



## **Assessment Criteria for**

IMI Bus and Coach  
Engineering Technician  
Apprenticeship  
Standard - MechElec

**ST0067/AP01**



INSTITUTE  
of the MOTOR  
INDUSTRY



## CENTRE INFORMATION

Please be aware that any legislation referred to in this document may be subject to amendment/s during the life of this apprenticeship. Therefore IMI Approved Centres must ensure they are aware of and comply with any amendments, e.g. to health and safety legislation and employment practices.

Please be aware that vehicle technologies referred to in this document reflect current practice, but may be subject to amendment/s, updates and replacements during the life of this apprenticeship. Therefore IMI Approved Centres must ensure they are aware of the latest developments and emerging technologies to ensure the currency of this apprenticeship.

Please note: the relevance of the information contained in the group content will vary depending upon the vehicle types being worked upon. The group content is for guidance only and is not meant to be prescriptive.

For Office Use Only		
Issue number and date	Change detail	Section/page
Issue 1 01-12-17	Original document	
Issue 2 21-02-19	Removed reference to light vehicle from Group 10.	Page 38
	Removed duplicate Learning Outcome 1 from Group 11.	Page 42
	Minor formatting changes to wording and referencing	Whole document
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Requests should be made in writing and addressed to:

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CONTACT SHEET

Apprentice Name:	
Apprentice Registration No:	
Apprentice Address:	
Apprentice Tel No:	
Apprentice Email:	
Employer Contact:	
Employer Name & Address:	
Employer Tel No:	

Please complete as appropriate:	
Mentor Name:	
Mentor Job Title:	
Mentor Signature:	
Employer Name:	
Employer Signature:	
Training provider name	
Training provider address / stamp	
Assessor Name:	
Assessor Signature:	
Internal Quality Assurer Name:	Internal Quality Assurer Name:
Internal Quality Assurer Signature:	Internal Quality Assurer Signature:



The delivery of the group subjects identified in the table below have been recommended by the employers who developed the Bus and Coach Apprenticeship Standard and when competence should be assessed.

Knowledge and Skills Delivery Plan	
Phase 1	
Group 1	Soft Skills And Behaviours
Group 2	Health, Safety And Good Housekeeping
Group 3	Materials, Fabrication, Tools And Measuring Devices In The Bus And Coach Environment
Group 4	Effective Working Relationships With Colleagues
Group 5	Understand The Construction And Operation Of Bus And Coach Systems
Gateway 1	
Phase 2	
Group 6	Engine Design And Systems
Group 7	Chassis Systems
Group 8	Transmission Systems
Group 9	Electrical Systems
Gateway 2	
Phase 3	
Group 10	Core Competencies
Group 11	Trade Specific Route: MechElec
End Point Assessment	

#### Note: Assessments

The assessments for this standard combine various assessment styles/methodologies to meet with the recommendations of the employers who developed this Bus and Coach Apprenticeship.



<b>UNIT REF:</b> <b>GROUP 1</b>	<b>TITLE: SOFT SKILLS AND BEHAVIOURS</b>
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**Rationale:** This group sets out the soft skills and behaviours and provides the framework that will provide the basis for the approach to assessment. This group will be assessed at each of the gateways through the behaviours assessment involving the apprentice, the employer and the training provider. There is no requirement for separate assessment whilst on the programme, however the apprentice should be aware of the criteria they will have to meet.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<b>The Apprentice will:</b>	<b>The Apprentice can:</b>
1. Understands the importance of working with others and building relationships	1.1. Routinely collaborate with others to achieve targets  1.2. Maintain positive working relationships even though the other person may be very different  1.3. Accept the tasks given, and quickly recognise whether they have the ability to complete them and seek help appropriately  1.4. Demonstrate honesty when working as part of a team  1.5. Carry out tasks with consideration for others  1.6. Seek support & help from colleagues when appropriate  1.7. Provide feedback to others at the appropriate moment and support it with relevant evidence  1.8. Actively contribute to team goals
2. Understands the importance of complying with both legislative and company procedures	2.1. Use systems and processes relevant to the role  2.2. Use materials efficiently in order to minimise waste and the impact on the environment  2.3. Comply with all legislation relevant to role  2.4. Contribute to improving the workshops overall efficiency  2.5. Complete documentation with a clear understanding of its purpose  2.6. Prioritise the tasks ahead and react appropriately to the unexpected



	<p>2.7. Operate safely without the need for reminders</p> <p>2.8. Flag up difficulties in sufficient time to take remedial action</p>
<p>3. Communicates effectively with colleagues and stakeholders on a range of topics that supports the process of maintaining and repairing vehicles</p>	<p>3.1. Use a clear voice and polite tone.</p> <p>3.2. Speak confidently and use different types of questions appropriately</p> <p>3.3. Complete internal documentation as required using legible, grammatically correct written communication for internal e-mails/repair order completion</p> <p>3.4. Exhibit appropriate body language and attitude when dealing with colleagues, manufacturers and customers</p> <p>3.5. Converse with others regarding technical issues explaining technical terminology when asked</p> <p>3.6. Approach colleagues and stakeholders with respect and follow the appropriate procedures when dealing with a problem.</p> <p>3.7. Quickly refer difficult issues to others</p> <p>3.8. Take a systematic approach to problem solving. Know their limitations and when best to escalate issues</p> <p>3.9. Confidently break down complex tasks and allocate time and resources appropriately</p>
<p>4. Understands how to be an effective team member taking responsibility, accountability and ownership of own actions.</p>	<p>4.1. Share their knowledge and skills when requested</p> <p>4.2. Provide reports on progress when asked</p> <p>4.3. Contribute ideas, think them through in detail and their implications and present them clearly</p>
<p>5. Understands the need to continually self-develop knowledge and skills and mentor less experienced colleagues.</p>	<p>5.1. Independently and regularly reflect on progress and set goals and priorities for future development</p> <p>5.2. Demonstrate an interest in learning and actively use the opportunities to extend their knowledge and skills that are put in front of them</p>
<p>6. Understands the need for a strong work ethic and understand the need to be reliable and flexible, diligent and a good timekeeper.</p>	<p>6.1. Be punctual and routinely meet deadlines</p> <p>6.2. Wear appropriate clothes at all times and present a clean appearance especially when meeting customers and stakeholders</p>



**PHASE 1 EVIDENCE REQUIREMENTS –  
FOR REVIEWING THE APPRENTICE’S LOG OF PROGRESS**

1. **The apprentice must produce evidence of:** communicating effectively, behaving in accordance with the values of the company, working as an effective team member, constantly learning and demonstrating commercial awareness (developed throughout the programme).

**GATEWAY 1 REQUIREMENTS**

1. The training provider and mentor must review the Apprentice’s progress to meet with this units knowledge and skills outcomes from the Apprentice’s log of progress to meet with phase 1 evidence requirements above.





<b>UNIT REF:</b> <b>GROUP 2</b>	<b>TITLE: HEALTH, SAFETY AND GOOD HOUSEKEEPING</b>
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**Rationale:** This group enables the apprentice to develop an understanding, knowledge and skills in routine maintenance and cleaning of the bus and coach environment and using resources economically and health and safety legislation and duties of everyone in the work environment. It will provide an appreciation of significant risks in the bus and coach environment and how to identify and deal with them. Once completed the apprentice will be able to identify hazards and evaluate and reduce risk.

<b>LEARNING OUTCOMES</b>	<b>ASSESSMENT CRITERIA</b>
<b>The Apprentice will:</b>	<b>The Apprentice can:</b>
1. Understand the correct personal and vehicle protective equipment to be used within the bus and coach environment	1.1. Explain the importance of wearing the types of personal protective equipment required for a range of bus and coach repair activities  1.2. Identify vehicle protective equipment for a range of repair activities  1.3. Describe vehicle and personal safety considerations when working at the roadside
2. Understand effective housekeeping practices in the bus and coach environment	2.1. Describe why the bus and coach environment should be properly cleaned and maintained  2.2. Describe requirements and systems, which may be put in place to ensure a clean bus and coach environment  2.3. Describe how to minimise waste when using utilities and consumables  2.4. State the procedures and precautions necessary when cleaning and maintaining an bus and coach environment  2.5. Describe the selection and use of cleaning equipment when dealing with general cleaning, spillages and leaks in the bus and coach environment  2.6. Describe procedures for correct disposal of waste materials from a bus and coach environment  2.7. Describe procedures for starting and ending the working day which ensure effective housekeeping practices are followed



<p>3. Understand key health and safety requirements relevant to the bus and coach environment</p>	<p>3.1. List the main legislation relating to bus and coach environment health and safety</p> <p>3.2. Describe the general legal duties of employers and employees required by current health and safety legislation</p> <p>3.3. Describe key and current health and safety requirements relating to the bus and coach environment</p> <p>3.4. Describe why workplace policies and procedures relating to health and safety are important</p>
<p>4. Understand about hazards and potential risks relevant to the bus and coach environment</p>	<p>4.1. Identify key hazards and risks in a bus and coach environment</p> <p>4.2. Describe policies and procedures for reporting hazards, risks, and health and safety matters in the bus and coach environment</p> <p>4.3. State precautions and procedures which need to be taken when working with vehicles, associated materials, tools and equipment</p>
<p>5. Understand personal responsibilities</p>	<p>5.1. Explain the importance of personal conduct in maintaining the health and safety of the individual and others</p> <p>5.2. Explain the importance of personal presentation in maintaining health safety and welfare</p>
<p>6. Be able to use correct personal and vehicle protection within the bus and coach environment</p>	<p>6.1. Select and use personal protective equipment throughout activities. To include appropriate protection of:</p> <ul style="list-style-type: none"><li>a. eyes</li><li>b. ears</li><li>c. head</li><li>d. skin</li><li>e. feet</li><li>f. hands</li><li>g. lungs</li></ul> <p>6.2. Select and use vehicle protective equipment throughout all activities</p>



<p>7. Be able to carry out effective housekeeping practices in the bus and coach environment</p>	<p>7.1. Select and use cleaning equipment which is of the right type and suitable for the task</p> <p>7.2. Use utilities and appropriate consumables, avoiding waste</p> <p>7.3. Use materials and equipment to carry out cleaning and maintenance duties in allocated work areas, following bus and coach work environment policies, schedules and manufacturer's instructions</p> <p>7.4. Perform housekeeping activities safely and in a way which minimises inconvenience to customers and staff</p> <p>7.5. Keep the work area clean and free from debris and waste materials</p> <p>7.6. Keep tools and equipment fit for purpose by regular cleaning and keeping tidy</p> <p>7.7. Dispose of used cleaning agents, waste materials and debris to comply with legal and workplace requirements</p>
<p>8. Be able to recognise and deal with dangers in order to work safely within the bus and coach workplace</p>	<p>8.1. Name and locate the responsible persons for health and safety in their relevant workplace</p> <p>8.2. Identify and report working practices and hazards which could be harmful to themselves or others</p> <p>8.3. Carry out safe working practices whilst working with equipment, materials and products in the bus and coach environment</p> <p>8.4. Rectify health and safety risks encountered at work, within the scope and capability of their job role</p>
<p>9. Be able to conduct themselves responsibly</p>	<p>9.1. Show personal conduct in the workplace which does not endanger the health and safety of themselves or others</p> <p>9.2. Display suitable personal presentation at work which ensures the health and safety of themselves and others at work</p>



**PHASE 1 EVIDENCE REQUIREMENTS –  
FOR REVIEWING THE APPRENTICE’S LOG OF PROGRESS**

1. **The apprentice must produce evidence of:**
  - a using personal and vehicle protection within the automotive environment
  - b carrying out effective housekeeping practices in the automotive environment
  - c recognising and dealing with dangers in order to work safely within the automotive workplace.
  - d conducting yourself responsibly

**GATEWAY 1 REQUIREMENTS**

2. The training provider and mentor must review the Apprentice’s progress to meet with this units knowledge and skills outcomes from the Apprentice’s log of progress to meet with phase 1 evidence requirements above.



UNIT REF: GROUP 3	TITLE: MATERIALS, FABRICATION, TOOLS AND MEASURING DEVICES IN THE BUS AND COACH ENVIRONMENT
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**Rationale:** This group enables the apprentice to develop an understanding, knowledge and skills of the correct selection, care and use of key hand tools and measuring devices for modification, fabrication and repair in the bus and coach environment, the correct preparation and use of common bus and coach environment equipment, the correct selection and fabrication of materials used when modifying and repairing and the correct application of bus and coach engineering fabrication and fitting principles

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<b>The Apprentice will:</b>	<b>The Apprentice can:</b>
1. Understand how to select, use and care for hand tools and measuring devices in the bus and coach environment	1.1. Identify and explain the use of common types of hand tools used for fabricating and fitting in the bus and coach environment  1.2. Identify and explain the use of common measuring devices used for fabrication and fitting in the bus and coach environment  1.3. Describe, within the scope of their responsibilities, how to select, prepare and maintain hand tools, measuring devices and PPE used for fabrication, repair and fitting in the bus and coach environment  1.4. State the limitations of common hand tools and measuring devices used for fabricating, repair and fitting in the bus and coach workplace  1.5. Explain how common hand tools and measuring devices used for fabricating, repair and fitting in the bus and coach environment should be stored and maintained  1.6. Identify common electrical measuring tools used in the repair of vehicles and components  1.7. Explain the preparation and safe and correct use of common electrical tools when measuring voltage, current and resistance
2. Understand how to prepare and use common workshop equipment	2.1. Describe the preparation and safe use of workshop equipment  2.2. Explain the term: safe working load



<p>3. Understand how to select materials when fabricating, modifying and repairing vehicles and fitting components</p>	<p>3.1. Describe the properties, application and limitations of ferrous and non-ferrous metals, including their safe use</p> <p>3.2. Describe the properties, application and limitations of common non-metallic materials, including their safe use</p> <p>3.3. Define common terms relating to the properties of materials</p>
<p>4. Understand how to apply bus and coach engineering, fabrication and fitting principles when modifying and repairing vehicles and components</p>	<p>4.1. Describe how to tap threads, file, cut and drill plastics and metals when modifying or repairing vehicles</p> <p>4.2. Describe how to measure, mark out, shape and join materials when fabricating</p> <p>4.3. Describe the selection and fitting procedures of the following: a. gaskets and seals b. sealants and adhesives c. fittings and fasteners d. electrical circuit components</p> <p>4.4. Identify locking, fastening and fixing devices</p> <p>4.5. State the importance of correct operating specifications for limits, fits and tolerances in the bus and coach environment</p>
<p>5. Be able to select, maintain and use and hand tools and measuring devices in the bus and coach environment</p>	<p>5.1. Select, maintain and use suitable hand tools safely when fabricating and fitting in the bus and coach workplace</p> <p>5.2. Select, maintain and use suitable measuring devices safely when fabricating and fitting in the bus and coach environment</p> <p>5.3. Select, maintain and use suitable PPE for fabrication, repair and fitting in the bus and coach environment</p> <p>5.4. Select, maintain and use suitable electrical measuring tools safely when repairing vehicles and components</p>



<p>6. Be able to prepare and use common workshop equipment</p>	<p>6.1. Use suitably maintained workshop equipment safely</p> <p>6.2. Use correct interpretation of 'safe working load' on lifting and supporting equipment</p> <p>6.3. Report any faulty or damaged tools and equipment to the relevant persons clearly and promptly</p> <p>6.4. Store work tools and equipment in a safe manner, which permits ease of access and identification for use</p>
<p>7. Be able to select materials when fabricating, modifying and repairing vehicles and fitting components</p>	<p>7.1. Select and use appropriate materials whilst constructing, fitting, modifying or repairing vehicles and components</p>
<p>8. Be able to apply bus and coach engineering, fabrication and fitting principles when modifying and repairing vehicles and components</p>	<p>8.1. Use correct procedures when:</p> <ul style="list-style-type: none"><li>a. filing</li><li>b. tapping threads</li><li>c. cutting plastics and metals</li><li>d. drilling plastics and metals.</li><li>e. fitting</li></ul> <p>8.2. Use appropriate techniques when fabricating, repairing and modifying vehicles and components</p> <p>8.3. Select and use:</p> <ul style="list-style-type: none"><li>a. gaskets</li><li>b. seals</li><li>c. sealants</li><li>d. fittings and fasteners</li></ul> <p>8.4. Apply modification and repair techniques to bus and coach electrical circuits</p> <p>8.5. Select and use locking, fixing and fastening devices</p>



**PHASE 1 EVIDENCE REQUIREMENTS –  
FOR REVIEWING THE APPRENTICE’S LOG OF PROGRESS**

1. **The apprentice must produce evidence of:**
  - a selecting, maintaining and using any hand tools and measuring devices in the bus and coach environment.
  - b preparing and using common workshop equipment.
  - c selecting materials when fabricating, modifying and repairing vehicles and fitting components.
  - d applying automotive engineering, fabrication and fitting principles when modifying and repairing vehicles and components

**GATEWAY 1 REQUIREMENTS**

1. The training provider and mentor must review the Apprentice’s progress to meet with this units knowledge and skills outcomes from the Apprentice’s log of progress to meet with phase 1 evidence requirements above.





UNIT REF: GROUP 4	TITLE: EFFECTIVE WORKING RELATIONSHIPS WITH COLLEAGUES
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**Rationale:** This group enables the apprentice to develop an understanding, knowledge and skills of how to keep good working relationships with all colleagues in the bus and coach work environment by using effective communication and support skills.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<p><b>The Apprentice will:</b></p> <p>1. Understand key organisational structures, functions and roles within the bus and coach work environment</p>	<p><b>The Apprentice can:</b></p> <p>1.1. Identify the purpose of different sections of a typical bus and coach work environment</p> <p>1.2. Explain organisational structures and lines of communication within the bus and coach work environment</p> <p>1.3. Explain levels of responsibility within specific job roles in bus and coach workplace. To include:</p> <ul style="list-style-type: none"> <li>a. trainee</li> <li>b. skilled technician</li> <li>c. supervisor</li> <li>d. manager</li> </ul>
<p>2. Understand the importance of obtaining, interpreting and using information in order to support their job role within the bus and coach work environment</p>	<p>2.1. Explain the importance of different sources of information in a bus and coach work environment.</p> <p>2.2. Explain how to find, interpret and use relevant sources of information</p> <p>2.3. Describe the main legal requirements relating to the vehicle, including road safety requirements</p> <p>2.4. Explain the importance of working to recognised procedures and processes</p> <p>2.5. Explain when replacement units and components <b>must meet the manufacturers' original equipment specification.</b></p> <p>2.6. Explain the purpose of how to use identification codes</p>
<p>3. Understand communication requirements when carrying out vehicle repairs in the bus and coach work environment</p>	<p>3.1. Explain how to report using written and verbal communication</p> <p>3.2. Explain the importance of documenting information relating to work carried out in the bus and coach environment</p> <p>3.3. Explain the importance of working to agreed timescales</p>



4. Understand how to develop good working relationships with colleagues and customers in the bus and coach workplace	4.1. Describe how to develop positive working relationships with colleagues and customers 4.2. Explain the importance of developing positive working relationships 4.3. Explain the importance of accepting other peoples' views and opinions 4.4 Explain the importance of making and honouring realistic commitments to colleagues and customers
5. Be able to work effectively within the organisational structure of the bus and coach work environment	5.1. Respond promptly and willingly to requests for assistance from customers and colleagues 5.2. Refer customers and colleagues to the correct person should requests fall outside their responsibility and capability
6. Be able to obtain and use information in order to support their job role within the bus and coach work environment	6.1. Select and use legal and technical information, in an bus and coach work environment
7. Be able to communicate with and support colleagues and customers effectively within the bus and coach work environment	7.1. Use methods of communication with customers and colleagues which meet their needs 7.2. Give customers and colleagues accurate information 7.3. Make requests for assistance from or to customers and colleagues clearly and courteously
8. Be able to develop and keep good working relationships in the bus and coach work environment	8.1. Contribute to team work by initiating ideas and co-operating with customers and colleagues 8.2. Treat customers and colleagues in a way which shows respect for their views and opinions 8.3. Make and keep achievable commitments to customers and colleagues 8.4. Inform colleagues promptly of anything likely to affect their own work



**PHASE 1 EVIDENCE REQUIREMENTS –  
FOR REVIEWING THE APPRENTICE’S LOG OF PROGRESS**

1. **The apprentice must produce evidence of:**
  - a. Working effectively within the organisational structure of the bus and coach work environment.
  - b. Obtaining and using information in order to support their job role within the bus and coach work environment.
  - c. Communicating with and supporting colleagues and customers effectively within the bus and coach work environment.
  - d. Developing and keeping good working relationships in the bus and coach work environment.

**GATEWAY 1 REQUIREMENTS**

1. The training provider and mentor must review the Apprentice’s progress to meet with this units knowledge and skills outcomes from the Apprentice’s log of progress to meet with phase 1 evidence requirements above.



UNIT REF: GROUP 5	TITLE: UNDERSTAND THE CONSTRUCTION AND OPERATION OF BUS AND COACH SYSTEMS
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**Rationale:** This group enables the Apprentice to develop the knowledge in order to understand the construction and operation of common bus and coach Engine, Chassis, Transmission, Electrical and Body systems.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<b>The Apprentice will:</b>	<b>The Apprentice can:</b>
1. Understand how the main Bus and Coach engine systems operate	1.1. Identify Bus and Coach engine system components 1.2. Describe the construction and operation of Bus and Coach compression ignition engine systems 1.3. Compare key Bus and Coach engine system components and assemblies against alternatives to identify differences in construction and operation 1.4. Identify the key engineering principles that are related to Bus and Coach engine systems 1.5. State common terms used in Bus and Coach engine systems
2. Understand how the main Bus and Coach chassis systems operate	2.1. Identify Bus and Coach chassis system components 2.2. Describe the construction and operation of Bus and Coach chassis systems 2.3. Compare key Bus and Coach chassis system components and assemblies against alternatives to identify differences in construction and operation 2.4. Identify the key engineering principles that are related to Bus and Coach chassis systems 2.5. State common terms used in Bus and Coach chassis systems
3. Understand how the main Bus and Coach transmission systems operate	3.1. Identify Bus and Coach transmission system components 3.2. Describe the construction and operation of Bus and Coach transmission systems 3.3. Compare key Bus and Coach transmission system components and assemblies against alternatives to identify differences in construction and operation 3.4. Identify the key engineering principles that are related to Bus and Coach transmission systems



	3.5. State common terms used in Bus and Coach transmission systems
4. Understand Bus and Coach electrical and electronic principles	<p>4.1. Identify electrical symbols and units found in Bus and Coach circuits</p> <p>4.2. Describe how to interpret Bus and Coach wiring diagrams</p> <p>4.3. Describe the operation of key Bus and Coach circuit protection devices and why these are necessary</p> <p>4.4. Describe earthing principles and earthing methods</p> <p>4.5. Identify the use of different cables and connectors used in Bus and Coach circuits</p> <p>4.6. Describe the operation of electrical and electronic sensors and actuators and their application</p> <p>4.7. Describe the key electrical and electronic control principles that are related to Bus and Coach electrical circuits</p> <p>4.8. State common terms used in Bus and Coach electrical circuits</p>
5. Understand how Bus and Coach batteries, starting and charging systems operate	<p>5.1. Identify Bus and Coach batteries, starting and charging system components</p> <p>5.2. Describe the construction and operation of Bus and Coach batteries, starting and charging system components</p> <p>5.3. Describe how to remove and replace batteries, starting and charging system units and components</p> <p>5.4. Compare Bus and Coach batteries, starting and charging system components and assemblies against alternatives to identify differences in construction and operation</p> <p>5.5. State common terms used in conjunction with Bus and Coach batteries, starting and charging systems</p>
6. Understand how Bus and Coach auxiliary electrical systems operate	<p>6.1. Identify Bus and Coach auxiliary system components</p> <p>6.2. Describe the construction and operation of Bus and Coach auxiliary systems</p>



	<p>6.3. Compare key Bus and Coach auxiliary system components and assemblies against alternatives to identify differences in construction and operation</p> <p>6.4. State common terms used in Bus and Coach auxiliary system design</p>
<p>7. Understand routine assembly of bus and coach body systems and components</p>	<p>7.1. Identify the tools and equipment for assembling bus/coach body components</p> <p>7.2. Select tools and equipment for assembling bus/coach body components</p> <p>7.3. Identify the types of fastening method used in the assembly of bus/coach body components</p> <p>7.4. Select suitable fastening methods for the assembly of bus/coach body components</p> <p>7.5. Use instructions to interpret assembly sequence</p> <p>7.6. Check component parts to ensure they are fit for purpose</p> <p>7.7. Outline how to apply the principles of assembly when instructions are not available</p>

<p><b>PHASE 1 EVIDENCE REQUIREMENTS – FOR REVIEWING THE APPRENTICE’S LOG OF PROGRESS</b></p>
<p>1. <b>The apprentice must produce a written report</b> to show they understand the construction and operation of the following bus and coach common systems, based on the Learning Outcomes 1 to 7 above:</p> <ul style="list-style-type: none"> <li>a. Engine design and systems</li> <li>b. Chassis systems</li> <li>c. Transmission systems</li> <li>d. Electrical systems</li> <li>e. Body</li> </ul>
<p><b>GATEWAY 1 REQUIREMENTS</b></p>
<p>2. The training provider and mentor must review the <b>Apprentice’s</b> progress to meet with this units knowledge and skills outcomes from the <b>Apprentice’s</b> log of progress to meet with phase 1 evidence requirements above.</p>



Apprenticeship All Routes: Mechanical, Electrical, Coach Builder and Mechelec			
Gateway Requirements Review 1			
Mentor and Assessor Joint Review of Apprenticeship Progress			
Apprentice Name		Number	
Apprentice has completed evidence for the following units listed below:			
Unit Number	Unit Description	The Apprentice has:	
		Met all unit outcomes	Not met all unit outcomes
Group 1	Soft Skills and Behaviours		
Group 2	Health, Safety And Good Housekeeping		
Group 3	Materials, Fabrication Tools and Measuring devices in the Bus and Coach Environment		
Group 4	Effective Working relationships with Colleagues		
Group 5	Understand The Construction And Operation Of Bus And Coach Systems		
Gateway 1 Assessments			
Online Multiple-choice Test			
<b>Written Support Material Test (optional)</b> <i>NB. The IMI strongly recommends Apprentices complete the Written Support Test at the Gateways. This will assist in the Apprentice's development and preparation to meet with the requirements of the Bus and Coach EPA Assessment Plan.</i>			
<b>Service Maintenance Inspection Task:</b> Conduct a Routine Service Inspection.			
<b>Engineering Assessment Task:</b> a. make a P clip for a brake pipe. b. thread a hole in a steel bar and remove a stud			
<b>Remove and Replace a Component Task:</b> Covering one of the following chassis systems: a. brakes b. steering c. suspension			
The Apprentice is developing the following behaviors:			
demonstrates the ability to work with others and build relationships			
complies with both legislative and company procedures			



Mentor feedback to Apprentice:		
Mentor Name	Mentor Signature	Date
Assessor feedback to Apprentice		
Assessor Name	Assessor Signature	Date
Result of Review	Pass: (ready to progress to next phase)	Refer: (*more development required)
<b>* Where a referral is given, specific actions must be provided to the Apprentice in the feedback</b>		
Apprentice Signature: (I have read and agreed with the mentor and assessor feedback)		
Apprentice Comment (Optional)		





UNIT REF: GROUP 6	TITLE: ENGINE DESIGN AND SYSTEMS
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**Rationale:** This group builds on the knowledge gained from: **Group 5 Understand The Construction And Operation Of Bus And Coach Systems.** This group enables the Apprentice to develop the knowledge and skills in order to understand the procedures involved in locating, identifying and rectifying faults in engine systems. It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<p><b>The Apprentice will:</b></p> <ol style="list-style-type: none"> <li>1. Understand how to test, replace and check engine system units and components</li> </ol>	<p><b>The Apprentice can:</b></p> <ol style="list-style-type: none"> <li>1.1. Identify the key hazards and risks to be considered when carrying out fault finding and replacement activities on Bus and Coach engine systems, units and components</li> <li>1.2. Describe how to remove and replace Bus and Coach engine system units and components</li> <li>1.3. Describe how to select, prepare and use testing equipment and methods when carrying out fault finding on Bus and Coach engines</li> <li>1.4. Describe common types of testing methods used to check the operation of Bus and Coach engine systems and components and their purpose</li> <li>1.5. Explain the types of reports used and the importance of accuracy when identifying faults in Bus and Coach engine systems and components</li> <li>1.6. Explain common faults found in Bus and Coach engine systems and components</li> <li>1.7. Describe the procedures for reporting work progress and completion</li> </ol>



<p>2. Be able to carry out removal and replacement of Bus and Coach engine units and components.</p>	<p>2.1. Remove and replace the Bus and Coach's engine systems and components, adhering to the specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none"><li>a. the manufacturer's approved removal and replacement methods</li><li>b. recognised researched repair methods</li><li>c. health and safety requirements.</li></ul> <p>2.2. Ensure that replaced Bus and Coach engine units and components conform to the vehicle operating specification and any legal requirements</p> <p>2.3. Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>2.4. Ensure that the reassembled Bus and Coach engine systems performs to the vehicle operating specification and meets any legal requirements</p>
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PHASE 2 EVIDENCE REQUIREMENTS – FOR REVIEWING THE APPRENTICE’S LOG OF PROGRESS	
1. The apprentice must produce appropriate evidence relating to the following cooling system activities:	<ul style="list-style-type: none"><li>a. Removing, replacing and adjusting cooling system components.</li><li>b. Rectifying cooling system faults (water leaks, oil in water, excessively low or high coolant temperatures).</li><li>c. Recognising and recording heating system efficiencies.</li><li>d. Carrying out routine servicing activities on cooling systems to manufacturer's/company standards</li></ul>
2. The apprentice must produce appropriate evidence relating to the following fuel system activities:	<ul style="list-style-type: none"><li>a. Recognising symptoms and faults associated with diesel fuel systems including: water in the system, air in the system, leak, blockages, starting difficulties and excessive smoke (black or white).</li><li>b. Rectifying faults associated with diesel fuel systems including water in the system, air in the systems, leaks, blockages, starting difficulties and excessive smoke (black or white).</li><li>c. Carrying out routine servicing activities on fuel systems to manufacturer's/company standards.</li></ul>
3. The apprentice must produce appropriate evidence relating to the following lubrication system activities:	<ul style="list-style-type: none"><li>a. recognising symptoms and faults associated with abnormal oil pressure, oil leaks, excessive oil consumption, oil in water and oil contamination.</li><li>b. rectifying faults associated with abnormal oil pressure, oil leaks, excessive oil consumption, oil in water and oil contamination.</li><li>c. carrying out routine servicing activities on lubrication systems to manufacturer's/company standards.</li></ul>
4. The apprentice must produce appropriate evidence relating to the following exhaust system activities:	<ul style="list-style-type: none"><li>a. recognising symptoms and faults associated with exhaust air leaks, exhaust gas leaks and exhaust emissions treatments.</li><li>b. rectifying faults associated with exhaust air leaks, exhaust gas leaks and exhaust emissions treatments.</li><li>c. carrying out routine servicing activities on exhaust systems to manufacturer's/company standards.</li></ul>
GATEWAY 2 REQUIREMENTS	
1. The training provider and mentor must review the Apprentice’s progress to meet with this units knowledge and skills outcomes from the Apprentice’s log of progress to meet with phase 2 evidence requirements above.	



UNIT REF: GROUP 7	TITLE: CHASSIS SYSTEMS
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**Rationale:** This group builds on the knowledge gained from: **Group 5.2 Understanding The Construction And Operation Of Bus And Coach Chassis Systems And Components.** This group enables the Apprentice to develop the knowledge and skills in order to understand the procedures involved in locating, identifying and rectifying faults in chassis systems. It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<b>The Apprentice will:</b> 1. Understand how to test, replace and check chassis system units and components	<b>The Apprentice can:</b> 1.1. Identify the key hazards and risks to be considered when carrying out fault finding and replacement activities on Bus and Coach chassis systems, units and components 1.2. Describe how to remove and replace Bus and Coach chassis system units and components 1.3. Describe how to select, prepare and use testing equipment and methods when carrying out fault finding on Bus and Coach chassis systems 1.4. Describe common types of testing methods used to check the operation of Bus and Coach chassis systems and components and their purpose 1.5. Explain the types of reports used and the importance of accuracy when identifying faults in Bus and Coach chassis systems and components 1.6. Explain common faults found in Bus and Coach chassis systems and components 1.7 Describe the procedures for reporting work progress and completion



<p>2. Be able to carry out removal and replacement of Bus and Coach chassis units and components.</p>	<p>2.1. Remove and replace the Bus and Coach's chassis systems and components, adhering to the specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none"><li>a. the manufacturer's approved removal and replacement methods</li><li>b. recognised researched repair methods</li><li>c. health and safety requirements.</li></ul> <p>2.2. Ensure that replaced Bus and Coach chassis units and components conform to the vehicle operating specification and any legal requirements</p> <p>2.3. Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>2.4. Ensure that the reassembled Bus and Coach chassis system performs to the vehicle operating specification and meets any legal requirements</p>
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PHASE 2 EVIDENCE REQUIREMENTS – FOR REVIEWING THE APPRENTICE'S LOG OF PROGRESS	
1.	<p><b>The apprentice must produce appropriate evidence of</b> rectifying faults on the following chassis system components:</p> <ul style="list-style-type: none"><li>a. Steering (inc. ball joints, track rods, steering box and steering geometry checks and adjustments).</li><li>b. 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>c. Brakes (inc. worn shoes/pads, worn or scored brake surfaces, abnormal brake noises, judder, fluid contamination of brakes surfaces, fluid/air leaks, uneven braking, poor efficiency, lack of assistance, loss of pressure, brake drag, grab or fade).</li><li>d. Wheels, hubs and tyres (inc. checking tyre pressures, tread depth and condition, wheel condition and security).</li></ul>
2.	<p><b>The apprentice must produce appropriate evidence</b> showing they can carry out routine servicing to manufacturers / company standards on the following chassis systems:</p> <ul style="list-style-type: none"><li>a. Steering</li><li>b. Suspension</li><li>c. Brakes</li><li>d. Wheels, hubs and tyres</li></ul>
GATEWAY 2 REQUIREMENTS	
1.	<p>The training provider and mentor must review the <b>Apprentice's</b> progress to meet with this units knowledge and skills outcomes from the <b>Apprentice's</b> log of progress to meet with phase 2 evidence requirements above.</p>



UNIT REF: GROUP 8	TITLE: TRANSMISSION SYSTEMS
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**Rationale:** This group builds on the knowledge gained from: **Group 5.3 Understanding The Construction And Operation Of Bus And Coach Transmission Systems And Components**. This group enables the Apprentice to develop the knowledge and skills in order to understand the procedures involved in locating, identifying and rectifying faults in transmission systems. It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<b>The Apprentice will:</b>	<b>The Apprentice can:</b>
1. Understand how to test, replace and check transmission system units and components	1.1. Identify the key hazards and risks to be considered when carrying out fault finding and replacement activities on Bus and Coach transmission systems, units and components  1.2. Describe how to remove and replace Bus and Coach transmission system units and components  1.3. Describe how to select, prepare and use testing equipment and methods when carrying out fault finding on Bus and Coach transmission systems  1.4. Describe common types of testing methods used to check the operation of Bus and Coach transmission systems and components and their purpose  1.5. Explain the types of reports used and the importance of accuracy when identifying faults in Bus and Coach transmission systems and components  1.6. Explain common faults found in Bus and Coach transmission systems and components  1.7. Describe the procedures for reporting work progress and completion



<p>2. Be able to carry out removal and replacement of Bus and Coach transmission units and components.</p>	<p>2.1. Remove and replace the Bus and Coach's transmission systems and components, adhering to the specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none"> <li>a. the manufacturer's approved removal and replacement methods</li> <li>b. recognised researched repair methods</li> <li>c. health and safety requirements.</li> </ul> <p>2.2. Ensure that replaced Bus and Coach transmission units and components conform to the vehicle operating specification and any legal requirements</p> <p>2.3. Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>2.4. Ensure that the reassembled Bus and Coach transmission system performs to the vehicle operating specification and meets any legal requirements</p>
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<b>PHASE 2 EVIDENCE REQUIREMENTS – FOR REVIEWING THE APPRENTICE'S LOG OF PROGRESS</b>	
<p>1.</p>	<p><b>The apprentice must produce evidence of</b> rectifying faults with <b>transmission system</b> components, including correct identification and preparation of replacement parts, tools and process for the repair / adjustment / replacement of:</p> <ul style="list-style-type: none"> <li>a. clutch (manual and automatic)</li> <li>b. driveline faults (propshaft, drive shaft, universal and constant velocity joints, universal joint alignment, final drive faults and gear selection faults).</li> </ul>
<p>2.</p>	<p><b>The apprentice must produce evidence of</b> carrying out routine servicing to manufacturer's / company standards on the following transmission systems:</p> <ul style="list-style-type: none"> <li>a. clutch</li> <li>b. driveline</li> </ul>
<b>GATEWAY 2 REQUIREMENTS</b>	
<p>1.</p>	<p>The training provider and mentor must review the <b>Apprentice's</b> progress to meet with this units knowledge and skills outcomes from the <b>Apprentice's</b> log of progress to meet with phase 2 evidence requirements above.</p>





UNIT REF: GROUP 9	TITLE: ELECTRICAL SYSTEMS
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**Rationale:** This group builds on the knowledge gained from the Understanding The Construction And Operation Of Bus And Coach Groups **5.4: Electrical Principles. 5.5: Starting and Charging Systems. 5.6: Auxilliary Electrical Systems and Components.** This group enables the Apprentice to develop the knowledge and skills in order to understand the procedures involved in locating, identifying and rectifying faults in electrical systems. It also covers the procedures involved in the removal and replacement of system components and the evaluation of their performance.

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<b>The Apprentice will:</b>	<b>The Apprentice can:</b>
1. Understand how to test, replace and check Bus and Coach electrical systems and components	1.1. Identify the key hazards and risks to be considered when carrying out fault finding and replacement activities on Bus and Coach electrical system units and components  1.2. Describe how to remove and replace Bus and Coach electrical system units and components  1.3. Describe how to select, prepare and use testing equipment and methods when carrying out electrical fault finding on Buses and Coaches  1.4. Describe common types of testing methods used to check the operation of Bus and Coach electrical systems and components and their purpose  1.5. Explain the types of reports used and the importance of accuracy when identifying faults in Bus and Coach electrical systems and components  1.6. Explain common faults found in Bus and Coach electrical systems and components  1.7 Describe the procedures for reporting work progress and completion



LEARNING OUTCOMES	ASSESSMENT CRITERIA
<p><b>The Apprentice will:</b></p>	<p><b>The Apprentice can:</b></p>
<p>2. Be able to carry out removal and replacement of Bus and Coach electrical units and components.</p>	<p>2.1. Remove and replace the bus and coach electrical systems and components, adhering to the specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none"> <li>a. the manufacturer's approved removal and replacement methods</li> <li>b. recognised researched repair methods</li> <li>c. health and safety requirements.</li> </ul> <p>2.2. Ensure that replaced electrical units and components conform to the vehicle operating specification and any legal requirements</p> <p>2.3. Use suitable testing methods to evaluate the performance of the reassembled system</p> <p>2.4. Ensure that the reassembled electrical systems perform to the vehicle operating specification and meet any legal requirements</p>

PHASE 2 EVIDENCE REQUIREMENTS – FOR REVIEWING THE APPRENTICE'S LOG OF PROGRESS
<p>1. <b>The apprentice must produce evidence of</b> rectifying known faults with electric or electronic system components, including correct identification and preparation of replacement parts, correct tools and process for the repair/adjustment and replacement of:</p> <ul style="list-style-type: none"> <li>a. starting systems</li> <li>b. lighting components</li> <li>c. auxiliary systems</li> </ul>
<p>2. <b>The apprentice must produce evidence of</b> carrying out routine servicing to manufacturer's / company standards on the following electrical systems:</p> <ul style="list-style-type: none"> <li>a. starting</li> <li>b. lighting</li> <li>c. auxiliary</li> </ul>
GATEWAY 2 REQUIREMENTS
<p>1. The training provider and mentor must review the Apprentice's progress to meet with this units knowledge and skills outcomes from the Apprentice's log of progress to meet with phase 2 evidence requirements above.</p>



Apprenticeship Routes: Mechanical, Electrical and Mechelec			
Gateway Requirements Review 2			
Mentor and Assessor Joint Review of Apprenticeship Progress			
Apprentice Name		Number	
Unit Number	Unit Description	The Apprentice has:	
		Met all unit outcomes	Not met all unit outcomes
Group 6	Engine Design and Systems		
Group 7	Chassis Systems		
Group 8	Transmission Systems		
Group 9	Electrical Systems		
Gateway Assessments			
Online Knowledge Test Assessment covering Groups 6, 7, 8 & 9			
Written Support Material Test (optional)			
Carry Out a Rectification Task to ONE of the following systems:			
<ul style="list-style-type: none"> <li>a. <b>engine</b> (cooling, fuel, lubrication or exhaust)</li> <li>b. <b>chassis</b> (steering, suspension, brakes, wheels, hubs or tyres)</li> <li>c. <b>transmission</b> (clutch or driveline)</li> <li>d. <b>electrical</b> (starting, lighting or auxiliary)</li> </ul>			
The Apprentice continues to consistently display the following behaviors:			
behaving in accordance with the values of the company they work for			
treating customers and stakeholders with courtesy			
responding quickly to customer and stakeholder requirements to ensure an excellent experience			
operating effectively as a team member			
taking ownership and responsibility when required			
being honest and accountable in all activities when things do not go as planned			
working continuously at development of both self, team and processes			



Mentor feedback to Apprentice:		
Mentor Name	Mentor Signature	Date
Assessor feedback to Apprentice		
Assessor Name	Assessor Signature	Date
Result of Review	Pass: (ready to progress to next phase)	Refer: (*more development required)
<b>* Where a referral is given, specific actions must be provided to the Apprentice in the feedback</b>		
Apprentice Signature I have read and agreed with the mentor and assessor feedback		
Apprentice Comment (Optional)		



UNIT REF: GROUP 10	TITLE: CORE COMPETENCIES
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**Rationale:** This group enables the apprentice to develop the understanding, knowledge and skills required to work in a typical bus and coach environment for the following specific trades: mechanical, electrical, coach builder, mechelec

These core competencies consist of the following:

- inspecting and preparing vehicles to ensure company and legal conformity for specific trade
- working safely in the work environment
- using technology to access information
- carrying out planned preventative maintenance to the specific trade
- removing, repairing and replacing components
- investigating vehicle defects

LEARNING OUTCOMES	ASSESSMENT CRITERIA
<b>The Apprentice will:</b>	<b>The Apprentice can:</b>
1. Understand how to carry out inspections on Buses and Coaches using prescribed methods	1.1. Explain the fundamental requirements of the “O” licence with regards to maintaining vehicle roadworthiness  1.2. Identify the different systems to be inspected when using the prescribed inspection methods  1.3. Identify the procedures involved to carry out the systematic inspection of the prescribed inspection methods on Buses and Coaches  1.4. Identify conformity of vehicle systems and condition on Bus and Coach inspections  1.5. Compare test and inspection results against Bus and Coach specification and legal requirements  1.6. Explain how to record and complete the inspection results in the format required  1.7. Identify the recommendations that can be made based on results of the Bus and Coach inspections  1.8. Explain the implications of failing to carry out Bus and Coach inspection activities correctly  1.9. Explain the implications of signing workplace documentation and vehicle records



	<p>1.10. Explain the procedure for reporting damage to Bus and Coach components and units outside normal inspection items</p>
<p>2. Understand how to carry Bus and Coach servicing</p>	<p>2.1. Explain the difference between the various prescribed Bus and Coach maintenance procedures:</p> <ul style="list-style-type: none"><li>a. routine servicing</li><li>b. first use inspection</li><li>c. daily vehicle checks</li><li>d. scheduled safety inspection</li></ul> <p>2.2. Describe the procedures used for checking the condition and serviceability of Bus and Coach systems and components</p> <p>2.3. Describe the procedures for checking and replenishing fluid levels</p> <p>2.4. Describe the procedures for the replacement of lubricants and fluids</p> <p>2.5. Identify adjustments that need to be carried out on Bus and Coach systems and components</p> <p>2.6. Describe the requirements of Bus and Coach maintenance arrangements as part of the Operator Licence criteria and organisational procedures</p> <p>2.7. Explain the importance of accurately recording Bus and Coach maintenance activities</p> <p>2.8. Describe procedures for the correct disposal of waste materials produced as a result of servicing operations</p> <p>2.9. Describe the procedures for reporting work progress and completion</p>



3. Be able to work safely when carrying out removal and replacement activities	3.1. Use suitable personal protective equipment and vehicle coverings throughout all vehicle unit and component removal and replacement activities  3.2. Work in a way which minimises the risk of damage or injury to the vehicle, people and the environment
4. Be able to use relevant information to carry out the task	4.1. Select suitable sources of technical information to support vehicle unit and component removal and replacement activities including: a. vehicle technical data b. removal and replacement procedures c. legal requirements  4.2. Use technical information to support vehicle unit and component removal and replacement activities
5. Be able to carry out Bus and Coach inspections	5.1. Carry out Bus and Coach inspections, adhering to the specifications and tolerances for the vehicle and following: a. <b>the manufacturer's approved inspection methods</b> b. recognised researched inspection methods c. health and safety requirements d. workplace procedures  5.2. Ensure the inspected Bus and Coach complies to the vehicle operating specification and any legal requirements  5.3. Use suitable testing methods to evaluate the performance of the inspected systems



<p>6. Be able to carry out Bus and Coach preventative maintenance within your specific trade</p>	<p>6.1. Use maintenance methods that are relevant to the symptoms presented for your trade</p> <p>6.2. Evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately</p> <p>6.3. Carry out all repair activities following:</p> <ul style="list-style-type: none"><li>a. <b>manufacturers' instructions</b></li><li>b. recognised researched repair methods</li><li>c. workplace procedures</li><li>d. health and safety requirements</li></ul> <p>6.4. Ensure all repaired and replaced components and units conform to the vehicle operating specification and any legal requirements</p> <p>6.5. Adjust components and units correctly to ensure that they operate to meet system requirements</p> <p>6.6. Use testing methods that are suitable for assessing the performance of the system rectified</p> <p>6.7. Ensure the Bus and Coach system rectified performs to the vehicle operating specification and any legal requirements</p>
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<p>7. Be able to carry out Bus and Coach servicing activities</p>	<p>7.1. Carry out Bus and Coach servicing using prescribed methods, adhering to the correct specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none"><li>a. the manufacturer's approved inspection methods</li><li>b. recognised researched inspection methods</li><li>c. health and safety requirements</li></ul> <p>7.2. Carry out adjustments, replacement of vehicle components and replenishment of consumable materials following the manufacturer's current specification for:</p> <ul style="list-style-type: none"><li>a. the particular service interval</li><li>b. working methods and procedures</li><li>c. use of equipment</li><li>d. the tolerances for the vehicle.</li></ul> <p>7.3. Ensure the examination methods identify accurately any vehicle system and or component problems falling outside the maintenance schedule are specified.</p> <p>7.4. Ensure that the vehicle conforms to the vehicle operating specification and any legal requirements</p> <p>7.5. Ensure any comparison of the vehicle against specification accurately identifies any:</p> <ul style="list-style-type: none"><li>a. differences from the vehicle specification</li><li>b. vehicle appearance and condition faults</li></ul> <p>7.6. Use suitable testing methods to evaluate the performance of all replaced and adjusted components and systems accurately</p>
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**PHASE 3 EVIDENCE REQUIREMENTS – FOR REVIEWING THE APPRENTICE’S LOG OF PROGRESS**

- 1. The apprentice must produce evidence of:**
- a. inspecting and preparing a vehicle to the required company and DVSA standard prior to successful achievement of a pre-arranged vehicle test specific to your trade (mechanical, electrical, mechelec or coach builder).
  - b. contributing to the maintenance of a safe and efficient workshop and adhere to company and legislative processes.
  - c. using correct and emerging technology to access specific relevant information held within engineering manuals, drawings and electronic resources.
  - d. carrying out planned preventative maintenance and repairs within your specific trade.
  - e. removing, repairing and replacing components in line with manufacturer’s and company procedures.
  - f. investigating defects reported by drivers and identify the root cause and eliminate recurring defects, relevant to your trade.
  - g. maintaining records to company and operator’s licence obligations and regulations

**GATEWAY 3 REQUIREMENTS**

1. The training provider and mentor must review the Apprentice’s progress to meet with the group knowledge and skills outcomes from the Apprentice’s log of progress to meet with phase 3 evidence requirements above.



UNIT REF: GROUP 11	TRADE SPECIFIC ROUTE: MECHELEC
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**Rationale:** This group enables the apprentice to develop the understanding, knowledge and skills required to inspect, maintain, diagnose and repair bus and coach mechanical and electrical systems and components.

**Mechanical systems are:**

- engine, fuel, cooling and transmission systems

**Electrical systems are:**

- electronic drive systems, starting and charging systems, lighting and auxiliary electrical systems, components and associated wiring circuits

The group covers routine mechanical health checks and the maintenance and servicing as part of planned preventative maintenance.

KNOWLEDGE LEARNING OUTCOMES	ASSESSMENT CRITERIA
<b>The Apprentice will:</b>	<b>The Apprentice can:</b>
1. Understand bus and coach electrical and electronic principles	1.1. Explain the principles of electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics  1.2. Explain the principles of sensor inputs, computer processing and actuator outputs.  1.3. Identify sensor types (passive and active)  1.4. Identify the electrical principles that are related to bus and coach electrical circuits
2. Understand how to carry out Bus and Coach scheduled mechanical and electrical maintenance	2.1. Identify various sources of technical and legislative information relating to Bus and Coach mechanical and electrical maintenance procedures  2.2. Explain how to access, interpret and use the various sources of technical and legislative information  2.3. Identify the checks which need to be carried out as part of scheduled mechanical and electrical maintenance on Buses and Coaches  2.4. Explain how to carry out scheduled maintenance of Bus and Coach mechanical and electrical systems and components  2.5. Explain common faults found in Bus and Coach mechanical and electrical systems  2.6. Explain the organisational procedures for obtaining authorisation to conduct extra work found as a result



	<p>of scheduled mechanical and electrical maintenance activities on Buses and Coaches</p> <p>2.7. Explain how to examine, measure and make suitable adjustments to Bus and Coach mechanical and electrical systems and components</p> <p>2.8. Explain how to select, prepare and use maintenance equipment for Bus and Coach mechanical and electrical systems</p> <p>2.9. Describe the requirements of Bus and Coach maintenance arrangements as part of the Operator Licence criteria and organisational procedures</p> <p>2.10. Explain the importance of accurately recording Bus and Coach maintenance activities</p> <p>2.11. Explain the procedures for the correct disposal of waste materials produced as a result of maintenance and electrical activities</p> <p>2.12. Explain the procedures for reporting work progress and completion</p>
<p>3. Understand how Bus and Coach mechanical and electrical systems operate</p>	<p>3.1. Explain the construction and operation of Bus and Coach mechanical and electrical systems to include:</p> <ul style="list-style-type: none"><li>a. engine mechanical – fuel, coolant and transmission systems</li><li>b. electrical systems – electrical circuits, electrical units and components</li><li>c. auxiliary systems – battery charging, starting systems, electronic drive systems</li></ul> <p>3.2 Explain the interaction between electrical, electronic and mechanical components within the system defined</p> <p>3.3. Compare Bus and Coach mechanical and electrical system components and assemblies against alternatives to identify differences in construction and operation to include:</p> <ul style="list-style-type: none"><li>a. engine mechanical – fuel, coolant and transmission systems</li><li>b. electrical systems – electrical circuits, electrical units and components</li><li>c. auxiliary systems – battery charging, starting systems, electronic drive systems</li></ul>



	3.4. Explain the engineering principles that are related to Bus and Coach mechanical and electrical systems
4. Understand how to inspect, diagnose and repair mechanical and electrical faults in Bus and Coach systems	4.1 Identify key hazards and risks to be considered when carrying out inspection, diagnosis and repair activities on Bus and Coach systems and components  4.2. Describe how to analyse symptoms and causes of faults found in Bus and Coach mechanical and electrical systems to include: a. engine mechanical – fuel, coolant and transmission systems b. electrical systems – electrical circuits, electrical units and components c. auxiliary systems – battery charging, starting systems, electronic drive systems  4.3. Explain systematic diagnostic techniques used in identifying mechanical and electrical system faults  4.4. Explain how to examine, measure and make suitable adjustments to the components  4.5. Explain how to carry out the repair activities in order to correct the faults in Bus and Coach mechanical and electrical systems  4.6. Explain how to select, prepare and use diagnostic and repair equipment for Bus and Coach mechanical and electrical systems  4.7. Explain how to evaluate and interpret test results found in diagnosing Bus and Coach mechanical and electrical system faults against vehicle manufacturer specifications and settings  4.8. Explain how to evaluate the operation of components and systems following diagnosis and repair to confirm system performance

<p>5. Be able to carry out Bus and Coach scheduled mechanical and electrical maintenance activities</p>	<p>5.1. Carry out Bus and Coach scheduled mechanical and electrical maintenance using prescribed methods, adhering to the correct specifications and tolerances for the vehicle and following:</p> <ul style="list-style-type: none"> <li>a. the manufacturer's approved inspection methods</li> <li>b. recognised researched inspection methods</li> <li>c. health and safety requirements</li> </ul> <p>5.2. Carry out adjustments, replacement of vehicle components and replenishment of consumable materials following the manufacturer's current specification for:</p> <ul style="list-style-type: none"> <li>a. the particular maintenance interval</li> <li>b. working methods and procedures</li> <li>c. use of equipment</li> <li>d. the tolerances for the vehicle.</li> </ul> <p>5.3. Ensure the examination methods identify accurately any vehicle system and or component problems falling outside the maintenance schedule are specified.</p> <p>5.4. Ensure that the vehicle conforms to the vehicle operating specification and any legal requirements</p> <p>5.5. Ensure any comparison of the vehicle against specification accurately identifies any:</p> <ul style="list-style-type: none"> <li>a. differences from the vehicle specification</li> <li>b. vehicle appearance and condition faults</li> </ul> <p>5.6. Use suitable testing methods to evaluate the performance of all replaced and adjusted components and systems accurately</p>
<p>6. Be able to inspect, diagnose and repair Bus and Coach mechanical and electrical systems</p>	<p>6.1. Use diagnostic methods that are relevant to the symptoms presented</p> <p>6.2. Evaluate your assessment of dismantled sub-assemblies and identify their condition and suitability for repair or replacement accurately</p> <p>6.3. Carry out all inspection, diagnostic and repair activities following:</p> <ul style="list-style-type: none"> <li>a. manufacturers' instructions</li> <li>b. recognised researched repair methods</li> <li>c. workplace procedures</li> <li>d. health and safety requirements</li> </ul>



	<p>6.4. Ensure all repaired and replaced components and units conform to the vehicle operating specification and any legal requirements</p> <p>6.5. Adjust components and units correctly to ensure that they operate to meet system requirements</p> <p>6.6. Use testing methods that are suitable for assessing the performance of the system rectified</p> <p>6.7. Ensure the Bus and Coach system rectified performs to the vehicle operating specification and any legal requirements</p>
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PHASE 3 EVIDENCE REQUIREMENTS – FOR REVIEWING THE APPRENTICES` LOG OF PROGRESS
<p><b>1. The Apprentice must produce evidence of:</b></p> <ul style="list-style-type: none"><li>a. carrying out routine safety inspections.</li><li>b. carrying out routine mechanical and electrical servicing, planned preventative maintenance and health checks.</li><li>c. inspecting, diagnosing and repairing mechanical systems, engine, fuel, coolant and transmission systems.</li><li>d. inspecting, diagnosing and repairing electrical systems, electrical circuits, electrical units and components.</li><li>e. inspecting, diagnosing and repairing on board auxiliary systems, battery charging and electronic drive systems.</li><li>f. using diagnostic equipment and software to locate, diagnose and rectify faults on mechanical and electrical components.</li><li>g. using diagnostic equipment to interrogate electronic control units and programmable control systems</li></ul>
GATEWAY 3 REQUIREMENTS
<p>1. The training provider and mentor must review the Apprentice's progress to meet with the group knowledge and skills outcomes from the Apprentice's log of progress to meet with phase 3 evidence requirements above.</p>



Apprenticeship Route: Mechelec			
Gateway Requirements Review 3			
Mentor and Assessor Joint Review of Apprenticeship Progress			
Apprentice Name		Number	
Unit Number	Unit Description	The Apprentice has:	
		Met all unit outcomes	Not met all unit outcomes
Group 10	Bus and Coach Core Competencies		
Group 11	Inspect, Maintain, Diagnose and Repair Bus and Coach Mechanical and Electrical Systems		
<b>The Apprentice has fully embedded and naturally displays the following behaviors at all times:</b>		<b>Met all unit outcomes</b>	<b>Not met all unit outcomes</b>
Communicates effectively with colleagues, manufacturers and suppliers on a range of topics that supports the process of inspecting, diagnosing, repairing and testing of vehicle faults.			
Behaves in accordance with the values of the company they work for; treats customers and stakeholders with courtesy and responds quickly to their requirements.			
Operates as an effective team member taking responsibility, accountability and ownership of own actions.			
Continually develops knowledge and skills and mentors less experienced colleagues.			
Has a strong work ethic and understands the need to be reliable, flexible, and diligent and a good timekeeper.			
The Apprentice has successfully completed the math's component required for this Apprenticeship Standard			
The Apprentice has successfully completed the English component required for this Apprenticeship Standard			
Line / Senior manager: I can confirm the Apprentice is ready to take the End Point Assessment			Please Tick
Line / Senior manager: I believe the Apprentice requires further training before taking the End Point Assessment			Please Tick
Line / Senior manager Name:		Line / Senior manager Signature:	Date:





Line / Senior manager feedback to Apprentice:		
Assessor: I can confirm the Apprentice is ready to take the End Point Assessment		Please Tick
Assessor: I believe the Apprentice requires further training before taking the End Point Assessment		Please Tick
Assessor Name:	Assessor Signature:	Date:
Assessor feedback to Apprentice:		
Result of Review	Pass: (ready to progress to next phase)	Refer: (*more development required)
<b>* Where a referral is given, specific actions must be provided to the Apprentice in the feedback</b>		
Apprentice Signature: I have read and agreed with the mentor and assessor feedback		
Apprentice Comment: (Optional)		