

# Bus and coach engineering technician standard: Employer Occupational Brief



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## Competence expectations at gateways

There are three gateway competency points in the bus and coach engineering technician apprenticeship. It is expected that an apprentice will have demonstrated competence as prescribed on the following pages for their relevant trade specific pathway, which is reviewed and agreed by the employer and education and training provider before progression to the next phase of learning and development.

- Gateway 1 will usually be at the end of the first year of learning and development and is common to all apprentices.
- Gateway 2 will usually be at the end of the second year of learning and development and is split into two sets of competencies, one for apprentices following the coach builder trade specific role and the other for apprentices following other trade specific roles.
- Gateway 3 is readiness for independent end assessment when an apprentice will be competent in the core and their trade specific role as dictated in the assessment plans

Employers and education and training providers should utilise the content of this document to assist in the design of the learning and development phase of the apprenticeship.

Gateway 1 – All trade specific roles should achieve the following level competence:

The employer must produce an internal certificate to confirm the apprentice's competence against the standards below once they have been demonstrated	
Cross standard competencies	
Understand Health, Safety & Good housekeeping in the bus & coach environment	<ul style="list-style-type: none"> <li>• Contribute to health and safety</li> <li>• Contribute to housekeeping practices</li> </ul>
Understand materials, fabrication tools and measuring devices in the B&C environment	<ul style="list-style-type: none"> <li>• Identify and use a range of hand tools and equipment</li> <li>• Carry Out a Range of Basic Bus/Coach Repairs</li> </ul>
Achieve effective working relationships with colleagues	<ul style="list-style-type: none"> <li>• Achieve effective working relationships with your colleagues</li> <li>• Achieve effective communications with your colleagues</li> <li>• Promote equality and diversity in the workplace</li> </ul>
Understanding the construction and operation of common bus and coach	
Engine design and systems	<ul style="list-style-type: none"> <li>• Identify and understand basic principles of engine system components (cooling (heat transfer and boiling points), fuel, lubrication and exhaust)</li> <li>• Describe how a compression ignition engine operates (combustion process) including firing order of six cylinder diesel engine</li> <li>• Understand common terms used when describing the engine system (TDC, BDC, stroke, bore)</li> </ul>
Chassis systems	<ul style="list-style-type: none"> <li>• Identify and understand basic principles of the chassis system components (chassis layout (inc. axel configuration, rear steer, front steer, all steer) steering, suspension (air and mechanical), brakes (hydraulic and air, additional braking devices such as ABS), wheels, hubs and tyres)</li> </ul>
Transmission systems	<ul style="list-style-type: none"> <li>• Identify and understand basic principles of the transmission system (types of gearbox, differentials, clutches, fluid couplings / torque converters)</li> <li>• Drive line systems (universal joints, propshafts and driveshafts)</li> </ul>
Electrical systems	<ul style="list-style-type: none"> <li>• Identify and understand basic principles of electrical and electronic system components (starting, charging, lighting)</li> <li>• Ohm's law, basic circuits, series and parallel circuits</li> <li>• Open circuit, short circuit, high resistance, bad earth</li> <li>• Volts, Amps, Ohms, Watts</li> <li>• Battery and charging system</li> <li>• Appreciation of potential auxiliary electrical systems, such as heating, cooling and CCTV</li> </ul>
Body	<ul style="list-style-type: none"> <li>• Identify and understand basic components of bus and coach body design</li> </ul>

	<ul style="list-style-type: none"><li>• Location and purpose of main bus and coach body panels / components</li><li>• Appropriate methods of basic repair for components</li></ul>	
<b>Behaviours</b>	<ul style="list-style-type: none"><li>• Demonstrate the ability to work with others and build relationships</li><li>• Demonstrate compliance with both legislative and company procedures</li></ul>	

Gateway 2 – Mechanical, Electrical and Mechelec apprentices should achieve the following level of competence:

Progression from gateway 1 to gateway 2 is likely to take one year

The employer must produce an internal certificate to confirm the apprentice's competence against the standards below once they have been demonstrated

**Engine design and systems**

Rectify known faults with engine system components, including correct identification and preparation of replacement parts, correct tools and process for the repair

**Cooling**

- Procedures to remove, replace and adjust cooling system components
- Rectification of faults to do with cooling systems, including water leaks, oil in water, excessively low or high coolant temperatures
- Internal heating system efficiencies
- Carry out routine servicing to manufacturer's and / or company standards

**Fuel**

- Symptoms and faults associated with diesel fuel systems including water in the system, air in the system, leaks, blockages, starting difficulties, excessive smoke (black or white)
- Procedures to rectify faults associated with diesel fuel systems including water in the system, air in the system, leaks, blockages, starting difficulties, excessive smoke (black or white)
- Carry out routine servicing to manufacturer's and / or company standards

**Lubrication**

- Symptoms and faults associated with abnormal oil pressure, oil leaks, excessive oil consumption, oil in water and oil contamination
- Procedures to rectify faults associated with abnormal oil pressure, oil leaks, excessive oil consumption, water in oil and oil contamination
- Carry out routine servicing to manufacturer's and / or company standards

	<p><b>Exhaust</b></p> <ul style="list-style-type: none"> <li>• Symptoms and faults associated with exhaust air leaks, exhaust gas leaks, exhaust emissions treatments</li> <li>• Procedures to rectify faults associated with exhaust components, exhaust air leaks, exhaust gas leaks, exhaust emissions treatments</li> <li>• Carry out routine servicing to manufacturer's and / or company standards</li> </ul>
<p><b>Chassis systems</b></p>	<p>Rectify known faults with chassis system components, including correct identification and preparation of replacement parts, correct tools and process for the repair / adjustment / replacement of:</p> <ul style="list-style-type: none"> <li>• Steering (inc. ball joints / track rods / steering box / steering geometry, checks and adjustments)</li> <li>• Suspension (inc. ride height, wear, noises under operation, air / fluid leakage, excessive travel, excessive tyre wear, poor vehicle handling including bounce, worn joints, damaged linkages and vehicle crabbing)</li> <li>• Brakes (inc. worn shoes / pads, worn or scored brake surfaces, abnormal brake noises, judder, fluid contamination of brake surfaces, fluid / air leaks, uneven braking, poor efficiency, lack of assistance, loss of pressure, brake drag, grab or fade)</li> <li>• Wheels, hubs and tyres (inc. checking tyre pressure, tread depth and condition, wheel condition and security)</li> <li>• Carry out routine servicing to manufacturer's and / or company standards</li> </ul>
<p><b>Transmission systems</b></p>	<p>Rectify known faults with transmission system components, including correct identification and preparation of replacement parts, correct tools and process for the repair / adjustment / replacement of:</p> <ul style="list-style-type: none"> <li>• Clutch (manual and automatic)</li> <li>• Driveline faults (propshaft, drive shaft, universal and constant velocity joints, universal joint alignment, final drive faults and gear selection faults)</li> <li>• Carry out routine servicing to manufacturer's and / or company standards</li> </ul>
<p><b>Electrical systems</b></p>	<p>Rectify known faults with electric or electronic system components, including correct identification and preparation of replacement</p>

parts, correct tools and process for the repair / adjustment / replacement of

- Starting system
- Lighting components
- Auxiliary systems

Carry out routine servicing to manufacturer's and / or company standards

Gateway 2 – Coach builder apprentices should achieve the following level of competence:

Progression from gateway 1 to gateway 2 is likely to take one year	
The employer must produce an internal certificate to confirm the apprentice's competence against the standards below once they have been demonstrated	
<b>Engine design and systems</b>	<p>Removal and replacement of components whilst affecting a repair on the body using correct tools, procedures, equipment and where applicable replacement parts:</p> <p><b>Cooling</b></p> <ul style="list-style-type: none"> <li>• Radiator, hoses, pipes, thermostats, coolant, sensors</li> </ul> <p><b>Fuel</b></p> <ul style="list-style-type: none"> <li>• Tanks, hoses, pipes, sensors, valves and fuel</li> </ul> <p><b>Lubrication</b></p> <ul style="list-style-type: none"> <li>• Drain and refill lubricant, remove / replace tanks and associated components</li> </ul> <p><b>Exhaust</b></p> <ul style="list-style-type: none"> <li>• Remove components, conduct visual checks reporting findings, replace components</li> </ul>
<b>Chassis systems</b>	<p>Removal and replacement of components whilst affecting a repair on the body using correct tools, procedures, equipment and where applicable replacement parts:</p> <ul style="list-style-type: none"> <li>• Steering</li> <li>• Suspension</li> <li>• Brakes</li> <li>• Wheels, hubs and tyres</li> </ul>
<b>Electrical systems</b>	<p>Removal and replacement of components whilst affecting a repair on the body using correct tools, procedures, equipment and where applicable replacement parts:</p> <ul style="list-style-type: none"> <li>• Cabling / wiring</li> <li>• Lighting units</li> <li>• Switches / controls</li> <li>• Ancillary systems</li> </ul>



## Coachbuilding

- Understand the routine assembly of B&C body components
- Understand how to identify and repair damage to B&C body panels and components
- Understand the correct sequence for assembly of bus and coach panels and component parts
- Understand and select the correct preparation and finishing methods for each type of material and its relevant repair method used in bus and coach body work
- Remove, repair and replace different types of body panels (aluminium, steel, fibreglass, composite)
- Remove, repair and replace glazing (bonded and gasket) in bus and coach
- Prepare surfaces to be brush painted, prepare paint (primer and top coat), apply paint to adhere to desired finish
- Understand the principles of spray and brush painting vehicles, the types of paint available and suitable for vehicles, drying procedures, the precautions that must be taken, and when you should recommend a vehicle is sent for spray paint treatment
- Understand and apply the correct techniques for applying vinyl
- Remove, repair and replace trim in bus and coach equipment
- Understand and correctly use specialist coach building equipment, such as paint mixing equipment, sanding, extraction etc.
- Identify and select the correct types of fastening methods for the routine assembly of bus and coach body components
- Check component parts to ensure they are fit for purpose
- Use instructions to interpret correct assembly sequence for body components
- Apply general principles of assembly when instructions are not available

Gateway 3 – All apprentices must complete the core competencies, plus the trade specific competencies in the relevant section

Progression from gateway 2 to gateway 3 is likely to take one year

The employer must produce an internal certificate to confirm the apprentice's competence against the standards below

Core competencies:

Knowledge

- How to inspect, diagnose and record defects to the applicable standard
- Diagnostic principles based on logical, analytical interpretation leading to solving problems
- Emerging bus and coach technologies and the impact they will have on the knowledge and skills technicians will require in the future
- Current Health and Safety requirements and workshop practices
- How to carry out high quality road worthiness inspections specific to their trade
- How the business works from an operational perspective and where their role fits within the business and how they contribute to the success of the organisation
- Customer expectations delivering a safe, clean, reliable service
- The requirements of attending and assessing roadside incidents

Skills

- Carry out the foundation tasks common to all procedures involving basic mechanical and electrical and coachbuilder procedures including, the safe use of hand tools and workshop equipment ; safe use of power tools and equipment; the use of mechanical and electronic measuring equipment; test equipment and gauges; basic workshop practices and procedures relating to working on vehicles and components; assembly processes for mechanical units, electrical circuits and coachbuilding, including various fixing and joining methods.
- Inspect and prepare a vehicle to the required company and DVSA standards prior to successful achievement at pre-arranged vehicle test specific to their trade
- Contribute to the maintenance of a safe and efficient workshop and adhere to company and legislative processes
- Use current and emerging technology to access specific relevant information held within engineering manuals, drawings and electronic resources.
- Carry out planned preventative maintenance and repairs within specific trade
- Remove repair/replace components in line with manufacturers and company procedures
- Investigate defects reported by drivers and identify the root cause

	<ul style="list-style-type: none"> <li>and eliminate recurring defects, relevant to their trade</li> <li>• Maintain records to company and Operators Licence obligations and regulations</li> </ul>
<b>Behaviours</b>	<ul style="list-style-type: none"> <li>• Communicate effectively with colleagues, manufacturers and suppliers on a range of topics that will support the process of inspecting, diagnosing, repairing and testing of faults.</li> <li>• Behave in accordance with the values of the company they work for; treat customers and stakeholders with courtesy and respond quickly to their requirements.</li> <li>• Operate as an effective team member taking responsibility, accountability and ownership of own actions.</li> <li>• Continually develop knowledge and skills and mentor less experienced colleagues.</li> <li>• Have a strong work ethic and understand the need to be reliable, flexible, diligent and a good timekeeper</li> </ul>
<b>Trade specific competencies:</b>	
<b>Mechanical</b>	<ul style="list-style-type: none"> <li>• Understand the fundamentals of existing and emerging mechanical vehicle design and systems</li> <li>• Carry out routine mechanical servicing, planned preventative maintenance and “health checks</li> <li>• Carry out routine servicing</li> <li>• Inspect, diagnose and repair braking systems</li> <li>• Inspect, diagnose and repair steering systems</li> <li>• Inspect, diagnose and repair suspension systems</li> <li>• Diagnose/repair engine, fuel coolant and exhaust systems</li> <li>• Diagnose/repair transmission and retarder systems</li> <li>• Use diagnostic equipment and software to diagnose and rectify located faults on mechanical components</li> <li>• Identify with accumulated knowledge and apply initiative to rectify intermittent faults</li> </ul>
<b>Electrical</b>	<ul style="list-style-type: none"> <li>• Understand the fundamentals of existing and emerging electrical design and systems</li> <li>• Carry out routine electrical servicing and planned maintenance</li> <li>• Inspect, diagnose and repair electrical circuits and wiring</li> <li>• Interrogate wiring diagrams. Identify components, current flow and circuit protection</li> <li>• Inspect, diagnose and repair electrical charging systems, electrical power storage devices and systems</li> <li>• Inspect, diagnose and repair electrical charging systems, battery storage and electrical drive systems</li> <li>• Inspect, diagnose and repair engine, transmission and other vehicle control management systems</li> <li>• Inspect, diagnose and repair on board auxiliary systems</li> <li>• Inspect, diagnose and repair electronic, digital programmable control systems</li> <li>• Use diagnostic equipment and software to check Multiplex control systems and rectify component system faults</li> </ul>
<b>Coach builder</b>	<ul style="list-style-type: none"> <li>• Understand the fundamentals of existing and emerging coach building design and systems</li> </ul>

	<ul style="list-style-type: none"> <li>• Carry out routine safety inspections</li> <li>• Manufacture, repair and fit body parts, panels, body fixings access panels</li> <li>• Manufacture, repair and fit body structural components</li> <li>• Undertake Gas, MiG or TiG welding repairs or for fabrication process</li> <li>• Carry out Fibre Glass or GRP (Glass Reinforced Plastics) repairs to body components</li> <li>• Repair interior trim materials and components</li> <li>• Remove and replace bonded and gasket glazing</li> <li>• Work with and repair new and emerging materials</li> <li>• Use specialist body repair equipment, preparation and finishing processes including painting</li> </ul>
<p><b>Mechelec</b></p>	<ul style="list-style-type: none"> <li>• Understand the fundamentals of existing and emerging mechanical and electrical design and systems</li> <li>• Carry out routine safety inspections</li> <li>• Carry out routine mechanical and electrical servicing, planned preventative maintenance and “health checks”</li> <li>• Inspect, diagnose and repair mechanical systems, engine, fuel, coolant and transmission systems</li> <li>• Identify with accumulated knowledge and apply initiative to rectify intermittent faults</li> <li>• Inspect, diagnose and repair electrical systems, electrical circuits, electrical units and components</li> <li>• Inspect, diagnose and repair on board auxiliary systems, battery charging and electronic drive systems</li> <li>• Use diagnostic equipment and software to locate, diagnose and rectify faults on mechanical and electrical components</li> <li>• Use diagnostic equipment to interrogate electronic control units and programmable control systems</li> </ul>