its implications • safe set up of site and safe systems of work ensuring operators are kept safe (including danger zones)	EC4, EC5, EC6 MC2, MC4

1.85 **Processing** of tree and woodland work arisings.

Range:
Processing – Chipping, windrow, leave in situ, mulching.

What do learners need to learn?	Skills
The processing of woodland arisings, including: • factors to consider regarding treatment of arisings – cost, habitat, plans for the site, biosecurity • methods of disposal • legislation, guidance and best practice to be followed	EC4, EC5

Performance outcome 4

4. Manage woodlands to meet objectives

4.1 **Measure** the volume of individual trees and forest stands.

Range:

Measure – Equipment: Girth tapes or callipers, measuring tapes, clinometers, relascopes, marking equipment (paint/tape).

Measurement conventions: Record keeping, over-bark and under-bark measurements, diameter at breast height (dbh) at 1.3 m, leaning trees, trees on slopes, rounding down and accuracy and precision.

What do learners need to demonstrate?	Skills
Accurately measure the volumes of individual trees and forest stands. Locate site boundaries from a map. Select appropriate measuring equipment. Verify the accuracy of measuring equipment (e.g. checking girth tapes for stretch, calibrating if using electronic clinometers, rangefinders). Apply measurement conventions for height and dbh. Measure individual tree volume by sectional measurement and single tree tariff charts. Measure stand volume by tariff system (full tariff / abbreviated tariff). Use relascope to calculate basal area. Estimate timber yield.	EC3, EC5 MC1, MC2, MC3, MC4, MC5 DC1, DC4

4.2 Measure the volume of **felled timber**.

Range:

Felled timber – Individual logs, stacked timber.

Equipment: Girth tapes, callipers, measuring tapes.

Measurement conventions: Record keeping, over-bark and under-bark measurements, rounding down and accuracy and precision.

What do learners need to demonstrate?	Skills
Accurately measure the volumes of individual logs and stacked timber. Select appropriate measuring equipment. Verify the accuracy of measuring equipment. Apply measurement conventions. Measure timber stack volume. Measure log volume using Huber's formula.	EC3, EC5 MC1, MC2, MC4, MC5 DC1, DC4

4.3 **Survey and inspect** woodlands and trees from the ground.

Range:

Survey and inspect – Objectives: Amenity, access, plant health, pest and disease, boundary location, establishment success, competing vegetation, damage, wildlife, woodland attributes.

Equipment: Rangefinder, nylon hammer, identification guides, portable computers and mobile devices, compass, measuring tape, clinometer, field notebook.

Factors: Defect identification, timing, decay or damage detection, hazard evaluation, habitat potential, distance from targets, age, species, dimensions, historical significance, pests and pathogens.

Recommendations: Risk mitigation, tree pruning, signage or access restrictions/management, remedial work or removal, further monitoring, detailed or aerial inspection.

What do learners need to demonstrate?	Skills
Carry out woodland surveys to meet specific objectives. Undertake systematic inspections of individual and groups of trees from the ground, including: • identifying species • evaluating tree health and condition • identifying hazards • recognising signs and symptoms of common pests, diseases, disorders Interpret data from tree surveys and inspections. Report on tree surveys and inspections. Make recommendations appropriate to survey and inspection objectives.	EC3, EC5 MC1, MC2 DC1, DC2

Performance outcome 5

5. Maintain woodlands to meet prescribed objectives

Vegetation management

5.1 Remove unwanted vegetation from a site to meet **objectives** using appropriate **methods**.

Range:
Objectives – Removal of competing vegetation, access, timber quality (cleaning, re-spacing), habitat maintenance, removal of invasive/injurious species.
Method – Manual (hand cutting tools), motor-manual (brushcutters and clearing saws, pedestrian mowers, chainsaws).

What do learners need to demonstrate?	Skills
Learners will remove unwanted vegetation from sites using appropriate methods according to the objective. Interpret information sources – maps, work specifications. Locate vegetation to be removed. Locate site constraints. Identify where signage is to be located. Produce a risk assessment and emergency plan. Produce an outline method statement for the operation. Organise and set out the worksite. Set out worksite signage and controls. Select and prepare tools, equipment and machinery for use (excluding pesticides). Ensure biosecurity measures are in place if appropriate. Work safely and efficiently to maximise productivity and manage arisings. Avoid damage to surrounding trees, other plants, animals and infrastructure. Optimise work processes. Ensure good communication at all times. Leave a safe and tidy site as per specification. Check tools, equipment and machinery for damage in line with manufacturer's guidance and report on any defects found.	EC3, EC5

Brush cutter, clearing saw, and trimmer

5.2 **Maintain** brushcutter, clearing saw and trimmer.

Range:
Maintain – Power unit, blade (brushcutter or clearing saw), trimmer head.

What do learners need to demonstrate?	Skills
Select appropriate tools and PPE for the maintenance of both the cutting head and power unit. Carry out the maintenance of the power unit including spark plug, air filter, cooling system, exhaust system, starter mechanism, check and grease angle drive and gear box, fuel filter.	EC5 MC1

Select appropriate tools and PPE for the maintenance of the brush cutter blade and sharpen as per manufacturer's recommendations, maintaining correct angles. Select appropriate tools and PPE for the maintenance of the clearing saw blade and sharpen as per manufacturer's recommendations maintaining correct angles. Check that both the brush cutter and clearing saw blades are balanced. Select appropriate tools and PPE for the maintenance of the trimmer head and replace the nylon cord. All waste to be disposed of appropriately and according to legislation.	

5.3 Remove vegetation using brush cutter, applying appropriate **techniques**.

Range:
Techniques – Scything, swatting.

What do learners need to demonstrate?	**Skills**
Identify hazards, risks and controls associated with site and task machine. Select and wear appropriate compliant personal protective equipment (PPE). Prepare and check the site prior to cutting. Carry out pre-cutting checks. Demonstrate how to set up the machine and harness prior to use. Start the machine. Demonstrate the techniques for clearing heavier grasses and scrub. Site to be left in a safe and tidy condition and as per specification.	EC5

5.4 Remove trees using a clearing saw, applying appropriate **techniques**.

Range:
Techniques – Directional felling saplings up to 6 cm diameter (left and right).
Overlapping technique: Material 6 to 12 cm diameter.
Felling cut: Material greater than 13 cm diameter.

What do learners need to demonstrate?	**Skills**
Identify hazards, risks and controls associated with site and task machine. Select and wear appropriate compliant personal protective equipment (PPE). Prepare and check the site prior to cutting. Carry out pre-cutting checks. Demonstrate how to set up the machine and harness prior to use. Start the machine. Demonstrate the techniques for clearing larger woody material. Site to be left in a safe and tidy condition and as per specification.	EC5

5.5 Remove vegetation using a trimmer, applying appropriate **techniques**.

Range:
Techniques – Scything, swatting.

What do learners need to demonstrate?	Skills
Identify hazards, risks and controls associated with site and task machine. Select and wear appropriate compliant personal protective equipment (PPE). Prepare and check the site prior to cutting. Carry out pre-cutting checks. Demonstrate how to set up the machine and harness prior to use. Start the machine. Demonstrate the different techniques for clearing grass and scrub. Site to be left in a safe and tidy condition and as per specification.	EC5

5.6 Maintain and repair **boundaries** using appropriate **tools equipment and machinery**.

Range:
Boundaries – Hedgerows, ditches/drains, fences (post and wire, post and rail), walls (stone or brick).
Tools equipment and machinery – Hand tools, hand-held power tools, pedestrian operated machinery.

What do learners need to demonstrate?	Skills
Maintain boundaries, including: • cut back or lay a hedge • clear out and maintain ditch or drain • maintain and repair a wall • erect and repair fences Locate site constraints. Identify where signage is to be located. Produce a risk assessment and emergency plan. Produce an outline method statement for the operation. Organise and set out the worksite including signage and controls. Select and prepare tools, equipment and machinery for use. Ensure biosecurity measures are in place if appropriate. Work safely and efficiently to maximise productivity and manage arisings. Avoid damage to surrounding trees, other plants, animals and infrastructure. Ensure good communication at all times. Leave a safe and tidy site as per specification. Check tools, equipment and machinery for damage in line with manufacturer's guidance and report on any defects found.	EC3, EC5

Access routes and surfaces

5.7 Maintain and repair **access routes and surfaces**, using appropriate **materials, tools, equipment and machinery**.

Range:
Access routes and surfaces – Roads, paths, car parks/hard standing, boardwalk.
Materials – Aggregates, stone, concrete, wood chip, timbers, composites.
Tools equipment and machinery – Hand tools, hand-held power tools, pedestrian operated machinery.

What do learners need to demonstrate?	**Skills**
Maintain access routes and surfaces, including: • clear unwanted debris and vegetation from an access route • apply and level surface materials to provide an appropriate hard surface Interpret information sources – maps, work specifications. Locate site constraints. Identify where signage is to be located. Produce a risk assessment and emergency plan. Produce an outline method statement for the operation. Organise and set out the worksite including signage and controls. Select and prepare tools, equipment and machinery for use. Ensure biosecurity measures are in place if appropriate. Work safely and efficiently to maximise productivity and manage arisings. Avoid damage to surrounding trees, other plants, animals and infrastructure. Ensure good communication at all times. Leave a safe and tidy site as per specification. Check tools, equipment and machinery for damage in line with manufacturer's guidance and report on any defects found.	EC3, EC5

Structures

5.8 Maintain and repair **structures and furniture** using appropriate **tools equipment and machinery**.

Range:
Structures and furniture – Gates, recreational furniture, signage.
Tools equipment and machinery – Hand tools, hand-held power tools, pedestrian operated machinery.

What do learners need to demonstrate?	**Skills**
Maintain and repair structures and furniture, including: • repair/fix ironmongery (e.g. gate/lock hinges) • erect signs or gate • repair wooden structures and furniture Interpret information sources – maps, work specifications. Locate site constraints. Identify where signage is to be located. Produce a risk assessment and emergency plan. Produce an outline method statement for the operation.	EC3, EC5

Organise and set out the worksite including signage and controls. Select and prepare tools, equipment and machinery for use. Ensure biosecurity measures are in place if appropriate. Work safely and efficiently to maximise productivity and manage waste materials. Avoid damage to surrounding trees, other plants, animals and infrastructure. Ensure good communication at all times. Leave a safe and tidy site as per specification. Check tools, equipment and machinery for damage in line with manufacturer's guidance and report on any defects found.	

Performance outcome 6

6. Undertake complex felling operations

6.1 Interpret **information** and **prepare** for felling operations.

Range:

Information – Maps, work specifications, industry guidance (including FISA 804 Electricity at Work: Forestry).

Prepare – Written preparation: Risk assessment, method statement, emergency plan, mark/annotate site maps.

Physical preparation: Fuelling point, signage, felling system, tools, equipment and machinery, biosecurity measures, marking of hazards/constraints on site.

What do learners need to demonstrate?	**Skills**
Interpret information sources – maps, work specifications, including: • locate trees to be felled • locate site constraints • identify where signage is to be located Produce a risk assessment and emergency plan. Produce an outline method statement for the felling operation. Organise and set out the felling site and worksite signage and controls, including: • warning signs • marking of exclusion zones around constraints (e.g. power lines, protected areas, rights of way) • marking of trees in the red and amber zones of overhead powerlines. How the zones are identified and marked on site, what these markings mean: PL 'powerline' = tree is within the amber zone of an OHPL; RZ 'red zone' = tree is within the red zone of an OHPL Prepare tools, equipment and machinery for use including chainsaw. Ensure biosecurity measures are in place if appropriate. Implement felling system to be used considering the method of extraction and machinery being used.	EC3, EC5 MC1, MC2 DC1, DC2

6.2 Fell trees for harvesting using appropriate **felling cuts**.

Range:
Felling cuts – Double v cut, dogs tooth cut, conventional felling cut, split level or Danish cut, 80% cut, step cut.

What do learners need to demonstrate?	Skills
Fell trees up to 380 mm diameter, in line with the felling plan. Assess the tree and decide on felling direction. Prepare escape routes prior to felling. Brash tree prior to felling. Use appropriate cuts to fell trees on the site. Ensure trees are felled to aid extraction method. Use efficient working methods to maximise productivity and manage arisings. Use bench felling or other organised felling techniques to minimise manual handling and create good ergonomics for the operator. Use appropriate methods to maximise value of felled timber.	EC5 MC1

6.3 Fell trees using assisted felling **systems** considering relevant **factors**.

Range:
Systems – Rope-based systems, winch systems, wedges, felling levers.
Factors – Tree: lean, crown weighting/form/branching habit, species, size, health, condition. Site: location, targets, suitable anchor points, winds (strength/speed, direction).

What do learners need to demonstrate?	Skills
Carry out an assisted fell of a small tree using ground-based techniques only: • Identify hazards, risks and controls • Select appropriate equipment for the estimated load • Inspect the equipment • Select felling direction • Attach a rope or cable into a tree at an appropriate height • Set up a rope-based system with mechanical advantage and fell the tree with an appropriate holding cut • Set up a hand winch-based system and fell the tree with an appropriate holding cut • Ensure good communication at all times • Leave a safe and tidy site as per specification	EC5, EC6 MC2, MC4

6.4 **Process** felled trees and **sort** products according to specification.

Range:
Process – Sned, de-limb, process appropriate to product specification.
Sort – Manually sort, move and stack timber; roll, lift with lifting aids (timber tongs, pulp hook).

What do learners need to demonstrate?	**Skills**
Sned or de-limb timber and ensure all pegs are removed flush to the stem. Cut timber to length as per specification. Manually move and stack timber using good manual handling techniques. Do not stack more than one metre high. Sort timber and stack into the different product lengths and specifications. Ensure timber stacked to aid extraction using the chosen method. Use efficient working methods to maximise productivity and manage arisings. Site to be left safe and as per specification.	EC5 MC1, MC2

Underpinning knowledge outcome 3

Specific knowledge criteria for Arboriculture performance outcomes

Manage tree populations to meet objectives (PO7)

Health and safety

1.86 Health and safety **legislation, regulations** and **guidance** in tree management.

Range:
Legislation, regulations and guidance – Legislation and Regulations: Management of Health and Safety at Work Regulations, Occupiers Liability Act 1957 and 1984, Highways Act 1980, Countryside Rights of Way Act 2000 (CROW), Work at Height Regulations (WAHR), LOLER Regulations, Highways Act 1980, Roads and Street Works Act 1980.

ACOPs, Industry and HSE Guidance: Industry Code of Practice for Arboriculture – Tree Work at Height (Second Edition), Arboricultural Association Technical Guides TG1-5, LOLER: How the Regulations Apply to Arboriculture – AIS 30 (HSE), FISA 804, 802, 806, 604, AFAG 606, Safety at Street Works and Road Works: A code of practice 2013.

What do learners need to learn?	**Skills**
Legal responsibilities associated with health and safety, including the protection of lawful and unlawful visitors. Hazards and risks associated with managing trees, including awareness of lone working. Control measures that can be put in place to mitigate these risks, including how to implement them and monitor them once work has commenced. Responsibilities of key roles during arboricultural operations sites in relation to industry guidance and best practice (responsible person, competent person, proficient operator). How to set up a safe site prior to undertaking treework activities.	EC4, EC5

Environment

1.87 Characteristics and features of **tree and woodland ecosystems and habitats**.

Range:
Tree and woodland ecosystems and habitats – Tree and woodland habitats: Glades, rides, woodland edges, veteran trees, veterinisation, deadwood, ponds, streams, bog, thicket and dense shade, nesting and roosting sites, earths/ dens/setts.

Features: Woodland name, boundary shape, wood banks, out-grown hedges, ditches, pits, charcoal hearths, saw pits, tracks and indicator species.

Woodland structure and strata: Ground, stand composition, the shrub, sub and upper canopy strata.

Techniques: Planting/sowing (trees, shrubs and ground flora), natural regeneration, pruning and thinning, clearance, coppice, agroforestry and silvicultural systems.

Ecosystem services: Water storage and retention, erosion control, carbon and oxygen cycles, nitrogen cycle, species refuge, energy transformation, carbon sequestration, genetic reservoir, particulate deposition, food production.

What do learners need to learn?	Skills
Characteristics of tree and woodland ecosystems: • How different woodland and non-woodland habitats affect tree management decision making and objectives setting • Woodland canopy structure including ground, stand composition, the shrub, sub and upper canopy strata • Importance of trees as habitats for regionally or internationally significant flora and fauna • Tree and woodland habitats and their relevant management techniques • How improvements can be made to tree and woodland habitats • Ecosystem services provided by trees and woodlands	EC4, EC5

1.88 The health, environmental and economic **benefits** of trees, woodland, forests and green infrastructure.

Range:
Benefits – Urban greening, carbon sequestration and absorption of gasses, carbon sinks, sustainable wood-fuel initiatives, increased bio-diversity, improved air quality, increased employment prospects, increased visitors, increased property values, increased access to the countryside, healthier lifestyles, reduced energy consumption, financial benefits, regeneration of derelict and industrial land, improved landscapes and increased wildlife habitat and diversity.

What do learners need to learn?	Skills
Health, environmental and economic benefits of trees, woodland and forests and green infrastructure to society. Financial support opportunities to increase woodland and green infrastructure: Planting and management grants, commercial loans, sponsorship, fundraising. Differences and similarities between rural and urban woodland infrastructure. How benefits affect management decision making and objectives setting.	EC4, EC5

1.89 **Environmental risk assessments**.

Range:
Environmental risk assessments – Site variables and characteristics: Terrain and slope, ground conditions, vegetation, soil, geology, access, drainage, exposure, season, climate and weather.

What do learners need to learn?	Skills
Purpose of environmental risk assessments. Content of an environmental risk assessment. Relationship with tree constraint plans. How environmental risk assessments are conducted.	EC4, EC5

Site variables and characteristics: terrain and slope, ground conditions, vegetation, soil, geology, access, drainage, exposure, season, climate and weather. How site variables and characteristics affect tree management planning and decision making.	

Business

1.90 **Factors** that can affect profitable tree and woodland operations.

Range:
Factors – Stakeholders: Land/tree owners, land agents, contractors, subcontractors, roles on treework sites (responsible person, competent person, proficient operator), visitors, neighbours.
Price: Insurance, contractor rates, competition.
Costs: Labour, equipment, consumables.
Products: Species characteristics, woodchips, fuelwood, niche products, quality and market requirements.
Site: Access, terrain/obstacles, extraction routes.

What do learners need to learn?	**Skills**
Stakeholders in the supply chain and their roles. Similarities and differences in how arboriculture and forestry organisations obtain revenue. How arboricultural organisations maximise revenue generation opportunities. How tree and woodland management contributes to revenue generation, including interim and future revenue. Role of the marketplace in determining price and the factors that affect price. Relationship between price and management decisions. How long-and short-term tree and woodland management objectives are set. How management objectives affect the profitability of treework operations. Options available to reduce costs during preparation, operation and post operation (tools, equipment, labour, consumables). Factors affecting the quality and quantity of tree by-products and how these are optimised through management activities to maximise yield and quality. Factors affecting non-market benefits and services (recreation, wellbeing, air quality, biodiversity, water management) of trees and woodland to society and how these are optimised through management activities and decisions.	EC4, EC5 MC2, MC10

Tree biology physiology and health

1.91 Influence of **tree physiology and health** on tree management objectives and operations.

Range:
Tree physiology and health – Factors – Abiotic: Wind, lightning, frost, drought, flooding, nutrient deficiencies, herbicides, air pollution, planting failure.
Biotic: Bacteria, fungi, vertebrate pests, invertebrate pests, invasive and competing plants.
Human: Vandalism, vehicle impact, fire damage, incorrect pruning cuts, road salt, mower damage, strimmer damage, root severance, lowered gradient, raised gradient and pollution.

Fungi: Ascomycetes, Basidiomycetes and Oomycetes.

Invertebrate pests: Hemiptera, Hymenoptera, Lepidoptera, Coleoptera.

Vertebrate pests: Squirrels, rabbits, deer hares and voles.

Wood cells: Tracheids, vessel members, fibres and parenchyma.

Management options: Irrigation, feeding, approved repellents, physical barriers, fencing, tree shelters, breeding for natural resistance, species selection, cultural, chemical, biological, natural population control.

Legislation: Environmental Protection Act 1990 (as amended), Control of Substances Hazardous to Health Regulations (COSHH), Wildlife and Countryside Act 1981 (as amended), Pests Act 1954 (as amended), Plant Health Act 1967 (as amended).

What do learners need to learn?	**Skills**
Characteristics of healthy, unhealthy and structurally weak trees, including: • characteristics of defects in trees, unhealthy or structurally weak trees • characteristics of unhealthy stands of trees (signs and symptoms of pests and pathogens) • characteristics of wood cells and their role in structure and function of wood, tree growth, wound response and decay • factors that affect tree growth (including stem, root and shoot growth) and development • abiotic, biotic and human causes of ill health and damage to trees • factors that predispose trees to ill health • implications on tree survival and immediate growing environment from dysfunction • typical pests and pathogens, their characteristics and options for management and prevention • implications of tree health for the management of tree populations and woodlands • suitability of different management options to promote healthy tree growth, alleviate or improve condition • biosecurity requirements and reporting of potential tree health issues • legislation relating to practice and products for controlling tree pests and pathogens, including recognition of non-target species, protocols for plant passports and import requirements	EC4, EC5

1.92 **Techniques and technology** to monitor tree health.

Range:

Techniques and technology – Non-invasive: Chlorophyll fluorimeter, visual tree assessment (VTA), nylon hammer, thermal imaging, tree radar, static pull testing, stability modelling.

Semi-invasive: Sonic tomography, soil and foliar sampling.

Invasive: Drilling, increment borer, fractometer, resistograph.

Equipment: Rangefinder, portable computers and mobile devices, compass, measuring tape, clinometers, field notebook, probe.

Geographic information technologies: Global Positioning System (GPS), Geographic Information Systems (GIS), remote sensing.

What do learners need to learn?	**Skills**
Techniques and associated technology and equipment used to monitor tree health, including: • samples to be taken and their purpose	EC4, EC5 MC1

• processes followed to take samples • timing of sample collection or monitoring • their use in decision making and setting woodland management objectives • use of geographic information technologies to monitor tree health	DC1, DC2

General surveying and management

1.93 **Surveying** trees and tree populations.

Range:
Surveying – Features: Terrain and slope, infrastructure, overground and underground services, buildings/structures, ground conditions, climate and microclimate, geology, soil, hydrology, existing tree species, access, timing, habitats.
Technology: Digital maps, measuring tapes, CAD, GIS, drones, probes.

What do learners need to learn?	**Skills**
Features of tree populations and their effect on: • treework operations that can be undertaken • individual tree and tree population management planning and setting objectives • plans, sketches and mapping • types of equipment and technology used to support surveying and tree and woodland management • how they are used to compile and analyse data, and monitor operations • benefits and limitations of technology • techniques for digitally creating and editing (including scaling, identifying specific trees and features) • hand-drawn styles and appropriate use • their content and format • conventions and symbols • how they are used in planning, reporting and undertaking practical operations	EC3, EC5 MC1, MC2, MC3 DC1, DC2

Managing tree populations

1.94 **Characteristics** of common **tree and shrub species**.

Range:
Characteristics – Identification features, site requirements (soil type, moisture regime, temperature regime, shelter, shade tolerance), pests and pathogens, appropriate locations and uses.
Tree and shrub species – Refer to Annex A: Tree and shrub species.

What do learners need to learn?	Skills
Characteristics of common tree and shrub species. Suitability of different trees and shrubs for a variety of situations including such as exposed sites, confined sites, industrial sites, weedy sites, compacted soils, poor drainage/wet sites, shallow soil depth, dry, acid soils, clay and sandy soils. Influence of infrastructure on the selection of trees and shrubs, such as underground and overhead services easements, highways, footpaths/rights of way, waterways/water bodies and urban drainage systems, buildings and foundations, boundaries, structures, signage and street furniture, porous and non-porous surfaces (highways, paths, lawns), reflective surfaces, miscellaneous items including public and private amenity (e.g. garden furniture, ornaments, plant pots). Further factors that influence plant selection such as ultimate size, shape, seasonal colour, flowering period, hardiness, ability to cope with site specific conditions, aesthetic value, root spread, fruit production, possible seasonal nuisance, arboricultural merit.	EC4, EC5

1.95 Benefits and limitations of **single tree operations**.

Range:
Single tree operations – Operations: bracing, pruning, dismantling, felling, root zone amelioration, veterinisation, dismantling.
Management objectives: Light, safety, amenity, visual impact, pest and pathogen control or mitigation, habitat.
Guidance: BS3998 Tree work – Recommendations.

What do learners need to learn?	Skills
Benefits and limitations of single tree operations to different trees in different environments and how they support meeting management objectives.	EC4, EC5

1.96 Tree **valuation methods** and **Tree Protection Orders (TPOs),** and associated tree protection **legislation, regulations, codes of practice** and **guidance**.

Range:

Valuation methods – TEMPO (Tree Evaluation Method for Preservation Orders), CAVAT (Capital Asset Valuation of Amenity Trees), Heliwell.

Tree Protection Orders (TPOs) – TPO types: Individual, group, area, woodland.

Prohibited activities: Cutting down, topping, lopping, uprooting, wilful damage, wilful destruction.

TPO assessment criteria: Biological life expectancy, safe useful life expectancy, importance of position in the landscape, visual amenity value to people, presence of other trees, relation to setting, condition and form.

Implications of contravening legislation: Criminal record, fines, insurance premiums, poor public relations.

Legislation, regulations and codes of practice – Town and Country Planning Act 1990 (as amended) and Town and Country Planning (Trees) Regulations 2012, Environment Act 2021, Countryside Rights of Way Act 2000, Habitat Regulations 1994, Hedgerow Regulations 1997, Forestry Act 1967, Protected Species legislation.

Guidance – BS3998, BS5837, Planning Portal.

What do learners need to learn?	**Skills**
Role and responsibilities of local planning authorities and regulatory bodies (including Forestry Commission) in relation to tree protection legislation including Conservation Areas, Tree Preservation Orders (TPO) and planning conditions, including: • valuation methods used for supporting decision making of suitability for a Tree Preservation Order • tree inventory data required for the planning process • industry standards and current industry and government guidance • purpose and content of Tree Constraint Plans, Arboriculture Impacts Assessments, Tree Protection Plans and the factors that lead to their implementation • relationship between planning conditions and developments constrained by trees and permitting work to a TPO tree • types of TPO and prohibited activities • making applications to carry out work on trees protected by a Tree Preservation Order • criteria used to support the objective assessment of a tree for protection by a TPO • differences between statute and common law • differences between criminal and civil offences • potential implications upon a business or individual of contravening legislation • processes associated with undertaking works on protected trees	EC4, EC5 DC1, DC5

1.97 Ground based and aerial tree inspection **methodologies, techniques and equipment**.

Range:
Methodologies – Systematic, diagnostic.
Techniques – Non-invasive, semi-invasive, invasive.
Equipment – Rangefinder, nylon hammer, identification guides, portable computers and mobile devices, compass, dbh tape, measuring tape, clinometer, tree tags/marking equipment, field notebook, tree climbing equipment, MEWPs, probe, endoscope, rods.

What do learners need to learn?	Skills
Reasons to undertake ground-based and aerial tree inspections – occupier's liability, risk assessment, tree condition, amenity valuation, planning proposals and applications, insurance purposes, mortgage requirements, civil claims and alleged criminal activity, presence of protected species, hazard assessment, statutory protection, annual work programmes. Factors to consider – defect identification, timing, decay or damage detection, hazard evaluation, habitat potential, nesting or rooting sites, distance from targets, age, species, dimensions, historical significance, pests and pathogens. Tree inspection equipment. Inspection methodologies and techniques. Ground-based tree measurements, how they are taken and recorded including methods and conventions: stem diameter (dbh – diameter at breast height), stem circumference, tree height, crown spread. Methods of estimating tree age and how they are applied (including non-invasive/semi-invasive/invasive methods). Factors influencing selection of appropriate aerial access method. Emergency planning for aerial rescue and liaison with ground staff, including: • planning and use of effective communication systems • data gathering • qualitative and quantitative approaches to assessing risks from trees • reporting of findings and recommendations – risk mitigation, tree pruning, remedial work or removal, signage or access restriction/management, further monitoring, detailed or aerial inspection, prioritisation of recommended works Purpose of, and how to find relevant information including codes of practice, industry and HSE guidance: • Industry Code of Practice for Arboriculture- Tree Work at Height Second Edition • Arboricultural Association Guidance Notes • Arboricultural Association Technical Guides TG1 & 5 • LOLER: How the Regulations Apply to Arboriculture • PUWER: Provision and Use of Work Equipment Regulations	EC3, EC5, EC6 MC1, MC2 DC1, DC2

1.98 Potential **damage to infrastructure** resulting from tree management activities.

Range:
Damage to infrastructure – Infrastructure: Overground and underground services, waterways and water bodies, buildings and foundations, boundaries, structures (sheds, greenhouses),

signage and street furniture, surfaces (highways, paths, lawns) vehicles and miscellaneous items including public and private amenity (garden furniture, ornaments, plant pots).

Mitigation: Tree felling or pruning, root barriers, remedial work to infrastructure or tree removal, signage or access restriction/management, further monitoring, detailed or aerial inspection, prioritisation.

Guidance: ENA G55, National Housebuilding Council (NHBC) standards, Arboricultural Association Guidance Notes, BS3998, BS5837.

What do learners need to learn?	**Skills**
Direct and indirect damage to infrastructure resulting from tree management activities, including: • implications of growing trees near infrastructure • signs and symptoms of tree root damage to infrastructure • species associated with tree root damage to infrastructure • mitigation measures • preventative measures including utility pruning • associated standards and industry guidance • minimising damage to residual worksite and infrastructure • appropriate disposal of waste and arisings Role and professional limits of the arboriculturist and relationship with other professionals: Building surveyor, land surveyor, structural engineer, planning officer, architect, civil engineer, construction plant operator, utility arborist, electricity/gas network engineer/ technician, heritage officer.	EC4, EC5

1.99 Tree valuation **methods**.

Range:

Methods – Manual: TEMPO (Tree Evaluation Method for Preservation Orders), CAVAT (Capital Asset Valuation of Amenity Trees), Heliwell.

Digital: iTree.

What do learners need to learn?	**Skills**
Methods to calculate the value of trees to society, including: • their purpose and function • information, data and resources required • processes involved • factors that affect valuation including market forces • their suitability for different purposes and locations	EC5, EC3 MC2 DC1, DC2

Maintain trees to meet prescribed objectives (PO8)

Health and safety

1.100 Health and safety **legislation, regulations** and **guidance**.

Range:

Legislation and Regulations – Management of Health and Safety at Work Regulations, Work at Height Regulations (WAHR), Provision and Use of Work Equipment Regulations (PUWER), LOLER Regulations, Manual Handling Operations Regulations (MHOR), The Personal Protective Equipment at Work (Amendment) Regulations, Highways Act 1980, Roads and Street Works Act 1980.

Guidance (ACOPs, Industry and HSE) - Industry Code of Practice for Arboriculture Tree Work at Height (Second Edition), Arboricultural Association Technical Guides TG1–5, LOLER: How the Regulations Apply to Arboriculture AIS 30 (HSE), Provision and Use of Work Equipment Regulations 1998, Approved Code of Practice and guidance, FISA 804, 802, 806, 604, AFAG 606, Safety at Street Works and Road Works: A Code of Practice 2013.

What do learners need to learn?	Skills
Legal responsibilities associated with health and safety, including the protection of lawful and unlawful visitors. Responsibilities of key roles during arboricultural operations sites in relation to industry guidance and best practice (responsible person, competent person, proficient operator). Typical hazards and risks associated with undertaking arboricultural operations. Control measures that can be put in place to mitigate these risks, including how to implement them and monitor them once work has commenced. How to carry out a work at height assessment. How to set up a safe site prior to arboricultural operations.	EC4, EC5

Business

1.101 **Factors** affecting profitable arboricultural operations.

Range:

Factors – Stakeholders: Land/tree owners/customers, contractors, subcontractors, visitors, neighbours, tree officers.

Price: Insurance, labour and contractor rates, haulage rates, equipment and machinery hire.

Arisings: Species characteristics, woodchip, firewood, waste management (waste carriers licence), quality and market requirements.

Site: Access, terrain/obstacles/targets, extraction routes, haulage routes, job specification, presence of pests or diseases.

What do learners need to learn?	Skills
Stakeholders in the supply chains, their roles and relationship to each other. Similarities and differences in how arboriculture and forestry organisations obtain revenue. How arboricultural organisations maximise revenue generation opportunities and minimise costs. Role of the marketplace in determining price and the factors that affect price. Relationship between price and management decisions. How long-and short-term tree and woodland management objectives affect the profitability of maintenance operations.	EC4, EC5 MC2, MC10

Options available to reduce costs during preparation, operation and post-operation (tools, equipment, labour, consumables). Factors affecting the quality and quantity of potential products from arisings and how these are optimised through maintenance activities to maximise yield and quality. Factors affecting non-market benefits and services (recreation, wellbeing, air quality, biodiversity, water management) of trees and woodland to society and how these are optimised through maintenance activities.	

Tools equipment and machinery

1.102 Types of **tools, equipment and machinery** required for tree work operations.

Range:
Tools, equipment and machinery – Pruning saws, pole saws, secateurs, felling bar, wedges, personal protective equipment, chainsaws, brushcutters, leaf blowers, mowers, woodchippers, stump grinders, climbing equipment, rigging equipment, tree shears, mobile elevated work platforms, moving equipment (compact skid steers and attachments, powered barrows).

What do learners need to learn?	**Skills**
Types of tools, equipment and machinery required for tree work, including: • their features and function • preparation requirements – checks/inspections, adding materials, calibration/adjustment in line with manufacturers' guidance and legal requirements • safe operation • suitability for carrying out tasks in different environments • maintenance and storage requirements to manufacturers' requirements	EC4, EC5 MC1

Tree biology, physiology and health

Soils

1.103 **Techniques** for manipulating **soils and growing media** for tree growth.

Range:
Techniques – Fertilisation, aeration, mulching, drainage, irrigation.
Soils and growing media – Brown earth, podzols, gleys, peat, iron pans, reclaimed soils.
Properties and characteristics – Texture, pH, nutrient availability, drainage and water holding capacity, organic matter and living organisms in the soil, colour and heat retention, ease of cultivation, existing pollutants, horizons, soil depth.

What do learners need to learn?	Skills
How soil properties and characteristics affect tree growth. Suitability of different soils and growing media, objectives, environments and tree species. Techniques for manipulating soils and growing media to promote tree health and growth. How techniques are applied in practice.	EC4, EC5 MC1

1.104 Influence of tree **maintenance** operations on **tree physiology and health**.

Range:
Tree physiology and health – Characteristics of potentially unhealthy or structurally weak trees: Dieback, bulges, infection, infestation, cavities, broken branches, compression and tensile forks, fibre buckling, cracks, ribs, hazard beams, fruiting bodies.
Maintenance options: Warning signs, physical barriers, removal of targets, habitat and health promotion, pruning and felling, restraint and support systems.

What do learners need to learn?	Skills
Characteristics of defects in trees, potentially unhealthy or structurally weak trees. Characteristics of potentially unhealthy trees (signs and symptoms of pests/diseases). Implications for tree and woodland maintenance planning and operations. Suitability of alternative maintenance options. Biosecurity requirements and reporting of potential tree health issues. How poorly planned or executed maintenance can negatively impact on tree physiology and health.	EC4, EC5

1.105 **Fungal pathogens** affecting trees.

Range:

Fungal pathogens – Fungi: Examples of Ascomycetes (*Nectria* spp, *Dothistroma septosporum*, *Hymenoscyphus fraxineus*), Basidiomycetes (rusts, *Armillaria* spp, *Meripilus giganteus*, *Ganoderma* spp, *Laetiporus sulphureus*) and Oomycetes (*Phytophthora* spp).

Colonisation strategies: Heart rot, unspecialised opportunism, specialised opportunism, active pathogenesis.

Types of decay: Brown rots, white rots (simultaneous white rot, selective delignification), soft rots.

What do learners need to learn?	**Skills**
Identification of fungal pathogens affecting trees and their implications for tree maintenance. Fungal colonisation strategies. How decay processes influence structural strength and potential failure of trees through degradation of cell wall structure and components. How poorly planned or executed maintenance can negatively impact on tree health.	EC4, EC5

1.106 Tree **responses** to wounding and decay.

Range:

Responses – Storage and mobilisation of energy reserves, physical defences (thorns, bark, leaf adaptations), chemical defences (resins, gums, tannins), Compartmentalisation of Decay in Trees (CODIT), wound wood and adaptive growth (wound occlusion).

Conventions and practices – Timing of operations, natural target pruning, branch collars, branch bark ridge, appropriate tools and equipment, BS3998 Recommendations for Tree Work.

What do learners need to learn?	**Skills**
Growth and response processes in trees in response to wounding and decay. Potential impact of the age/growth stage of a tree on the response to wounding and decay. How current pruning conventions and maintenance practices relate to subsequent tree responses. Biosecurity considerations associated with undertaking pruning and maintenance activities.	EC4, EC5

1.107 **Indicators** of potential failure in trees including implications and management.

Range:
Indicators – Root movement, cracks, included bark, co-dominant stems.

What do learners need to learn?	Skills
The range of visual indicators of potential failure. Concepts of biomechanical theories explaining mechanical strength and integrity of trees: • Axiom of uniform stress • undamaged tree as a self-optimised structure • principle of the minimum lever arm Implications of mechanical failure for tree management: • diminished aesthetic value • potential for secondary infection • damage to potential targets • increased insurance premiums • civil claims (if not managed) • criminal prosecution (if not managed) Techniques to manage weak tree structures: • artificial support systems • crown pruning • felling and removal	EC4, EC5 MC4

Preparing for tree and woodland maintenance operations

1.108 Roles and responsibilities of **people** on treework sites.

Range:
People – Land/tree owners, arboriculture professionals (responsible person, competent person, proficient operator), contractors, professionals allied to arboriculture.

What do learners need to learn?	Skills
Roles and responsibilities of people during arboricultural operations (scheduled and emergency operations) sites in relation to industry guidance and best practice – Arboricultural Association ICoP for Arboriculture: Tree Work at Height.	EC4, EC5

1.109 The principles of site management.

What do learners need to learn?	Skills
Site planning and the set-up of the work site in line with specification and/or method statement – operators, equipment, time, specification, insurance, resources, access, logistics. Decision-making and problem-solving responsibilities. Duties and responsibilities of people involved as per Arboricultural Association ICoP for Arboriculture: Tree Work at Height	EC4, EC5

• responsible person • competent person • proficient operator Activities to be undertaken and their application in arboriculture operations. Select suitable equipment to carry out the work, ensuring the equipment is fit for purpose. Importance of biosecurity measures and keeping a site clear, clean and environmentally sound in line with specifications.	

1.110 The principles of **access management**.

Range:

Access management –

Factors: Pedestrian, vehicular, animal, public and permissive rights of way and highways.

Techniques: Signage, fencing, traffic lights, stop/go boards.

What do learners need to learn?	**Skills**
The principles of managing access to worksites, including: • access factors to consider when undertaking tree maintenance operations • legal status and types of right of way and open access to the countryside legislation • techniques for restricting access to the worksite, including via a right of way	EC4, EC5

1.111 Types of **infrastructure**.

Range:

Infrastructure – Railways, overground and underground services, waterways and water bodies, buildings and foundations, boundaries, structures (bridges, sheds, greenhouses), signage and street furniture, surfaces (public and non-public highways, paths, lawns) vehicles and miscellaneous items including public and private amenity (garden furniture, ornaments, plant pots).

Features: Terrain, ground conditions, climate and microclimate, soil and geology, hydrology, existing tree species, access, timing, habitats.

Designations: Tree Protection Orders (TPO), Conservation Areas, SSSIs, protected species, cultural, historical and archaeological features, UKFS/UKWAS.

Guidance: FISA 804 Electricity at Work: Forestry, Industry Code of Practice for Arboriculture – Tree Work at Height (Second Edition) (Preliminary Work Site Assessment), BS 5837 (2012) – Trees in Relation to Design, Demolition and Construction Recommendations.

What do learners need to learn?	**Skills**
Types of infrastructure that may be encountered when carrying out arboriculture operations. Key requirements of related legislation, regulations, guidance and best practice.	EC4, EC5 MC3

Regulatory bodies and/or service providers to contact and consult with prior to operations starting. What permits/permissions must be in place prior to operations starting. Implications for planning and completing arboriculture operations. Features and designations of sites where arboriculture operations take place. Be able to interpret information from maps such as constraints maps. Preparation for arboriculture operations. Types of arboriculture operations that can be undertaken.	

1.112 Potential **damage** to the environment.

Range:

Damage – Pollution (spills, run off), contamination, soil damage (rutting/gullying, compaction), watercourses (blockage from debris), damage to surrounding trees and vegetation, wildlife and habitat disturbance.

Legislation: Wildlife and Countryside Act 1981 (as amended), Environmental Protection Act 1990 (as amended), Countryside Rights of Way Act 2000, Protected Species legislation.

What do learners need to learn?	**Skills**
Potential damage to the tree and surrounding environment caused by maintenance operations, including: • types of damage • causes of damage • legislation and penalties for causing damage	EC4, EC5

1.113 **How damage can be eliminated, prevented, or mitigated** including planning, techniques, materials and equipment to be used.

Range:

How damage can be eliminated, prevented or mitigated – Temporarily removing targets: Garden furniture/ornaments, plants, vehicles, structures (fence, sheds, greenhouse).

Ground protection: Brash mats, boards, steel plates.

Watercourse protection: Silt traps, catch pits, brash mats, existing vegetation, safe and secure storage of fuel and oils.

What do learners need to learn?	**Skills**
Different forms of ground protection – for vehicle/machine movements, drop-zones, felling zones. Different forms of watercourse protection. Why they are used – avoiding diffuse pollution, protecting infrastructure, preventing soil damage. Why they are selected and how they are applied. Implications for route planning and arboriculture operations.	EC4, EC5

Information

1.114 **Types** and **sources** of information.

Range:

Types – Work specifications, method statements, images/photography, different types of maps (including stock maps, constraints maps, Ordnance Survey (OS), sketches, computer aided design (CAD), geographic information technology (GPS, GIS, remote sensing).

Sources – Health and Safety Executive, UK Forestry Standard (UKFS), Natural England, Environment Agency, Industry Code of Practice for Arboriculture – Tree Work at Height (Second Edition), Arboricultural Association Technical Guides TG1–5, LOLER: How the Regulations Apply to Arboriculture, AIS 30 (HSE) Safe Use of Work Equipment, Provision and Use of Work Equipment Regulations 1998 ACOP, FISA 804, 802, 806, 604, AFAG 606, Safety at Street Works, Road Works: A Code of Practice 2013, manufacturers' guidance, company guidance, industry guidance and best practice publications (Forestry Commission, Forest Research), BS3998 Tree Work Recommendations, BS5837 Trees in Relation to Design, Demolition and Construction to Construction – Recommendations, BS8545 Trees: From Nursery to Independence in the Landscape – Recommendations.

What do learners need to learn?	**Skills**
Sources of information required for tree and woodland maintenance operations. Types of information required for tree and woodland maintenance operations, including: • their content and format • conventions and symbols • how they are produced • how they are used in planning and carrying out operations	EC4, EC5

Tree work operations

1.115 Tree management and maintenance **operations**.

Range:

Operations – Felling, dismantling, pruning (natural target pruning, formative pruning, crown thinning, crown lifting, crown reduction, branch reduction, fruit production), propping and bracing, stump removal, pollarding, coppicing, soil amelioration.

What do learners need to learn?	**Skills**
Tree maintenance and management operations including: • felling of small trees up to 380 mm with hand tools and/or chainsaws • dismantling, pruning, de-limbing, snedding and cross-cutting • extraction and management of arisings including stump removal • managing the rooting environment of trees • pruning • propping and bracing • soil amelioration • techniques used to carry out tree maintenance and their suitability for different trees, in different environments, or to meet different management objectives	EC4, EC5

How to apply techniques safely to specified quality standards and guidance, minimising risks to the environment.	

1.116 **Techniques** for accessing tree canopies to undertake tree maintenance.

Range:

Techniques – Ladders, climbing irons, fall protection systems (moving rope technique, stationary rope technique) and mobile elevated work platforms (MEWP).

Equipment: Pruning saws, secateurs, climbing ropes, harnesses, climbing knots, friction hitches, karabiners, strops, slings, lanyards, throwlines, mechanical ascending and descending devices, cambium savers and pulleys, climbing irons/spikes, PPE.

Components: Selection of anchor points, correct equipment installation, friction elements, rope organisation, devices, back-up system.

What do learners need to learn?	**Skills**
Techniques for accessing trees canopies to undertake tree maintenance. Suitability of techniques for different trees in different environments, including whether the maintenance can be undertaken from ground level. How to undertake a risk assessment for tree access techniques. Suitability, compatibility and transition between fall protection systems as climbing and working systems. Components of fall protection systems. Equipment selection including loading, performance specification, manufacturers' information and industry best practice. Correct equipment installation. Rescue planning procedures and equipment. How to safely ascend, move around the canopy and descend trees using a fall protection system. Importance of good planning and use of communication between ground staff and climber. Equipment inspection, storage, maintenance, record keeping and care. How techniques are applied safely, to recognised standards and guidance, minimising risks to people, infrastructure and the environment. Training and qualification requirements. Requirements of industry standards and best practice – Arboricultural Association Industry Code of Practice for Arboriculture, TG1: Tree climbing and aerial rescue, TG2: Use of tools in the tree, TG3: Rigging and dismantling, TG5: Use of MEWPs in tree work.	EC5, EC6 MC2, MC4

1.117 **Techniques** for aerial tree rescue.

Range:

Techniques – climbing system, MEWP

What do learners need to learn?	**Skills**
Techniques for aerial tree rescue of casualties. Suitability of techniques for different situations. Equipment selection including loading, performance specification and manufacturers' information.	EC5, EC6 MC2, MC4

Importance of good planning and use of communication between ground staff rescuer and emergency services. Equipment inspection, storage, maintenance, record keeping and care. How techniques are deployed safely, including attachment of the casualty to the rescue system. Possible needs of the casualty immediately following the rescue. Training and qualification requirements. Requirements of industry standards and best practice – Arboricultural Association Industry Code of Practice for Arboriculture, TG1: Tree climbing and aerial rescue, TG2: Use of tools in the tree, TG3: Rigging and dismantling, TG4: Use of Mobile Cranes in Tree Work, TG5: Use of MEWPs in tree work.	

Tree and woodland management and maintenance

1.118 **Types** of maintenance.

Range:
Types – Vegetation, boundaries, access routes and surfaces, structures and outdoor furniture.

What do learners need to learn?	**Skills**
Types of maintenance and their relevance for arboricultural operations, including: • purpose of planned maintenance • relationship between maintenance activities and tree management plans • content and formats of planned maintenance programmes • process involved in developing maintenance programmes • documentation required for maintenance activities • preparations for planned and unplanned (including emergency) maintenance and repair	EC3, EC4, EC5 MC10 DC2

1.119 **Infrastructure maintenance** and repair techniques.

Range:
Infrastructure maintenance – Infrastructure: Overground and underground services, waterways and water bodies, buildings and foundations, boundaries, structures (sheds, greenhouses), signage and street furniture, surfaces (highways, paths, lawns) vehicles and miscellaneous items including public and private amenity (garden furniture, ornaments, plant pots).
Techniques: Mechanised (tractor with implements/attachments), motor-manual (hand-held power tools), manual (postrammer, hammer, spade, rake, handsaw), no intervention.
Materials: Timber and posts, wire, consumables (nails, staples) chemical (paint, preservatives).

What do learners need to learn?	**Skills**
Techniques used to maintain and repair wooded environments and infrastructure, including: • infrastructure features • indications of infrastructure defects	EC4, EC5

- consequences of not repairing damage to infrastructure caused during treework
- reporting of damage to infrastructure caused during treework
- how appropriate techniques are selected and applied
- tools, equipment, machinery and materials required
- suitability of techniques to meet sustainable and heritage management
- risks to the environment from maintenance activities including biosecurity and damage to residual habitat and species

1.120 **Vegetation** management **techniques**.

Range:

Vegetation – Unwanted vegetation: competing, invasive, injurious.

Vegetation to be maintained: trees, shrubs, hedges, grass.

Techniques – Mechanised (tractor/ATV with implements/attachments), motor-manual (chainsaw, brushcutter, pedestrian mower, hedge trimmer), manual (handsaw, secateurs), cultural, application of herbicides, mulching.

BS3998 terms: Target pruning, branch collar, branch bark ridge, pruning to growth points.

Pruning operations: Crown thinning, crown reduction, crown lifting, formative pruning, dead wooding, pollarding, conservation pruning, fruit production.

What do learners need to learn?	**Skills**
Different techniques for control of vegetation. Purposes for removing unwanted vegetation, including legal obligations. Legal and environmental implications of techniques available. Suitability of techniques for different situations and environments. Benefits and limitations of those techniques to different trees in different environments to meet different management objectives. Suitability of pruning operations for different situations and environments. How to apply techniques safely, to specified quality standards and guidance, minimising risks to the environment both in undertaking and supporting each technique. Treatment of work arisings – left in situ, chipping, stacking, burning, disposal by licenced waste contractor. Terms as per British Standard 3998: Recommendations for Tree Work.	EC4, EC5

Undertake complex arboriculture operations (PO9)

Health and safety

1.121 Health and safety **legislation, regulations** and **guidance** for arboriculture operations.

Range:
Legislation, regulations and guidance – Legislation and Regulations: Management of Health and Safety at Work Regulations 1999, Work at Height Regulations 2005 (WAHR), Provision and Use of Work Equipment Regulations (PUWER) 1998, LOLER Regulations 1998, Highways Act 1980, Roads and Street Works Act 1980.
ACOPs, Industry and HSE Guidance: Industry Code of Practice for Arboriculture – Tree Work at Height (Second Edition), Arboricultural Association Technical Guides TG1–5, LOLER: How the Regulations Apply to Arboriculture – AIS 30 (HSE), FISA 804, 802, 806, 604, AFAG 606, Safety at Street Works and Road Works: A Code of Practice 2013.

What do learners need to learn?	Skills
Typical hazards and risks associated with undertaking complex arboricultural operations and control measures to be put in place to mitigate these risks. Know how to carry out a work at height assessment. Responsibilities of key roles during arboricultural operations on sites in relation to industry guidance and best practice (Responsible Person, Competent Person, Proficient Operator). How to set up a safe site prior to arboricultural operations.	EC4, EC5

Environment

1.122 Environmental **legislation, regulations** and **codes of practice**.

Range:
Legislation, regulations and codes of practice – Town and Country Planning Act (TPOs, Conservation Areas), Environment Act 1995, Environment Act 2021**,** Countryside Rights of Way Act 2000, Habitat Regulations 1994, Wildlife and Countryside Act 1981, Protected Species legislation.

What do learners need to learn?	Skills
Environmental legislation, regulations and codes of practice relating to conservation, plant health, wildlife, pollution and water quality. Relationship between legislation, regulations and codes of practice, and how they complement each other. Responsibilities placed on organisations by environmental legislation, regulations and codes of practice when planning and carrying out arboricultural activities. Permissions required before felling operations can be carried out, related to: protected species, habitats, tree volume (felling licences). Regulators and their role in granting and enforcing permissions (Natural England, Environment Agency, Office for Environmental Protection, Forestry Commission).	EC4, EC5

1.123 **Environmental risk assessments**.

Range:

Environmental risk assessments – Codes of practice – Government guidelines for environmental risk assessment and management – Green leaves III.
Site factors: Topography, ground conditions, vegetation type, season, weather, proposed operations, management approach, protected species/habitats.

What do learners need to learn?	**Skills**
The purpose of environmental risk assessments, including: • their relationship with other documents, e.g. arboricultural reports or habitat plans • content of an environmental risk assessment • how environmental risk assessments are conducted • site factors that need to be incorporated into an environmental risk assessment, their interrelationships and how they are managed	EC4, EC5

Business

1.124 **Factors** that can affect profitable arboriculture operations.

Range:
Factors – Labour: Contractor/consultant rates, subcontractor rates, training and certification requirements.
Materials, tools and equipment: purchase, hire, maintenance, consumables.
Arisings: Woodchip, firewood, waste management.
Site: Access, terrain, obstacles, methods, job specification.

What do learners need to learn?	**Skills**
Role of the marketplace in determining price and the factors that affect price – competition, customer requirements, accreditation schemes (industry and sector schemes). Factors that can affect profitable arboriculture operations – insurance, consumables, training and certification requirements, equipment costs (purchase and maintenance), specialist machinery (purchase or hire). Options available to minimise negative factors during preparation, operation and post operation (tools, equipment, labour). Scheduled testing and maintenance of tools and equipment.	EC4, EC5 MC2, MC10

Tools, equipment and machinery

1.125 Types of **tools, equipment and machinery** required for tree work operations.

Range:
Tools, equipment and machinery – Pruning saws, pole saws, secateurs, felling bar, wedges, personal protective equipment, chainsaws, woodchippers, stump grinders, climbing equipment, rigging equipment, tree shears, leaf blowers, moving equipment (compact skid steers and attachments, powered barrows).

What do learners need to learn?	Skills
Types of tools equipment and machinery required for tree work, including: • their features and function • associated PPE requirements • preparation requirements – checks/inspections, adding materials, calibration/adjustment • safe operation • suitability for carrying out tasks in different environments • maintenance and storage to manufactures requirements	EC4, EC5 MC1

Preparing for arboriculture operations

1.126 Principles of site management.

What do learners need to learn?	Skills
The principles of site management including: • site planning and the set-up of the work site – operators, equipment, time, specification, insurance, resources, logistics, location of targets • decision-making and problem-solving responsibilities • duties and responsibilities of people involved as per Arboricultural Association ICoP (responsible person, competent person, proficient operator) • activities to be undertaken and their application in arboriculture operations Select suitable tools and equipment to carry out the work ensuring the equipment is fit for purpose. Factors to consider when selecting a drop zone. Appropriate methods for the removal/disposal of arisings.	EC4, EC5

1.127 Types of **infrastructure**.

Range:
Infrastructure – Types: Public and non-public highways, railways, watercourses, overhead and underground services, buildings/structures.
Features: Terrain, buildings, ground conditions, climate and microclimate, geology, hydrology, existing tree species, access, timing, habitats.
Designations: Tree Protection Orders (TPO), Conservation Areas, Sites of Specific Scientific Interest (SSSI), protected species, cultural, historical and archaeological features, UK Forestry Standard (UKFS), UK Woodland Assurance Standard (UKWAS).
Guidance: FISA 804 Electricity at Work: Forestry, Industry Code of Practice for Arboriculture – Tree Work at Height (Second Edition) (Preliminary Work Site Assessment), BS 5837 (2012) – Trees in Relation to Design, Demolition and Construction Recommendations.

What do learners need to learn?	Skills
Types of infrastructure that may be encountered when carrying out complex arboriculture operations. Key requirements of related legislation, regulations, guidance and best practice. Regulatory bodies and/or service providers to contact and consult with prior to operations starting. What permits/ permissions must be in place prior to operations starting. Implications for planning and completing arboriculture operations. Features and designations of sites where arboriculture operations take place. Be able to interpret information from maps such as constraints maps. Preparation for arboriculture operations. Types of arboriculture operations that can be undertaken.	EC4, EC5 MC3

1.128 Potential **damage** to the environment.

Range:
Damage – Pollution (spills, run off), contamination, soil damage (rutting/gullying, compaction), watercourses (blockage from debris), damage to adjacent trees and vegetation.

What do learners need to learn?	Skills
Potential damage to the environment caused by arboriculture operations, including: • types of damage • causes of damage – through acts and omissions	EC4, EC5

1.129 How damage can be eliminated, prevented, or mitigated including planning, **techniques, materials and equipment** to be used.

Range:
Techniques, materials and equipment – Temporarily removing targets: Garden furniture/ornaments, plants, vehicles, structures (fence, sheds, greenhouse).
Ground protection equipment: Brash mats, boards, steel plates.
Watercourse protection techniques/equipment: Silt traps, catch pits, brash mats, existing vegetation.

What do learners need to learn?	**Skills**
Different forms of ground protection – for vehicle/machine movements, drop-zones, felling zones. Different forms of watercourse protection. Why are they used – avoiding diffuse pollution, protecting infrastructure, preventing soil damage. Why they are selected and how they are applied. Implications for route planning and arboriculture operations.	EC4, EC5

Information

1.130 Types and **sources** of **information**.

Range:
Sources – Arboricultural Association guidance, British Standards (BS3998, BS5837), UK Forestry Standard (UKFS), UKWAS, Industry Codes of Practice (ICOPs), FISA Guidance (Forest Industry Safety Accord), manufacturers' guidance, company guidance, industry guidance and best practice publications (Forestry Commission, Forest Research), HSE Approved Codes of Practice (ACOPs).
Information – Work specifications, images/photography, different types of maps (including site plans, local authority protected tree maps, constraints maps, Ordnance Survey (OS), sketches, computer aided design (CAD), geographic information technology (GIS, remote sensing).

What do learners need to learn?	**Skills**
Types and sources of information for undertaking tree and woodland work operations, including: • information provided • their status in relation to regulatory and legal requirements • their content and format • conventions and symbols • how they are produced • how they are used in planning and carrying out operations	EC4, EC5

Arboriculture operations

1.131 Different **purposes** for pruning or dismantling trees.

Range:
Purposes – Sight lines, light, safety/stability, pest or disease control, aesthetics, access, clearance of overhead utilities, railways, fruit production.

What do learners need to learn?	Skills
How the purpose affects the selected technique to be applied and associated operations including ground protection.	EC4, EC5

1.132 **Characteristics** of potentially unhealthy or structurally weak trees.

Range:
Characteristics – Pollards, breakout cavity, weak or tight forks, pruning wounds/cavities, loose bark (oozing, weeping), basal cavities, damaged or impaired roots, crown dieback, cankers, fungal fruiting bodies, soil cracks and ground heave.

What do learners need to learn?	Skills
How to identify unhealthy or structurally weak trees. Causes of defects, and susceptibility of different tree species. Implications for arboricultural operations. Characteristics of species causing decay in trees.	EC4, EC5

1.133 **Techniques** for accessing tree canopies to carry out tree work.

Range:
Techniques – Ladders, trestles, rope and harness, mobile elevated work platforms (MEWP).

What do learners need to learn?	Skills
Suitability of techniques for different trees in different environments. Equipment and materials required. How they are applied when carrying out arboricultural operations. Current industry best practice.	EC4, EC5

1.134 Techniques for **aerial cutting** of trees.

Range:
Aerial cutting – Types of cut: Step cut (hand-held and free-fall), sink cut (hand-held and free-fall), directional step cut, final pruning cut (natural target prune).

What do learners need to learn?	**Skills**
Their suitability for different situations. Equipment required. How the techniques are applied. Understand the importance of good planning and effective communication between ground staff and climber. Requirements of industry standards and best practice – Arboricultural Association TG2: Use of tools in the tree, BS 3998 Recommendations for Tree Work.	EC5 MC1

1.135 Sectional tree felling, including the use of **rigging systems**.

Range:
Rigging systems – Butt tie, tip tie, cradle, speed line.

What do learners need to learn?	**Skills**
Basic principles of various rigging techniques and systems, including: • factors considered when planning operations • factors to consider when selecting anchor points for lowering • how to calculate the weight of the load involved with rigging operations • how to reduce shock loading on equipment and anchor points • how to add friction into a lowering system • importance of good planning and effective communication between ground staff and climber • how techniques are applied safely, to recognised standards and guidance, minimising risks to the operators, members of the public, and the environment • requirements of industry standards and best practice – Arboricultural Association TG3: Rigging and dismantling, TG4: Use of mobile cranes in treework, TG5: Use of MEWPs in tree work	EC5, EC6 MC1, MC2, MC4

1.136 Supporting aerial tree rigging operations from the ground in line with **industry guidance**.

Range:
Industry guidance – AA Technical Guide 3: Rigging and dismantling.

What do learners need to learn?	**Skills**
Preparation: • Responsibilities as an operator under Health and Safety at Work Act, Provision and Use of Work Equipment Regulations (PUWER) 1998, Lifting Operations and Lifting Equipment Regulations (LOLER) 1998 • Sources of industry guidance and good practice • Roles and responsibilities of the arboricultural ground worker during rigging operations • Principles of site zoning in relation to on-site operations • How to enter a drop zone safely and effectively • Reasons why a climber needs support on the ground • Reasons why it is important to inform the climber promptly and clearly of any changes in the hazards and risks on site • Importance of discussing the rigging operation with the climber and to agree a plan Operations: • How to set up the site, including the preparation of equipment • Methods to ensure the lowering equipment is compatible and sufficient to deal with the anticipated loads • How to set up the lowering device and associated equipment • How to attach equipment correctly and with industry recognised knots/hitches • Checks required for lowering lines and pulling lines to ensure they are ready for use • Procedures for sending equipment safely up into the tree as well as how it should be sent down after use • Methods to lower tree sections safely • Methods to estimate the weight of timber to be lowered and the amount of friction required in the lowering device • Importance of removing arisings from the drop zone • How to lower sections of the tree using the lowering device correctly and send the rope back up to the climber • Procedures on completion of tree work to retrieve all equipment, check it and store it for transport	EC5, EC6 MC1, MC2, MC4

1.137 **Aerial tree pruning** using chainsaws from a rope and harness.

Range:
Aerial tree pruning – Crown thin, crown raise, crown reduction.

What do learners need to learn?	**Skills**
Preparation: • Responsibilities as an operator under Health and Safety at Work Act, Provision and Use of Work Equipment Regulations (PUWER) 1998, Lifting Operations and Lifting Equipment Regulations (LOLER) 1998 • Sources of industry guidance and good practice relevant to aerial tree pruning • Different types of pruning carried out on trees and the reasons they are carried out • Potential environmental damage that could occur and how to respond appropriately • Site zoning in relation to on-site preparation • How to evaluate trees for hazards and the implications of the hazards when identified Operation: • Basic principles of natural target pruning and the effect on tree pruning operations • Precautions that may be taken during re-pollarding of trees • Different cuts and when they may be used • Use of associated equipment to aid removal of sections • Potential effects on the tree of removing the sections • Why it is important to achieve accurate and appropriate cuts • Procedure for removing a trapped saw • Situations when it is (and is not) acceptable to use a chainsaw one handed • How to select appropriate points/position of access equipment so the anchor point will not be compromised by the work carried out • Approved techniques for accessing trees and selecting a final working anchor point • How to identify a suitable drop zone for arisings • How to carry out prescribed aerial pruning operations using approved techniques	EC5 MC1

1.138 **Assisted felling** techniques including winching.

Range:
Assisted felling – Guidance: FISA 310, Winching Operations in Forestry Technical Guide (Forest Research).
Equipment: Hand winches, ropes, cables, slings, carabiners, shackles, pulleys/snatch blocks, wedges, felling levers.
Factors - Tree: lean, crown weighting/form/branching habit, species, size, health, condition.
Site: location, targets, suitable anchor points, winds (strength/speed, direction).

What do learners need to learn?	**Skills**
Learners will have knowledge of assisted felling techniques for trees up to 380 mm diameter, including: • situations when assisted felling is required (felling of standing stem after dismantling, avoiding obstacles) • how to achieve mechanical advantage using rope-based systems and winching systems • different types of equipment and machinery available • advantages and disadvantages of different equipment and machinery • maintenance and inspection requirements of the equipment and machinery • configuration and compatibility of equipment and machinery to be used • assisted felling systems that can be set up • how to get a rope or cable into a tree and what is the optimum height • forces that can be put onto the anchors and the equipment and its implications • safe set up of site and safe systems of work, ensuring operators are kept safe • how to apply techniques safely, to recognised standards and guidance, minimising risks to the operators and the environment	EC5, EC6 MC2, MC4

1.139 Ground and property **protection methods**.

Range:
Protection methods – Ground: Brash mats, boards, steel plates, track mats (steel/plastic), tyres.
Property: Plastic sheeting, plastic tubes for removal of arisings through properties.

What do learners need to learn?	**Skills**
Different forms of protection for grounds and property (site furniture, buildings, interiors), including: • how they are applied • implications for route planning and tree operations	EC4, EC5

1.140 **Processing** of tree and woodland work arisings.

Range:
Processing – Chipping, windrow, leave in situ, mulching, firewood, specialist markets, waste disposal, specialist waste disposal (controlled/hazardous waste).

What do learners need to learn?	**Skills**
The processing of arisings, including: • factors to consider regarding treatment of arisings – cost, species and habitats, plans for the site • methods of disposal • legislation, guidance and best practice to be followed – waste transfer licencing	EC4, EC5

Performance outcome 7

7. Manage tree populations to meet objectives

7.1 **Survey and inspect** tree populations from the ground.

Range:

Survey and inspect – Objectives: Tree protection (TPO), tree safety, plant health, pest and disease, boundary location, damage, wildlife.

Equipment: Rangefinder, nylon hammer, identification guides, portable computers and mobile devices, compass, measuring tape, clinometer/hypsometer, field notebook, binoculars.

Factors: Defect identification, timing, decay or damage detection, hazard evaluation, habitat potential, distance from targets, age, species, dimensions, historical significance, pests and pathogens, infrastructure.

Recommendations: Risk mitigation, tree pruning, signage or access restrictions/ management, remedial work or removal, further monitoring, detailed or aerial inspection, statutory protection.

What do learners need to demonstrate?	**Skills**
Locate site boundaries from a map. Verify the accuracy of measuring equipment. Carry out surveys of individual trees and groups of trees to meet specific objectives, including: • identify common tree and shrub species by botanical name • interpret data from tree surveys and inspections • draw a basic tree location plan digitally • amend a basic tree location plan digitally • create a Tree Constraints Plan • report on tree surveys • determine minimum root protection areas • assess against criteria for a Tree Preservation Order • assess tree quality by the cascade chart • value trees • make recommendations appropriate to survey objectives	EC3, EC5 MC1, MC3 DC1, DC2

7.2 **Inspect trees** from the ground.

Range:

Inspect trees – Objectives: Risk assessment, tree condition, amenity valuation, planning proposals and applications, insurance purposes, mortgage requirements, civil claims and alleged criminal activity, presence of protected species, hazard assessment, statutory protection, annual work programmes.

Equipment: Rangefinder, nylon hammer, identification guides, portable computers and mobile devices, compass, measuring tape, clinometer, field notebook, probe.

Factors: Defect identification, timing, decay or damage detection, hazard evaluation, habitat potential, distance from targets, age, species, dimensions, historical significance, pests and pathogens.

Recommendations: Risk mitigation, tree pruning, signage or access restrictions/management, remedial work or removal, further monitoring, detailed or aerial inspection, further specialised third party input, alleviation of ground compaction, insurance claim.

What do learners need to demonstrate?	Skills
Carry out non-invasive systematic inspections of individual and groups of trees/shrubs from the ground to meet specific objectives. Identify tree and shrub species commonly found in the UK, by botanical name. Evaluate tree health and condition. Identify unhealthy or structurally weak trees. Recognise signs and symptoms of common pests, pathogens, disorders. Identify presence of protected species or habitats. Take and preserve samples (leaves, fungi, insects) ensuring necessary biosecurity measures are followed. Interpret data from tree inspections. Assess risks from trees (targets, defects). Estimate tree age using approved methods. Input survey data into digital software. Report on tree inspections. Make recommendations appropriate to inspection objectives.	EC3, EC5 MC1, MC3 DC1, DC2

7.3 Create and amend **documents** and **plans**.

Range:
Documents – Reports on findings of surveys/assessments.
Plans – Tree location plan, tree constraints plan.

What do learners need to demonstrate?	Skills
Input survey data into forms or digital software. Produce reports to show findings of surveys/assessments. Draw a basic tree location plan by hand or digitally. Amend a basic tree location plan by hand or digitally.	EC1. EC3 MC1, MC3 DC1, DC2

Performance outcome 8

8. Maintain trees to meet prescribed objectives

8.1 Climb trees and perform aerial rescue using appropriate methods and **equipment**.

Range:

Equipment – Climbing ropes, climbing knots, friction hitches, karabiners, strops, slings, lanyards, throwlines, mechanical ascending and descending devices, cambium savers and pulleys, PPE.

What do learners need to demonstrate?	Skills
Select an appropriate and safe method to access a tree canopy. Select and check appropriate climbing equipment. Produce a risk assessment and emergency plan. Organise and set out the worksite, including signage and controls. Access a tree canopy safely (ladder and climbing system). Install a climbing line from ground level. Use a climbing system safely and efficiently to access the required working positions. Ensure biosecurity measures are in place if appropriate. Work safely and efficiently in accordance with the specification/method statement. Avoid damage to surrounding trees, other plants, animals and infrastructure. Ensure good communication at all times with ground staff to achieve a safe working environment. Descend safely. Rescue an incapacitated person/casualty from a tree. Leave a safe and tidy site as per specification. Check tools, equipment and machinery for damage in line with manufacturer's guidance and report on any defects found. Support aerial tree workers from the ground.	EC3, EC5, EC6 MC1

8.2 Prune trees using **hand tools** and associated **equipment**.

Range:

Hand tools – Pruning saws, secateurs, pole saws.

Equipment – Climbing ropes, harnesses, climbing knots, friction hitches, karabiners, strops, slings, lanyards, throwlines, mechanical ascending and descending devices, cambium savers and pulleys, PPE, hand-held power tools, pedestrian operated machinery.

What do learners need to demonstrate?	**Skills**
Undertake simple tree pruning operations. Formatively prune trees from ground level. Prune trees from ground level using a pole saw. Climb trees and carry out aerial pruning including reducing, reshaping and thinning. Ensure biosecurity measures are in place, if appropriate. Work safely and efficiently to maximise productivity and manage arisings/waste in accordance with the specification/method statement. Avoid damage to surrounding trees, other plants, animals and infrastructure. Ensure good communication at all times to achieve a safe working environment. Leave a safe and tidy site as per specification. Check tools, equipment and machinery for damage in line with manufacturer's guidance and report on any defects found. Work in accordance with BS3998 and to a given specification.	EC3, EC5, EC6 MC1

8.3 Maintain and repair **access routes and surfaces**.

Range:

Access routes and surfaces – Roads, paths, car parks/hard standing, boardwalk, lawn/grass areas, overgrown vegetation.

Surface materials: Aggregates, stone, concrete, woodchip, timbers, composites, soil, turf.

Tools, equipment and machinery: Hand tools, hand-held power tools, pedestrian operated machinery.

What do learners need to demonstrate?	**Skills**
Maintain access routes and surfaces, including: • clearing unwanted debris and vegetation from an access route or surface • applying and levelling surface materials to reinstate an access route or surface • interpreting information sources – maps, work specifications • locating site constraints • identifying where signage is to be located • producing a risk assessment and emergency plan • producing an outline method statement for the operation • organising and setting out the worksite including signage and controls • selecting and preparing tools, equipment and machinery for use • ensuring biosecurity measures are in place if appropriate	EC3, EC5, MC1

• working safely and efficiently to maximise productivity and manage arisings/waste • avoiding damage to surrounding trees, other plants, animals and infrastructure • ensuring good communication at all times • leaving a safe and tidy site as per specification • checking tools, equipment and machinery for damage in line with manufacturer's guidance and report on any defects found	

8.4 Maintain and repair **structures and furniture**.

Range:

Structures and furniture – Gates, boundaries (hedges, boundary walls, post and rail, post and wire, garden fencing) recreational furniture, signage.

Materials: Posts, wire, rails, hedging, timber, bricks/stone.

Tools, equipment and machinery: Hand tools, hand-held power tools, pedestrian operated machinery.

What do learners need to demonstrate?	**Skills**
Maintain and repair structures and furniture, including: • repair/fix ironmongery (e.g. gate/lock hinges) • repair a boundary • repair wooden structures and furniture Interpret information sources – maps, work specifications. Locate site constraints. Identify where signage is to be located. Produce a risk assessment and emergency plan. Produce an outline method statement for the operation. Organise and set out the worksite including signage and controls. Select and prepare tools, equipment and machinery for use. Ensure biosecurity measures are in place if appropriate. Work safely and efficiently to maximise productivity and manage waste materials. Avoid damage to surrounding trees, other plants, animals and infrastructure. Ensure good communication at all times. Leave a safe and tidy site as per specification. Check tools, equipment and machinery for damage in line with manufacturer's guidance and report on any defects found.	EC3, EC5, MC1

Performance outcome 9

9. Undertake complex arboriculture operations

9.1 Prepare the work site.

What do learners need to demonstrate?	Skills
Interpret information sources – maps, work specifications. Locate trees to be felled. Locate site constraints. Identify where signage is to be located. Produce a risk assessment and emergency plan. Produce an outline method statement for the operation. Organise and set out the work site including signage and controls. Prepare tools, equipment and machinery for use, including chainsaw. Ensure biosecurity measures are in place if appropriate. Implement systems of work to be used, considering the method of disposal and machinery being used.	EC3, EC5 MC1, MC2 DC1, DC2

9.2 **Prune trees** using a chainsaw from a rope and harness.

Range:
Prune trees – Standards and guidance – BS3998, AA Technical Guide 1 Tree Climbing and Aerial Rescue, AA Technical Guide 2 Use of Tools in the Tree.
Equipment – Top handled or small chainsaw with 12- or 14-inch bar, hand pruning saw, tape sling, all necessary climbing equipment (climbing ropes, harnesses, climbing knots, friction hitches, karabiners, strops, slings, lanyards, throwlines, mechanical ascending and descending devices, cambium savers and pulleys, PPE).

What do learners need to demonstrate?	Skills
Identify the hazards, risks and controls associated with the site, task and machines. Explain and produce an emergency plan for the work area. Perform an assessment of the tree to be worked on and carry out a work at height assessment. Explain how the species and condition of trees and time of year might affect the work to be carried out. Select compliant PPE and safety clothing for tree climbing and chainsaw use. Check all tree climbing and access equipment to ensure it is safe and fit for use under manufacturer's instructions and relevant legislation. Select appropriate points/position of access for equipment so the anchor point will not be compromised by the work carried out. Access the tree using an approved technique and select a final working anchor point. Identify a drop zone for arisings. Begin to carry out the prescribed pruning operation. Demonstrate a range of pruning skills. Demonstrate a range of cuts to remove material during the pruning	EC5, EC6 MC1

operations. Demonstrate use of associated equipment to help in the removal of sections during pruning. Descend safely from the tree. All equipment to be checked and stowed appropriately, and report any defects. Dispose of arisings according to legislation and the job specification. Make sure all work is carried out to minimise environmental damage. Ensure the site is left safe and tidy. At all times work in a way which maintains health and safety and is consistent with relevant legislation and industry best practice.	

9.3 Support **aerial tree rigging** operations from the ground.

Range:
Aerial tree rigging – Guidance – Technical Guide 3: Rigging and Dismantling.
Equipment – Lowering ropes, pulling line, impact pulley, lowering or craning device, soft eye rope sling (single eye), soft eye rope sling (double anchor), steel carabiners.

What do learners need to demonstrate?	**Skills**
Identify the hazards, risks and controls associated with the site, task and machines. Produce an emergency plan for the work area. Discuss the rigging operation with the climber and agree a plan. Set up the site including the preparation of equipment. Ensure the lowering equipment is compatible and sufficient to deal with the anticipated loads. Set up the lowering device and associated equipment in the location specified and agreed with the climber. Ensure equipment is attached correctly and with industry recognised knots/hitches. Check lowering line and pulling line (if being used) and ensure they are ready for use. Once the climber is in the tree and has achieved their final anchor point, send equipment safely up into the tree. Pass and retrieve equipment from the climber safely. Check with the climber that the rigging system is set up correctly and that lowering ropes run smoothly and do not conflict with those of the climber. Work with the climber to estimate the weight of the piece to be lowered and the amount of friction required in the lowering device. Lower sections of the tree using the lowering device correctly and send the rope back up to the climber. Work with the climber once the work is complete to retrieve all equipment, check it and store it for transport. Report any defects. Dispose of arisings according to legislation and the job specification. Make sure all work is carried out to minimise environmental damage. Ensure the site is left safe and tidy. At all times work in a way which maintains health and safety and is consistent	EC3, EC5, EC6 MC1, MC2, MC4

with relevant legislation and industry best practice.	

9.4 Fell trees using assisted felling **systems**, considering relevant **factors**.

Range:
Systems – Rope-based systems, winch systems, wedges, felling levers.
Factors – Tree: lean, crown weighting/form/branching habit, species, size, health, condition. Site: location, targets, suitable anchor points, winds (strength/speed, direction).

What do learners need to demonstrate?	**Skills**
Learners will carry out an assisted fell of a small tree using ground-based techniques only: • Identify hazards, risks and controls • Select appropriate equipment for the estimated load • Inspect the equipment • Select felling direction • Attach a rope or cable into a tree at an appropriate height • Set up a rope-based system with mechanical advantage and fell the tree with an appropriate holding cut • Set up a hand winch-based system and fell the tree with an appropriate holding cut • Ensure effective communication at all times • Leave a safe and tidy site as per specification	EC3, EC5, EC6 MC1, MC2, MC4

Annex A: Tree and plant/shrub species

Broadleaf: (Learners should know common **and** botanical names.)

Acer campestre	Field Maple
Acer platinoids	Norway maple
Acer pseudoplatanus	Sycamore
Aesculus hippocastanum	Horse Chestnut
Alnus glutinosa	Common Alder
Betula pendula	Silver Birch
Carpinus betulus	Hornbeam
Castanea sativa	Sweet Chestnut
Corylus avellana	Hazel
Crataegus monogyna	Common Hawthorn
Fagus sylvatica	Common Beech
Fraxinus excelsior	Common Ash
Ilex aquifolium	Holly
Malus sylvestris	Crab Apple
Nothofagus obliqua	Roble Beech
Nothofagus procera	Raoul
Platanus x hispanica	London Plane
Populus nigra	Black Poplar
Populus tremula	Aspen
Populus x canadensis	Hybrid Black Poplar
Prunus avium	Wild Cherry
Prunus spinosa	Blackthorn
Quercus cerris	Turkey Oak
Quercus petraea	Sessile Oak
Quercus robur	English Oak
Salix caprea	Goat Willow
Salix fragilis	Crack Willow
Sambucus nigra	Elder
Sorbus aucuparia	Rowan
Tilia cordata	Small leaved Lime
Tilia x europaea	Common Lime
Ulmus glabra	Wych Elm
Ulmus procera	English Elm

Conifers: (Learners should know common **and** botanical names.)

Abies alba	Common Silver Fir
Abies grandis	Grand Fir

Abies nordmanniana	Nordmann/Caucasian Fir
Abies procera	Noble Fir
Chamaecyparis lawsoniana	Lawson Cypress
X Cupressocyparis leylandii	Leyland Cypress
Cupressus macrocarpa	Monterey Cypress
Larix decidua	European Larch
Larix kaempferi	Japanese Larch
Larix x marschlinsii (Syn. L. x eurolepis)	Hybrid Larch
Metasequoia honshuenensis	Dawn Redwood
Picea abies	Norway Spruce
Picea pungens	Blue Spruce
Picea sitchensis	Sitka Spruce
Pinus contorta	Lodgepole Pine
Pinus nigra ssp. *maritima*	Corsican Pine
Pinus pinaster	Maritime Pine
Pinus radiata	Monterey Pine
Pinus sylvestris	Scots Pine
Pseudotsuga menziessii	Douglas Fir
Seqiouadendron giganteum	Giant Redwood
Sequoia sempervirens	Coast Redwood
Taxus baccata	Common Yew
Thuja plicata	Western Red Cedar
Tsuga heterophylla	Western Hemlock

Other plants/shrubs: (Learners should know common names.)

Clematis vitalba	Clematis
Hedera helix	Ivy
Heracleum mantegazzianum	Giant Hogweed
Hyacinthoides non-scripta etc.	Bluebell
Impatiens glandulifera	Himalayan Balsam
Lonicera periclymenum	Honeysuckle
Polypodium vulgare	Polypody Ferns
Prunus laurocerasus	Cherry Laurel
Reynoutria japonica	Japanese Knotweed
Rhododendron poniticum	Rhododendron
Rubus fruticosus	Bramble
Ruscus aculeatus	Butchers Broom
Viburnum opulus	Guelder Rose
Viscum album	Mistletoe
	Grass (various species)

Guidance for delivery

The purpose of this specialism is for learners to know and undertake the theory and practice of Tree and Woodland Management and Maintenance. A range of classroom-based and practical delivery methods should be employed to ensure both theory and practice are delivered with strong linkage to vocational context. Centres are encouraged to introduce employers and specific professionals from the forestry and arboriculture industry to provide interesting and relevant information to the learner.

All practical delivery should focus 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. Learners should understand the importance of maintaining an awareness of current legislation and Codes of Practice.

Machinery use outcomes are best initially delivered in a workshop context with eventual move to a working woodland or worksite environment. Reference should also be made to biosecurity and environmental protection measures throughout. The requirement for regular maintenance and use of the manufacturer's manuals should also be identified. Pre-start checks and safe starting techniques will form part of these outcomes. For chainsaw use 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.

For the more theory-based outcomes it is anticipated that the delivery will be through formal lectures, but it is recommended that they are linked directly with interactive lessons in a real environment and that visiting speakers are used where possible to provide a vocationally relevant context. Laboratory and field-based practical sessions will be essential to help learners to explore soil characteristics, tree physiology and structure, and a series of visits to nurseries, establishment sites and established trees/woodlands could help learners better understand factors affecting tree growth and development. Learners should also have access to a range of soils, as well as appropriate equipment and resources to undertake soil sampling.

Suggested learning resources

Books

Forestry pathway:

Hibberd, B.G. (ed.) (1991) *Forestry Commission Handbook 6 Forestry Practice*. Bristol: HMSO.
Forestry Commission (2015) *Thinning Control*. Bristol: Forestry Commission.
Mackie, E. D. and Matthews, R. W. (2006) *Forest Mensuration: A Handbook for Practitioners.* Bristol: Forestry Commission.
Mackie, E. D. and Matthews, R. W. (2008) *Timber Measurement.* Bristol: Forestry Commission.

Matthews, R.W., Jenkins, T.A.R., Mackie, E.D. and Dick, E.C. (2016) Forest Yield: A Handbook on Forest Growth and Yield Tables for British Forestry. Bristol: Forestry Commission. (
No longer available as a hardcopy, free to download as an online pdf from www.forestresearch.gov.uk).

Arboriculture pathway:

- Arboricultural Association (2020) *Industry Code of Practice for Arboriculture. Tree Work at Height (2nd edn).* Stonehouse: Arboricultural Association.
- Fay N., Dowson, D. and Helliwell, R. (2005) *Tree Surveys: A Guide to Good Practice*. Stonehouse: Arboricultural Association.
- BSI (2010) BS 3998:2010 *Tree Work. Recommendations*. London: British Standards Institute.

Industry/Best Practice Guidance Publications

Both Pathways:

Forest Industry Safety Accord (FISA) Safety Guides:

- FISA 103 Planting
- FISA 104 Fencing
- FISA 301 Using petrol-driven chainsaws
- FISA 302 Basic chainsaw felling and manual takedown
- FISA 303 Chainsaw snedding
- FISA 304 Chainsaw cross-cutting and manual stacking
- FISA 310 Use of winches in directional felling and takedown
- FISA 604 Wood Chippers

Forestry Pathway:

- FISA. 2019. *FISA Guidance on Managing Health and Safety in Forestry.* Forest Industry Safety Accord (FISA).

Forest Industry Safety Accord (FISA) Safety Guides:

- FISA 203 Clearing Saw
- FISA 802 Emergency Planning
- FISA 804 Electricity at work: Forestry

Arboriculture Pathway:

- Arboriculture Association Public Guidance:
  - Guide to Trees and the Law
  - Guide to Tree Pruning
- Arboriculture Association Technical Guides:
  - Technical Guide 1: Tree Climbing and Aerial Rescue
  - Technical Guide 2: Use of Tools in the Tree
  - Technical Guide 3: Rigging and Dismantling
  - Technical Guide 4: Use of Mobile Cranes in Tree Work
  - Technical Guide 5: Use of Mobile Elevating Work Platforms in Tree Work
- Arboriculture Association Safety Guides:
  - Safety Guide 1: Tree Climbing and Aerial Rescue
  - Safety Guide 2: Use of Tools in the Tree
  - Safety Guide 3: Rigging and Dismantling
  - Safety Guide 4: Use of Mobile Cranes in Tree Work
  - Safety Guide 5: Use of Mobile Elevating Work Platforms in Tree Work

Websites

- Arboricultural Association (AA) – **www.trees.org.uk**
- Confor – **www.confor.org.uk**
- Forest Industry Safety Accord (FISA) – **www.ukfisa.com**
- Forest Research (Forestry Commission) – **www.forestresearch.gov.uk**
- Forestry Commission – **www.gov.uk/government/organisations/forestry-commission**
- Forestry England – **www.forestryengland.uk/**
- Soil Association – **www.soilassociation.org**
- Department for Environment Food and Rural Affairs (DEFRA) – **www.gov.uk/government/organisations/department-for-environment-food-rural-affairs**
- DEFRA Plant Health Portal – **https://planthealthportal.defra.gov.uk**
- Environment Agency – **www.gov.uk/government/organisations/environment-agency**
- Health and Safety Executive – **www.hse.gov.uk**
- UK Woodland Assurance Standard – **www.ukwas.org.uk**
- UK Forestry Standard – **www.gov.uk/government/publications/the-uk-forestry-standard**

Scheme of assessment additional information

The below tables illustrate how each performance outcome is assessed through the use of assessment themes along with how each assessment criteria including the knowledge criteria in outcome 1 is packaged into an assessment theme for assessment purposes.

Assessment criteria that appear more than once against an assessment theme is required so that content is assessed within the context of a specific performance outcome.

Common performance outcomes

Performance Outcome	Assessment themes	Assessment criteria
PO2 Grow trees and woodlands (20%)	Plan for establishment - tree stocks	1.15 Different types of propagation 1.16 Organisations in the tree planting stock supply chain 1.17 Characteristics of responsible sources for tree stocks 1.18 Tree planting stock types 1.19 Characteristics of good quality stock plants
	Plan for establishment - establishment plans	1.4 Factors affecting plant growth and development 1.12 Typical hazards and risks associated with growing trees and woodlands 1.13 Properties and characteristics of different types of soils 1.14 Techniques for preparing, cultivating, protecting and manipulating soils and growing media for tree growth 1.22 Factors that influence the choice of tree species 1.23 Tree planting plans in arboriculture and forestry 1.24 Growing trees by artificial and natural regeneration 1.25 Types of management through the establishment period for trees in both forestry and arboriculture environments 1.26 Financial considerations for tree establishment and maintenance 1.27 Types of information required for tree planting and establishment operations 2.1 Select suitable tree species and stock types for planting
	Establish trees	1.20 Tree planting techniques including support and protection

		1.21 Types of tools, materials and equipment required for tree planting and related operations 2.2 Prepare resources for planting 2.3 Prepare site for planting 2.4 Plant trees according to planting specification 2.5 Apply support and protection to planted trees

Performance Outcome	Assessment themes	Assessment criteria
PO3 Operate and maintain forestry and arboriculture machinery (20%)	Health and safety	1.28 Health & Safety legislation, industry guidance and best practice 3.1 Carry out a site-specific risk assessment 3.2 Produce an emergency procedure
	Maintain machinery	1.29 Chainsaw maintenance 3.3 Maintain chainsaws
	Operate machinery	1.30 Cross cutting timber using a chainsaw 1.31 Techniques and equipment for felling small trees (less than 380mm diameter) using a chainsaw 1.32 Hand winching equipment, systems, maintenance and operation 1.33 Wood-chipper maintenance and operation 3.4 Cross cut timber using a chainsaw 3.5 Fell trees up to 380mm diameter using a chainsaw 3.6 Use winching equipment to move trees or timber 3.7 Load a manually fed wood chipper

Forestry pathway performance outcomes

Performance Outcome	Assessment themes	Assessment criteria
PO4 Manage woodlands to meet objectives (20%)	Environment and plant health	1.1 Characteristics of ecosystems found in different landscapes 1.2 The health, social, environmental and economic benefits and limitations of trees, woodland and forests 1.5 Abiotic and biotic causes of ill health and damage to trees.

		1.6 Typical pests 1.7 Typical pathogens affecting trees and woodlands. 1.8 Consequences of pests, diseases and disorders 1.9 Key responsibilities under plant health legislation. 1.10 Types of tests 1.35 Characteristics and features of tree and woodland ecosystems and habitats 1.36 The benefits of trees, woodland, forests and green infrastructure 1.38 environmental risk assessments 1.40 Influence of tree physiology and health on woodland management objectives and operations 1.41 Techniques and technology to monitor health of stands and individual trees
	Planning and silviculture	1.34 Health and safety legislation, regulations and guidance for woodland management 1.37 Woodland management plans 1.39 Factors that can affect profitable tree and woodland operations 1.42 Common silvicultural systems and woodland establishment 1.43 Silvicultural characteristics of tree and shrub species 1.44 Factors affecting the quality and quantity of timber 1.45 Timber products and their marketing 1.51 Woodland maintenance operations
	Surveying and measurement	1.3 Principles of tree and plant species identification, nomenclature and taxonomy systems 1.4 Factors affecting plant growth and development 1.46 Defects and grading of timber 1.47 Surveying woodland features 1.48 Woodland sampling and surveying techniques 1.49 Tree and stand measurement 1.50 Tree inspections from the ground 1.52 Types and sources of information 4.1 Measure the volume of individual trees and forest stands 4.2 Measure the volume of felled timber 4.3 Survey and inspect woodlands and trees from the ground

Performance Outcome	Assessment themes	Assessment criteria
PO5 Maintain woodlands to meet prescribed objectives (20%)	Health and safety	1.53 Health and safety legislation, regulations and guidance for woodland maintenance
	Plan for management/maintenance	1.11 Similarities and differences in how arboriculture and forestry organisations obtain revenue 1.54 Factors affecting profitable woodland maintenance operations 1.57 Influence of tree physiology and health on woodland maintenance operations 1.58 Roles and responsibilities of people on woodland sites 1.59 Principles of site management 1.60 The principles of access management 1.61 Types of infrastructure, features and designations 1.62 Potential damage to the environment 1.63 Types and sources of information 1.64 Maintenance planning
	Perform woodland maintenance	1.55 Tools, equipment and machinery required for woodland maintenance 1.56 Brush cutter, Clearing saw and Trimmer operating techniques, maintenance and equipment 1.65 Vegetation management techniques 1.66 Infrastructure maintenance and repair techniques 5.1 Remove unwanted vegetation from a site to meet objectives 5.2 Maintain brushcutter, clearing saw, and trimmer 5.3 Remove vegetation using brush cutter 5.4 Remove trees using a clearing saw 5.5 Remove vegetation using a trimmer 5.6 Maintain and repair boundaries 5.7 Maintain and repair access routes and surfaces 5.8 Maintain and repair structures and furniture

Performance Outcome	Assessment themes	Assessment criteria
PO6 Undertake complex felling operations (20%)	Health and safety	1.67 Health and safety on felling sites
	Environment	1.68 Environmental legislation, regulations, and codes of practice 1.69 Environmental risk assessments 1.77 Potential damage to the environment 1.78 How damage can be eliminated, prevented, or mitigated including planning, techniques, materials and equipment to be used
	Prepare for complex felling operations	1.70 Harvesting techniques, machinery and systems 1.71 Timber extraction methods and machinery 1.72 Factors to consider and associated standards when planning and preparing for felling activities 1.73 Factors that can affect profitable felling operations 1.75 Principles of site management 1.76 Types of infrastructure, features and designations 1.79 Types and sources of information 1.80 Different purposes for felling trees 6.1 Interpret information and prepare for felling operations
	Perform complex felling operations	1.74 Types of tools, equipment and machinery required for tree felling, tree work, and woodland work-related operations 1.81 Techniques used to fell and process trees 1.82 Felling of trees with chainsaws 1.83 Tree defects affecting felling operations 1.84 Assisted felling techniques including winching 1.85 Processing of tree and woodland work arisings 6.2 Fell trees for harvesting using appropriate felling cuts 6.3 Fell trees using assisted felling techniques 6.4 Process felled trees and sort products according to specification

Arboriculture pathway performance outcomes

Performance Outcome	Assessment themes	Assessment criteria
PO7 Manage tree populations to meet objectives (20%)	Environment and plant health	1.5 Abiotic and biotic causes of ill health and damage to trees 1.6 Typical pests 1.7 Typical pathogens affecting trees and woodlands 1.8 Consequences of pests, diseases and disorders 1.9 Key responsibilities under plant health legislation 1.10 Types of tests 1.87 Characteristics and features of tree and woodland ecosystems and habitats 1.88 The health, environmental and economic benefits of trees, woodland, forests and green infrastructure 1.89 Environmental risk assessments 1.91 Influence of tree physiology and health on tree management objectives and operations 1.92 Techniques and technology to monitor tree health
	Tree management planning	1.11 Similarities and differences in how arboriculture and forestry organisations obtain revenue 1.86 Health and safety legislation, regulations and guidance in tree management 1.90 Factors that can affect profitable tree and woodland operations 1.95 Benefits and limitations of single tree operations 1.96 Tree protection legislation, regulations, codes of practice and guidance, including Tree Protection Orders (TPOs) 1.98 Potential damage to infrastructure resulting from tree management activities 7.3 Create and amend documents and plans
	Tree surveys and inspections	1.3 Principles of tree and plant species identification, nomenclature and taxonomy systems 1.7 Factors affecting plant growth and development 1.93 Surveying trees and tree populations 1.94 Characteristics of common tree and shrub species 1.97 Ground based and aerial tree inspection methodologies, techniques and equipment 1.99 Tree valuation methods

		7.1 Survey and inspect tree populations from the ground 7.2 Inspect trees from the ground

Performance Outcome	Assessment themes	Assessment criteria
PO8 Maintain trees to meet prescribed objectives (20%)	Health and safety	1.100 Health and safety legislation, regulations and guidance
	Environment and plant health	1.105 Fungal pathogens affecting trees 1.106 How trees respond to wounding and decay 1.112 Potential damage to the environment 1.113 How damage can be eliminated, prevented, or mitigated including planning, techniques, materials and equipment to be used
	Plan for tree and site maintenance	1.101 Factors affecting profitable arboricultural operations 1.104 Influence of tree maintenance operations on tree physiology and health 1.107 Theories explaining the mechanical strength and integrity of trees 1.108 Roles and responsibilities of people on treework sites 1.109 The principles of site management 1.110 The principles of access management 1.111 Types of infrastructure 1.114 Types and sources of information
	Perform tree and site maintenance	1.102 Types of tools, equipment and machinery required for tree work operations 1.103 Techniques for manipulating soils and growing media for tree growth 1.115 Tree management and maintenance operations 1.116 Techniques for accessing tree canopies to undertake tree maintenance 1.117 Techniques for aerial tree rescue 1.118 Types of maintenance 1.119 Infrastructure maintenance and repair techniques 1.120 Vegetation management techniques 8.1 Climb trees and perform aerial rescue 8.2 Prune trees using hand tools and associated equipment 8.3 Maintain and repair access routes and surfaces 8.4 Maintain and repair structures and furniture

Performance Outcome	Assessment themes	Assessment criteria
PO9 Undertake complex arboriculture operations (20%)	Health and safety	1.100 Health and safety legislation, regulations and guidance
	Environment	1.105 Fungal pathogens affecting trees 1.106 How trees respond to wounding and decay 1.112 Potential damage to the environment 1.113 How damage can be eliminated, prevented, or mitigated including planning, techniques, materials and equipment to be used
	Prepare for complex arboriculture operations	1.101 Factors affecting profitable arboricultural operations 1.104 Influence of tree maintenance operations on tree physiology and health 1.107 Theories explaining the mechanical strength and integrity of trees 1.108 Roles and responsibilities of people on treework sites 1.109 The principles of site management 1.110 The principles of access management 1.111 Types of infrastructure 1.114 Types and sources of information
	Perform complex arboriculture operations	1.102 Types of tools, equipment and machinery required for tree work operations 1.103 Techniques for manipulating soils and growing media for tree growth 1.115 Tree management and maintenance operations 1.116 Techniques for accessing tree canopies to undertake tree maintenance 1.117 Techniques for aerial tree rescue 1.118 Types of maintenance 1.119 Infrastructure maintenance and repair techniques 1.120 Vegetation management techniques 8.1 Climb trees and perform aerial rescue 8.2 Prune trees using hand tools and associated equipment 8.3 Maintain and repair access routes and surfaces 8.4 Maintain and repair structures and furniture

Appendix 2 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:

4 the centre and qualification approval process
5 assessment, internal quality assurance and examination roles at the centre
6 registration and certification of learners
7 non-compliance and malpractice
8 complaints and appeals
9 equal opportunities
10 data protection
11 management systems
12 maintaining records
13 internal quality assurance
14 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

Our Quality Assurance Requirements document encompasses the relevant regulatory requirements of the following documents, which apply to centres working with City & Guilds:

12 Ofqual's General Conditions of Recognition

The **centre homepage** section of the City & Guilds website also contains useful information on:

13 **Walled Garden**: how to register and certificate candidates online
14 **Events**: dates and information on the latest Centre events
15 **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	**T: +44 (0)121 503 8993** **E: business@cityandguilds.com**

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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 recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group operates from three major hubs: London (servicing Europe, the Caribbean and Americas), Johannesburg (servicing Africa) and Singapore (servicing Asia, Australia and New Zealand). The Group also includes the Institute of Leadership & Management (management and leadership qualifications), City & Guilds Licence to Practice (land-based qualifications) and Learning Assistant (an online e-portfolio).

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