



Level 2 Apprenticeship Delivery Scoping

**Guidance for Training Providers,
Assessment Organisations and
Employers**

Foreword

To assist training providers, assessment organisations and employers LE-TEC's land-based engineering apprenticeship working group have scoped the knowledge that is to be delivered within the Land-based Engineering Service Engineer apprenticeship.

This information is to be used in conjunction with the land-based engineering apprenticeship standard ST0242 which details the knowledge, skills and behaviours that together prepare the apprentice to achieve occupational competency

The intention is to ensure that: -

- Training providers have greater clarity of the content required to be delivered.
- Assessment organisations base assessments on documented learning outcomes.
- Employers have a clearer picture of the knowledge gained during the apprenticeship process.

Employers may also find this information useful when mentoring and planning the development of apprentices in the workplace.

The ultimate outcome being to promote consistency in the interpretation of the occupational standard. This will help to ensure that apprentices learn and are assessed on the content required across the sector.

Whilst every effort has been made to ensure that the scoping encompasses the apprenticeship standard some adjustment may be required for advances in products, technology and changing working practices

Should you experience or observe any omissions please forward your comments to info@letec.co.uk

Land-based Engineering

Level 2 ST0242

Delivery Scoping

Module 1

Communication.

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K26	S9 / S21 / S23	B1 / B5 / B7

- Knows the meaning of formal and informal communication
- Knows the range of verbal and nonverbal communication and can select the appropriate method to meet a given requirement
- Knows the meaning of respectful communication
- Knows how to communicate at a level appropriate to the recipient
- Knows the implications of written communication
- Knows what GDPR is in simple terms
- Knows how to create a portfolio of evidence
- Knows how to produce legible descriptive details of work completed
- Knows the importance of good communication and the consequences of poor communication
- Knows the value and importance of using photographs in reporting
- Knows how to use questioning to gain understanding
- Can interpret written and grammatical information
- Knows the importance of the basic information required in reporting e.g.

Date and Time

Hours worked

Serial and chassis numbers

Quantities

Machine model

Observations

- Knows how to communicate technical information to facilitate understanding
- Knows the basic messages conveyed by body language

Module 2

Customer care

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K25	S1 / S2 / S12 / S15 / S18 S22/ S23 / S25	B1 / B3 / B5 / B7 / B8

- How personal presentation, attitudes and behaviours reflect on self and the company
- Knows what customer care is and why it is important to the business
- Knows the meaning and value of ‘internal’ and ‘external’ customers
- Knows how Land-Based service engineers contribute to employer ‘customer care’ procedures
- Knows how to interact with customers
- Knows how to represent the company in a positive light
- Understands dealer and manufacturer image and brand
- Understands actions to take when confronted by angry customers
- Knows of follow up procedures after completing customer facing service and maintenance work
- Knows the importance of respect of customers property and personal views
- Knows why customer and company confidentiality must be respected
- Is aware of the liabilities that can be incurred by verbal exchanges

Module 3

Engine fundamentals

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
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K8	S2 / S3 / S4 / S5 / S6 / S7 / S8 / S9 / S10 / S14 / S15 / S16 / S17 / S18 / S20 / S21 / S23	B1 / B2 / B3 / B4 / B5 / B8
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- Knows the construction and operation of CI & SI engines
Ignition systems
Fuel injection systems
Cooling and lubrication systems
- Knows Tier emission system regulations.
- Knows the range of alternative power sources and propulsion available
- Understands the characteristics and properties of mineral, plant-based bio, gas fuels, solar energy and battery electric
- Knows how to handle and dispose of alternative fuels and power sources
- Knows the engine exhaust emission systems and treatment solutions EGR, DPF, SCR
- Understands the content of exhaust emissions and their effect on the environment, emissions (Carbon monoxide, nitrogen oxides, hydrocarbons)

Module 4

Environmental

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K23	S1 / S2 / S4 / S5 / S10 / S14 / S15 / S19	B4

- Knows the products used in land-based engineering activities that are harmful to the environment and impact on sustainability.
- Knows what constitutes an environmental hazard.
- Knows the types of pollution that can be created by land-based engineering activities e.g.
Air pollution
Water courses pollution
Soil pollution
Animal feed pollution
Food chain pollution.
- Knows precautions, emergency procedures and remedial actions required to mitigate the environmental impact of spillages and releases of toxic gases and substances

- Knows the methods used to control hazardous and non-hazardous waste
- Knows methods used to dispose of hazardous and non-hazardous waste
- Consequences of not following correct waste management protocols
- Knows own responsibilities within employer's environmental protection procedures
- Precautions to be taken to stop the spread of livestock and plant-based diseases
- Knows how personal actions and the action of others in the land-based sector can influence sustainability e.g.
Wasteful practices
Spoiled products
Excessive applications
Aggressive operating styles
Poor calibration
- The effect of poor maintenance on sustainability and the environment

Module 5

Fault finding

KSBs which are typically trained within this module

Knowledge	Skill	Behaviours
K18 / K22	S3 / S4 / S7 / S9 / S10 /S15 / S16 / S17 / S18 / S19 / S20 / S21 / S23 / S26	B1 / B2 / B3 / B4 / B5 / B8

- Knows how to interpret sensory perceptions and what they indicate when conducting service and maintenance inspections e.g.

Visual

Seepage / Leakage
Chaffing / Staining
Scorching / Discolouration
Distortion / Misalignment
Perishing / Corrosion
Wear and tear / Uneven wear
Exhaust smoke colour
Broken seals / unauthorised modification

Touch

Vibration
Heat / Cold
Tension / Free play

Smell

*Burning
Fumes
Odours*

Hearing

*Regular / Intermittent noises
Knocking / Hissing
Misfire*

- Knows how to carry out operational checks e.g.
*Stall tests
Brake tests
Steering tests
Function of controls*
- Knows the limitations of personal ability and the actions to be taken to secure customer satisfaction
- Knows how to determine the difference between root cause and effect in simple fault finding
- Knows how to establish information required to support a simple diagnosis
- Knows how to perform simple electrical, hydraulic and operational diagnostic checks including;
*How to use service history and what it can reveal
How to record information
How to determine fact from opinion
The difference between characteristics and defects.
Processes and methods of fault elimination
Considering the obvious*
- Knows how to determine when to cease usage of a machine displaying a simple defect

Module 6

Health and Safety

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K1	S1 / S2 / S3 / S4 / S5 / S6 S7 / S8 / S9 / S10 / S11 / S12 / S13 / S14 / S15 / S16 / S17 / S18 / S19 / S20 / S24 / S25 / S26	B1 / B2 / B3 / B8

- Knows Health & Safety at Work Act, RIDDOR, LOLER, COSHH, PUWER, working at height and in confined spaces lone working and pressure vessel regulations, Waste management and LEV regulations for welding and exhaust extraction
- Knows safe working practices
- Knows the legislative requirements and wider implications of risk assessments
- Knows the difference between a risk and a hazard
- Knows the risks and hazards associated with land-based engineering
- Has an understanding of the 5 steps of risk assessment
- Knows the consequences of not following risk assessments
- Knows the appropriate selection, application and use of PPE
- Knows how to determine the serviceability of PPE
- Know the actions to take in the event of first aid emergency e.g
Use of resuscitation equipment
Chemical and heat burns.
Electrocution
Falls
Laceration
- Knows safe handling of batteries
- Knows safe manual handling

Module 7

Interpret and record information

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K10	S9 / S10 / S14 / S16 / S17 / S18 / S19 / S21 / S22 / S23 / S24 / S25 / S26	B3 / B8

- Knows how to access technical data
- Understands the importance of establishing and recording accurate technical data
- Knows how to interpret and apply technical information
- Knows the units of measurement used in technical documentation
Area
Speed
Distance
Temperature
Voltage

Current
Resistance
Power / torque
Flow
Temperature
Linear and Precision Measurement

- Knows how to convert units of measurement from Imperial to metric
- Can identify circuits and circuit components in hydraulic, electrical and pneumatic schematic drawings
- Knows the purpose and how to use:

Parts catalogues
Service manuals
Service bulletins
Service and maintenance schedules
Schematic drawings
Technical drawings
Operators manuals
Service records
Job cards and time sheets
Tyre technical data
Workshop procedures

- How to access fault registers, record and clear stored information
- Knows the importance of recording time, parts and consumable usage, serial numbers, hours worked and descriptions of work
- Knows how to complete job descriptions, service records and parts requisitions

Module 8

Land based fundamentals

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K5	S11 / S12 / S13 / S14 / S15 / S16 / S24 / S25	B1 / B2 / B3 / B4 / B5 / B6 / B7 / B8

- Knows the land-based practices conducted by their employer's customer base
- Knows the land-based crops grown within the employer's area of influence and how they are established, tended and harvested
- Knows the range of working conditions. within the employer's area of influence
E.g. soil types, weather / climatic conditions and environmentally sensitive locations.
- Has a fundamental understanding of how crops, soil types, climatic / weather conditions influence machinery performance
- Knows the seasons and the land-based operations associated with them

- Knows how to reference and make field settings in accordance with the manufacturer's operators manual

Module 9

Machine preparation

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K7 / K16 / K17	S1 / S2 / S3 / S4 / S5 / S6 / S7 / S8 / S9 / S10 / S11 / S12 / S13 / S14 / S15 / S16 / S17 / S18 / S19 / S20 / S21 / S24 / S25 / S26	B1 / B2 / B3 / B4 / B8

- Knows how to safely apply the equipment and detergents used to clean land-based prime movers and machinery
- Knows the methods used to clean land-based machinery and equipment
- Knows the health risks associated with residues found on land-based machinery
- Knows how to safely remove and dispose of residues:
 - Chemicals*
 - Organic matter*
 - Dirt*
 - Dust*
 - Lubricants Grease and fuels*
- Knows how to prevent water ingress during cleaning operations
- Knows the actions to be taken if water ingress occurs
- Knows how to clean upholstery, glass, paintwork
- Knows how to protect machinery and equipment bodywork against corrosion after cleaning
- Knows the Health & Safety hazards to consider when preparing to undertake service, maintenance, repair and diagnostic activities
- Knows the post work inspections to be made prior to starting Land-Based machinery
- Can Secure machines and equipment against accidental operation
- Knows emergency stop procedures
- Knows the actions required before commencing service, maintenance, repair and diagnostic activities e.g.
 - Warm up procedures*
 - Run down procedures*

Road testing
Immobilization
Disconnecting electrical supplies
Securing against movement
Supporting raised equipment
Retracting extended hydraulic cylinders

- Knows how to prepare fundamental diagnostic equipment before fitment
- Knows the parameters that must be achieved before operation and diagnostic checks can be made
- Knows how to mark and layout components to aid reassembly
- Understands how to carry out pre-delivery inspections (PDI)

Module 10

Machine fundamentals

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K4 / K6	S5 / S6 / S12 / S13 / S14 / S16 / S17 / S18 / S19 / S20 / S24 / S25 / S26	B1 / B2 / B3 / B4 / B8

- Can identify the types of prime movers, self-propelled machines and the machinery and equipment used in land-based sector operations
- Knows the application and function of prime movers, self-propelled machines, the machinery and equipment used in land-based sector operations
- Knows the controls and how to operate prime movers, self-propelled machines and the machinery and equipment used in land-based sector operations
- Has an elementary understanding of the regulations relating to the usage of prime movers and land-based machinery and equipment
- Knows the working principles of assemblies, subassemblies, components and systems used in land-based prime movers, machinery and equipment e.g.

Battery powered and electric drives?

The types of gearboxes & transmissions used

The methods used to increase and decrease travel speed

The types of gears used in transmissions

Understands torque and the part it plays in transmissions

Knows the methods of engaging, disengaging and transmitting drive (Fluid, electrical, mechanical and torque limiting devices)

Front, rear axles and final drive reduction units
Steering systems
Power Take off drives and options
Belt, chain and drive shafts
Hydraulic systems
Hydrostatic drives
The types of braking systems
Tracked and wheeled steering and drive systems
Suspension systems
Electrical systems and their components
Electronic control systems, telemetry, GPS and their components,
The principles of CAN bus
Pneumatic systems and their components
Cutting and chopping systems
Threshing and separation
Reciprocal drives
Metering and regulation
Placement and application machinery

- Can identify component parts and their function
- Knows how to follow mechanical, electrical, hydraulic, pneumatic schematic diagrams and engineering drawings
- Knows operator protection structures, cabs and chassis types

Module 11

Organisation

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K2 / K3	S1 / S2 / S3 / S4 / S5 / S6 S9 / S10 / S11 / S12 / S22 / S23	B2 / B3 / B4 / B5 / B8

- Knows employer / employee responsibilities and the consequences of not following
- Knows equity, diversity and inclusion protocols, policies and expectations within the organisation.
- Knows chains of Command
- Knows contract of employment
- Knows emergency procedures e.g.

Fire

Accidental injury

Contamination

Spills

Electrocution

- Knows how to follow a risk assessment
- Knows how a business is structured and generates revenue
- Knows actions that contribute towards profitability and company reputation
- Can determine limits of own ability and the correct actions to take
- The costs associated with faulty workmanship
- Actions that can incur costs for the company
- The limitation of own authority
- How to work in a team
- Why confidentiality and discretion are important
- The shelf life of chargeable labour time
- How to Identify wasteful working practices

Module 12

Service & maintenance

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K7 / K20	S1 / S2 / S3 / S4 / S9 / S10 / S11 / S14 / S15 / S16 / S17 / S18 / S19 / S21 / S23 / S25 / S26	B1 / B2 / B3 / B4 / B5 / B8

- Knows how to interpret service and maintenance schedules relating to land-based prime movers, machinery and equipment
- Knows how to perform the actions required when completing service and maintenance activities
- Knows the principles of predictive service and advisories
- Knows how to make service and maintenance adjustments to prime movers, machinery and equipment to meet manufacturer's recommendations
- Knows how to assess wear and tear of service and wearing parts
- Knows how to requisition service parts and the importance of recording service related data
- Knows how to prepare land-based prime movers, machinery and equipment for out of season storage, periods of inactivity and recommissioning

- Knows why service and maintenance operations are required e.g.
Longevity of operating life
Efficiency and economy
Warranty requirements
Enhanced resale value
Reduced downtime
- Knows the safety and environmental implications to consider when carrying out service and maintenance activities
- Knows how to compile an inventory of service parts and consumables required to complete service activities
- Knows how to protect machinery against damage whilst carrying out service and maintenance activities
- Knows how to complete the tasks to be performed during service and maintenance operations
- Knows how to avoid contamination when opening, draining, replenishing and changing service items
- Knows the causes and effect of contamination and the methods used to remove contaminants from fuel, hydraulic and transmission systems.
- Knows the procedures for collecting oil and fuel samples
- Knows how to prepare machinery and equipment for handover after service operations
- Knows fit for purpose lifecycles of consumable wearing parts

Module 13

Technical information

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K19	S9 / S10 / S14 / S17 / S18 / S19 / S21 / S24 / S25 / S26	B3 / B8

- Knows the purpose of digital information systems
- Knows how to check software versions and the importance of updating software programmes
- Knows how to access digital service, maintenance and fault code software
- Knows how to interpret digital service and maintenance information
- Knows the principles of using digital equipment to perform service and maintenance operations e.g.

Retrieve information
Reset service indicators
Calibration
Update software

- Knows the purpose of software licences for diagnostic equipment
- Knows employees' obligations regarding safeguarding against copying software

Module 14

Machine operation familiarisation

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K9	S3 / S12 / S13 / S15 / S16 / S22 / S24 / S25	B1 / B2 / B3 / B4 / B8

- Knows the safe working practices when coupling machinery and equipment to prime movers.
- Knows the different types of hitching systems and how to couple trailed equipment to a prime mover
- Knows how to attach hydraulically mounted PTO and non-PTO driven machinery to a prime mover
- Can determine the difference between lift linkage categories
- Knows how to adjust and set: -
Lift and work height / depth parameters
Clearance zones
Stabilizer linkages
PTO shaft length
Universal joint phasing
Tyre pressures
Track widths
- Knows how to make electrical and hydraulic connections between prime mover and machinery and equipment.
- Understands the terms gross vehicle weight, maximum all up carrying capacity, axle carrying capacity
- Knows the importance of tyre technical data and how to apply it.
- Knows the different types of ballast and how to add it to a prime mover
- Knows the different types of wheels and their usage. E.g.
Floatation wheels & tyres
Row crop wheels & tyres

Dual wheels and tyres

- Knows how to avoid contamination and cross contamination of hydraulic system and fluid systems

Module 15

Welding & fabrication

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K13	S1 / S2 / S3 / S4 / S8 / S10 / S14 / S15	B1 / B2 / B3 / B4 / B8

- Knows how to identify ferrous non-ferrous materials and their properties
- Knows how to cold cut, shape, and prepare materials for fabrication
- Knows how to use equipment to apply thermal energy for cutting, shaping, and preparing fabrication materials.
- Knows how to measure and mark out materials to produce fabricated items
- Knows how to prepare materials prior to chemical or thermal joining
- Knows how to compensate for distortion when applying localised heat
- Knows methods used to join materials by thermal or chemical processes
- Knows the principles of MMA, MIG, gas welding and soldering
- Knows the types, applications and use of chemical bonding products
- Understands the use of heat to soften and harden metals

Module 16

Workshop practices

KSBs which are typically trained within this module

Knowledge	Skills	Behaviours
K11 / K12 / K14 / K15 / K21 / K24	S1 / S2 / S3 / S4 / S5 / S6 / S7 / S8 / S10 / S11 / S15 / S19 / S20 / S25	B1 / B2 / B3 / B4 / B7 / B8

- Knows the different types of bearings / seals / gaskets and their application
- Knows the different types of fasteners and their application
- Knows the different types of sealants and their application
- Knows the different types of pulleys, belts and gears
- Knows how to prepare surfaces to be sealed, remove preservatives from new parts and clean parts prior to reassembly
- How to check and set timing and align components
- Knows how to route and secure pipes and electrical harnesses
- Knows how to protect parts against damage during reassembly
- Knows how to identify the correct replacement parts required
- Knows how to check the rotation and operation of assemblies and sub-assemblies after reassembly
- Knows the methods of checking and adjusting: -
 - Preload*
 - End float*
 - Rolling resistance*
 - Clearances*
 - Static and rotary balance*
 - Alignment*
 - Torque limiting devices*
 - The tension of springs, belts and drive chains*
 - Protrusion and recession*
 - Bolt torques and tightening sequences*
- Knows how to drain, bleed, purge and fill systems on land-based machinery and equipment e.g.
 - Hydraulic*
 - Pneumatic*
 - Fuel*
 - Stored energy*
 - Cooling*
 - Lubrication*
 - Gas*
- Knows how to conduct: -
 - Hydraulic & pneumatic pressure & flow tests*
 - Fuel system pressure tests*
 - Vacuum testing*
 - Coolant system tests*
 - Compression tests*
 - Temperature tests*
 - Calibration of tools, machinery and equipment*
 - The removal of broken studs and bolts*
 - Cutting and restoration of damaged threads*
- Knows thermal, mechanical, and chemical procedures used to remove / release seized and failed components

- Knows methods of corrosion protection and their application methods
- Knows how to rectify high- and low-pressure leaks and the dangers they impose
- Knows how to sharpen cutting surfaces
- Knows how to create a low resistance electrical joint
- Knows how to repair wiring harnesses
- Knows how to repair high pressure hoses
- Knows how to charge batteries
- Knows how to jump start machines
- Knows how to remove corrosion from electrical connectors
- Knows how to jack and support machinery
- Knows the methods used to dismantle and reassemble land-based machinery and their component parts