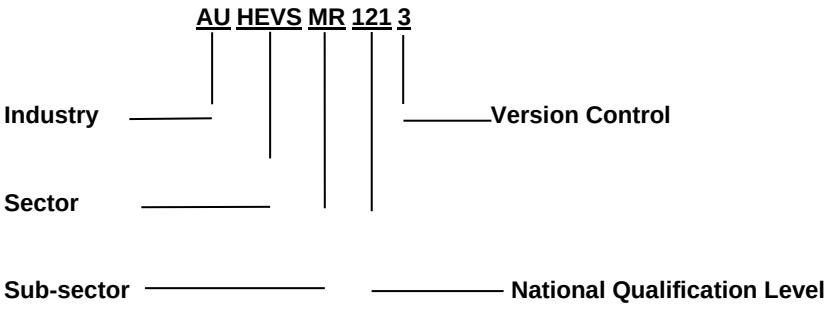
Competency Standards for Caribbean Vocational Qualifications (CVQ)

CCAUHEVSMR 213 CVQ Level 3 in Hybrid and Electric Vehicle Systems Maintenance and Repairs

Unit Number	Unit Title	Requirement
UA13503	Reduce risks to health and safety in the automotive environment	Mandatory
UA13603	Use tools and equipment in the automotive environment	Mandatory
UA13703	Isolate and reinstate electric and hybrid vehicle high voltage systems	Mandatory
UA13803	Perform service and repair on non-live electric and hybrid vehicle systems	Mandatory
UA13903	Diagnose and repair electric and hybrid vehicle high voltage batteries	Mandatory
UA14003	Conduct work on non-functioning and damaged electric and hybrid vehicles	Mandatory
U47403	Communicate with customers and others	Mandatory
U56502	Plan and allocate work to team members	Mandatory
U68402	Contribute to the protection of the environment	Mandatory

To obtain a Caribbean Vocational Qualification (CVQ) all Mandatory Units must be achieved.

Legend to Unit Code



Key: **AU – Automotive; HEVS – Hybrid and Electric Vehicle Systems; MR – Maintenance and Repairs**

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Country of Origin
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Qualification Overview

With Hybrid and Electric Vehicles increasing in popularity, garage technicians will become increasingly involved in the servicing and repair of these vehicles. The technological developments utilised with hybrid and electric vehicles along with the critical safety measures are very different to traditional vehicles.

The qualification covers the knowledge and skills required to work safely on hybrid and electric vehicles, diagnose problems and work safely around the high voltage battery and systems whilst carrying out repairs or replacement. This may include vehicles that may have or had damage to their high energy/electrical system.

Workers at this level must demonstrate competence in a broad range of complex, technical and professional work activities performed in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources are often a requirement. The individual must be capable of self-directed application and exhibit problem-solving, planning, designing and supervisory capabilities.

Like all NVQs, this qualification is competence based. This means that it is linked to candidates' ability to competently perform a range of tasks connected with their work. Candidates must plan a programme of development and assessment with their assessor and compile a portfolio of evidence to prove that they are competent in their work role.

Who is this qualification for?

The qualification is designed for motor vehicle technicians who maintain and repair hybrid technology vehicles, including the hybrid or electric drive system. It is intended for technicians who hold a Level 2 qualification (or higher) in automotive service and repair and a minimum of 2 years' workshop experience with electric and/or hybrid vehicles service level to ensure they are familiar with the skills, knowledge and techniques required to service, maintain and repair vehicles fitted with high voltage batteries and components.

Respective cluster of units

Candidates must complete the unit *UA13703 Isolate and reinstate electric and hybrid vehicle high voltage* systems before commencing units *UA13803 Carry out service and repair on non-live electric and hybrid vehicle systems, UA13903 Diagnose and repair electric and hybrid high voltage batteries and unit UA14003 Carry out work on broken down and damaged electric and hybrid vehicles*.

Where it can be used

The qualification can be used by technicians working in the automotive industry (car distributors/garages) who work on repairing and maintaining hybrid and electric vehicle batteries and systems.

Jobs in the occupational area

- Hybrid car technician
- Electric vehicle engineer

Occupational Standards can also be used to:

- Prepare job descriptions and specifications
- Determine recruitment criteria
- Appraise staff performance objectively
- Identify skill and training gaps and needs
- Conduct labour market analyses
- Develop curriculum
- Assess the effectiveness of training programmes
- Determine compensation and rewards

The benefits of acquiring the CVQ to candidates

- Provide a basis for articulation and accreditation
- Provides a broad-based preparation for employment
- Is an alternative route to further/higher education
- Complements and has parallel standing with academic qualifications
- Provides enhanced employability and higher earning potential
- Facilitates an apprenticeship with actual work experience
- Equips candidates with the knowledge, skills and attitudes for the workplace
- Past work experience and skills can count towards achieving the CVQ
- Allows for continuity whereby if a candidate cannot complete the CVQ at a centre or school, they can continue at another approved centre
- CVQ's are recognised qualifications and facilitates free movement of labour throughout CARICOM

The benefits of the CVQ to employers

- Provides a larger cadre of skilled employees/candidates to choose from
- Reduces cost of recruiting and selecting the ideal job candidate
- Reduces cost for training workers
- Ensures higher levels of productivity

The benefits of the CVQ to the Caribbean region:

- Produces a higher skilled workforce that is ready to adapt to ever-changing global demands
- Provides greater access for persons to achieve higher qualifications
- Contributes to the region's human resource capacity development

UA13503 Reduce risks to health and safety in the automotive environment

Unit Descriptor: This unit deals with the knowledge, skills and attitudes required to identify hazards and evaluate and reduce risks to health and safety in the workplace.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Identify risks and hazards to health and safety	1.1 Access sources of workplace policies which contain health and safety information on electric and hybrid vehicles to identify risks to health and safety of self and others.
	1.2 Perform a safety inspection of the work area and surroundings and identify any hazards or risks to health and safety according to workplace health and safety procedures.
2. Evaluate risks to health and safety	2.1 Prioritise identified hazards and risks according to workplace and health and safety requirements.
	2.2 Provide recommendations on how identified hazards and risks can be resolved to appropriate persons.
3. Reduce risks to health and safety	3.1 Select and wear suitable personal protective equipment according to manufacturers' instructions and workplace health and safety requirements.
	3.2 Select, use and maintain appropriate vehicle coverings throughout work activities according to workplace health and safety requirements.
	3.3 Control risks to health and safety of self and other persons following manufacturers' instructions and workplace policies and procedures.

3.4 Reduce health and safety risks that are within personal capability and job responsibility following workplace policies and procedures.

3.5 Make suitable recommendations on reducing risks of health and safety to the appropriate person, following workplace procedures.

3.6 Use equipment, materials and products to reduce the risk to health and safety following workplace policies, suppliers' instructions and manufacturers' instructions.

3.7 Complete appropriate documentation to record risks to health and safety according to workplace procedures and pass to the appropriate person.

RANGE STATEMENT

All range statements must be assessed:

1. **Personal protective equipment** may include but not limited to:

    - Overalls
    - Insulated gloves
    - Protective footwear
    - Protective eyewear
    - Protective headwear (when required)
    - Vehicle protective equipment (HV signage, wing protectors, insulated matting)

2. **Risks** may include but not limited to:

    - Incorrect use of tools and equipment relevant to the task
    - Incorrect use of materials and substances
    - Working practices which do not conform to laid down policies
    - Unsafe behaviour
    - Accidental breakages and spillages
    - Environmental factors
    - Working at heights
    - Incorrect lifting techniques
    - Incorrect use of personal protective equipment
    - Incorrect fire prevention equipment
    - Electrocution

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. What are the current health and safety legislation, regulations and workplace policies that regulate how you work.
2. Where to obtain workplace policies containing health and safety information.
3. Why it is important to identify and access sources of workplace policies containing health and safety information and how to do so.
4. Why it is important to carry out working procedures in accordance with relevant manufacturers' instructions, legislation requirements and workplace health and safety requirements.
5. Why it is important to perform a safety inspection of the work area and surroundings and identify any hazards or risks to health and safety according to workplace procedures and how to do so.
6. Why it is important to prioritise hazards and risks identified and provide recommendations on how they can be resolved to the appropriate person, following workplace and health and safety requirements.
7. How to prioritise identified hazards and risks and provide recommendations on how they can be resolved to the appropriate person.
8. Why is it important to select and wear suitable personal protective equipment according to manufacturers, instructions and workplace health and safety requirements.
9. Why it is important to select, correctly use and maintain appropriate vehicle coverings throughout all work activities according to workplace health and safety requirements and how to do so.
10. What are some of the risks to health and safety of self and other persons when working on high voltage systems and components.
11. Why it is important to control risks to health and safety of self and other persons following manufacturers' instructions and workplace policies and procedures and how to do so.
12. Why it is important to resolve health and safety risks that are within your capability and job responsibility following manufacturers' instructions and workplace policies and procedures and how to do so.
13. Why it is important to make suitable recommendations on reducing risks of health and safety to the appropriate person, following workplace procedures and how to do so.

14. Why it is important to use equipment, materials and products following workplace policies, suppliers' instructions and manufacturers' instructions and report any differences identified and how to do so.

15. Why it is important to complete appropriate documentation to record risks to health and safety according to workplace procedures and pass to the appropriate persons and how to do so.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real work environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Products of work

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **may not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA13603 Use tools and equipment in the automotive environment

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required by technicians to use tools and equipment in the automotive environment in accordance with health and safety requirements and manufacturers' instructions.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Prepare to use tools and equipment	1.1 Select and use personal protective equipment appropriate to the task and according to manufacturers' instructions.
	1.2 Obtain tools and equipment according job specifications and manufacturers' instructions.
	1.3 Follow workplace safety procedures and manufacturers' requirements whilst using tools and equipment.
	1.4 Carry out pre-start preparation inspections on tools and equipment according to manufacturers' instructions and workplace procedures.
	1.5 Identify faulty tools and equipment and report to the relevant persons, according to workplace procedures.
	1.6 Remove unsafe or faulty tools and equipment according to manufacturers' instructions and workplace procedures.
	1.7 Document any unsafe and faulty tools using relevant documentation according to operating procedures.

2.	Use tools and equipment	2.1 Adhere to safety and health requirements, workplace procedures and manufacturers' instructions when using tools and equipment.
		2.2 Carry out operations using tools and equipment according to manufacturers' instructions and workplace health and safety practices.
3.	Maintain tools and equipment	3.1 Perform routine and operational maintenance of tools and equipment following workplace procedures and manufacturers' instructions.
		3.2 Inspect, clean and store tools and equipment after use following manufacturers' instructions and workplace procedures.

RANGE STATEMENT

All range statements must be assessed:

1. **Personal protective equipment** may include but not limited to:

    - Overalls
    - Insulated gloves
    - Protective footwear
    - Protective eye wear
    - Protective headwear (when required)
    - Protective earwear
    - Vehicle protective equipment (HV signage, wing protectors, insulated matting)

2. **Tools and equipment** may include but not limited to:

    - Insulated hand tools
    - Power tools
    - Mechanical
    - Pneumatic
    - Hydraulic
    - Diagnostic

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. Why it is important to select and use personal protective equipment appropriate to the task.
2. What are the manufacturers' instructions for using and wearing personal protective equipment.
3. Which tools and equipment to select according to job specifications
4. Why it is important to follow workplace safety requirements and manufacturers' recommendations during use of tools and equipment and how to do so.
5. Why it is important to remove unsafe or faulty tools and equipment and what are the manufacturers' instructions and workplace procedures for doing so.
6. Why it is important to carry out pre-start preparation inspections on tools and equipment and what are the manufacturers' instructions and workplace procedures for doing so.
7. How to carry out pre-start preparation inspections on tools and equipment according to manufacturers' instructions and workplace procedures and when to do so.
8. Why and how to identify faulty tools and equipment and report to the relevant persons and what are the workplace procedures for doing so.
9. Why it is important to identify and remove unsafe or faulty tools and equipment and mark for repair and how to do so.
10. What are the workplace procedures for removing faulty tools and equipment and marking for repair.
11. Why it is important to adhere to manufacturers' instructions and safety and health requirements when using tools and equipment and how to do so.
12. How and when to carry out operations using the required tools and equipment according to job specifications.
13. Why it is important to undertake routine and operational maintenance of tools and equipment and what are the workplace procedures and manufacturers' instructions for doing so.
14. How to undertake routine and operational maintenance of tools and equipment according to workplace procedures and manufacturers' instructions.
15. Why it is important to inspect, clean and store tools and equipment after use and how to do so.
16. What are the manufacturers' recommendations and workplace procedures for inspecting, cleaning and storing tools and equipment after use.

17. Why it is important to document any unsafe and faulty tools using relevant documentation according to operating procedures and how to do so.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real work environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Products of work

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA13703 Isolate and reinstate electric and hybrid vehicle high voltage systems

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required by technicians to assess and isolate an electrical and hybrid vehicle high voltage system to make it safe to work on and reinstate the vehicle once the required work has been completed.

It has been recommended by industry experts that only those with appropriate training and experience on working with high voltage components of electric and hybrid vehicles should carry out the functions below.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Prepare to isolate the vehicle	1.1 Select wear suitable personal protective equipment according to manufacturers' instructions and workplace safety requirements.
	1.2 Select and use appropriate vehicle coverings throughout work activities according to manufacturers' instructions and workplace safety requirements.
	1.3 Identify specific high voltage components of the electric/hybrid vehicle following manufacturers' specifications and instructions.
	1.4 Use relevant sources to locate information on potential hazards in isolating and reinstating procedures.
	1.5 Interpret sourced information to determine potential hazards in isolating and reinstating procedures.
	1.6 Take precautions following manufacturers' instructions and workplace safety requirements to ensure that the vehicle is safe to work on.

		1.7 Prepare and test the required diagnostic tools and equipment for the job, according to the manufacturers' instructions and workplace requirements.
		1.8 Identify potential hazards by carrying out a visual assessment of the vehicle following manufacturers' instructions and workplace procedures.
		1.9 Notify relevant colleagues of your intention to work on a high voltage vehicle following workplace procedures.
2.	Isolate high voltage system	2.1 Locate and isolate the high voltage system following manufacturers' instructions.
		2.2 Work in a way to minimise injury to self and others following manufacturers' instructions, workplace procedures and health and safety requirements.
		2.3 Work in a way to minimise damage to the work environment, other persons, vehicle systems, components and units following manufacturers' instructions, workplace procedures and health and safety requirements.
		2.4 Conduct an appropriate test to ensure the residual voltage is below manufacturers' specifications and the vehicle is safe to work on.
		2.5 Secure and retain disconnected rechargeable energy storage system to prevent fitting by third party according to manufacturers' instructions and workplace procedures.
		2.6 Report problems with the electric/hybrid vehicle to the appropriate person in the workplace following workplace procedures.
3.	Reinstate high voltage system	3.1 Select and use personal protective equipment to carry out the reinstatement process according to workplace requirements and health and safety requirements.

		3.2 Reconnect the rechargeable energy storage system in the correct order to reactivate the vehicle, following manufacturers' instructions and workplace procedures.
		3.3 Use suitable tools, equipment and testing methods to evaluate the performance of the reassembled high voltage electrical vehicle systems according to manufacturers' instructions.
		3.4 Check and recalibrate sub-systems to ensure they are operating, according to manufacturers' instructions.
4.	Complete work processes	4.1 Carry out a final inspection to ensure the reassembled system performs to the manufacturers' operating specification before the vehicle is returned to customer.
		4.2 Clean area related to work activities following workplace procedures and health and safety requirements.
		4.3 Remove and dispose of waste material according to manufacturers' instructions, workplace health and safety procedures and relevant environmental legislation.
		4.4 Clean, maintain and store tools and equipment according to workplace requirements and manufacturers' instructions.
		4.5 Complete appropriate documentation according to workplace procedures and pass onto relevant persons.

RANGE STATEMENT

All range statements must be assessed:

1. **Personal protective equipment** may include but not limited to:

    - Overalls
    - Insulated gloves
    - Protective footwear
    - Protective eye wear
    - Protective ear wear
    - Vehicle protective equipment (HV signage, wing protectors, insulated matting)

2. **High voltage** may include but not limited to:

    - > 60 V and ≤ 1500 V DC
    - > 30 V and ≤ 1000 V AC root mean square (rms)

3. **Components** may include but not limited to:

    - Batteries (Low voltage and high voltage)
    - DC/DC Charger
    - Motor/generator
    - Cabling/wiring
    - Relays/Control units
    - Charger and charging points
    - Isolators
    - Inverters
    - Ignition/key-on control switch
    - Driver display panel
    - Drive trains
    - Ancillary systems and components

4. **Sources of information** may include but not limited to:

    - Manufacturers' data
    - Third party data
    - On vehicle data/warnings
    - Wiring diagrams
    - Repair instructions
    - Bulletins
    - Verbal instructions

5. **Precautions** may include but not limited to:

    - Awareness of magnetic components and their effects on equipment and tools
    - Checking voltage prior to working near or on high voltage systems
    - Isolating the work area
    - Isolation of high voltage electrical system

6. **Tools and equipment** may include but not limited to:

    - Insulated hand tools
    - Power tools
    - Code readers
    - Specialist tools e.g. manufacturer specific software
    - Safe and appropriate electrical testing equipment
    - Relevant safety equipment
    - Calibrated equipment (multi-meters, torque wrenches, measuring equipment, manufacturers' specialist tools)

7. **Testing methods** may include but not limited to:

    - Visual
    - Aural
    - Functional
    - Measurement

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. Why it is important to select and wear suitable personal protective equipment for work activities.
2. Why it is important to select and use appropriate vehicle coverings for work activities and what are the workplace safety requirements for doing so.
3. Why it is important to identify specific high voltage components of the electric/hybrid vehicle following the manufacturers' specifications and instructions and how to do so.
4. What are the relevant sources used to locate information to determine the potential hazards in isolating and reinstating procedures.
5. Why it is important to interpret information to determine potential hazards of isolating and reinstating procedures and how to do so.
6. What is the current health and safety legislation and specific vehicle manufacturers' repair and safety procedures relevant to working with electric/hybrid vehicles.
7. Why it is important to conduct safety precautions following manufacturers' instructions and workplace safety requirements to ensure that the vehicle is safe to work on and how to do so.
8. Why is it important to have an awareness of the effects that magnetic components have on equipment and tools.
9. What are the types of medical conditions that may be affected by high voltage or magnetic fields.
10. What are the testing and diagnostic tools and equipment required for the work activity.
11. Why it is important to prepare and test the required diagnostic tools and equipment, following the manufacturers' instructions and industry requirements and how to do so.
12. Why it is important to identify potential hazards by carrying out a visual assessment of the vehicle following manufacturers' instructions and how to do so.
13. Why it is important to notify relevant colleagues of your intention to work on a high voltage vehicle and what are the workplace procedures for doing so.
14. Why it is important to locate and isolate the high voltage system following the manufacturers' instructions and how to do so.
15. Why it is important to work in a way to minimise injury to yourself and others and what are the workplace procedures and health and safety requirements for doing so.

16. Why it is important to work in a way to minimise damage to your work environment and other vehicle systems, components and units and what are the manufacturers' specifications, workplace procedures and health and safety requirements for doing so.
17. What is the appropriate test to ensure the residual voltage is below manufacturers' specifications and that the vehicle is safe to work on.
18. Why it is important to carry out an appropriate test to ensure the residual voltage is below manufacturers' specifications and that the vehicle is safe to work on, and how to do so.
19. Why it is important to secure and retain the disconnected rechargeable energy storage system to prevent fitting by a third party, according to manufacturers' instructions and workplace procedures and how to do so.
20. Why it is important to report any problems with the electric and hybrid vehicle to relevant persons in the workplace and what are the workplace procedures for doing so.
21. Why it is important to select and use personal protective equipment to carry out the reinstatement process.
22. Why it is important to reconnect the rechargeable energy storage system in the correct order to reactivate the vehicle, and what are the manufacturers' instructions and workplace procedures for doing so.
23. Why it is important to use suitable tools, equipment and testing methods to evaluate the performance of the reassembled high energy electrical vehicle systems, and what are the manufacturers' instructions for doing so.
24. Why it is important to check and recalibrate subsystems to ensure they are operating and what are the manufacturers' instructions for doing so.
25. Why it is important to carry out a final inspection to ensure the reassembled systems perform to the vehicle manufacturers' operating specifications before the vehicle is returned to customer and how to do so.
26. What are the workplace procedures and health and safety requirements for cleaning areas related to work activities.
27. Why it is important to clean areas related to work activities and how to do so.
28. What are the workplace procedures, health and safety requirements and environmental and industry procedures for the removal and disposal of waste material and how to do so.
29. Why it is important to remove and dispose of all waste material according to manufacturers' instructions, workplace health and safety procedures and relevant environmental legislation.
30. What are the workplace procedures, health and safety requirements and environmental and workplace procedures for cleaning, maintaining and storing tools and equipment.

31. Why it is important to clean, maintain and store tools and equipment according to workplace requirements and manufacturers' instructions and how to do so.
32. What are the workplace procedures for completing workplace documentation and passing onto the relevant persons.
33. Why it is important to complete appropriate workplace documentation according to workplace procedures and pass to the relevant persons and how to do so.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real work environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Products of work

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **may be used** in circumstances where natural work evidence is unlikely to occur.

UA13803 Perform service and repair on non-live electric and hybrid systems

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required by technicians to carry out servicing and general repairs safely on non-live, high energy electrical systems and components on electrical and hybrid vehicles.

This unit only covers the competences required to work on non-live high energy electrical components and associated systems. It does not enable a candidate to dismantle 'live' components such as battery packs.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Undertake routine checks prior to starting service and repair	1.1 Select and wear suitable personal protective equipment according to workplace safety requirements and manufacturers' instructions.
	1.2 Select and use appropriate vehicle coverings throughout work activities according to manufacturers' instructions and workplace safety requirements.
	1.3 Identify specific components of the electric/hybrid vehicle according to vehicle specifications.
	1.4 Take the necessary precautions to ensure that the vehicle is safe to work on according to workplace safety requirements.
	1.5 Use relevant sources to locate information applicable to the component repair and replacement within high voltage electrical systems.
	1.6 Interpret sourced information applicable to the component repair and replacement within high voltage electrical systems.

2.	Test electrical systems and components	2.1 Prepare and test the required diagnostic tools and equipment, according to manufacturers' instructions and workplace procedures.
		2.2 Conduct diagnostic testing for electrical efficiency of the high voltage electrical system and components according to manufacturers' instructions, workplace procedures and safety requirements.
		2.3 Identify the faults within electrical systems and components and recommend the corrective action according to manufacturers' specifications.
		2.4 Perform removal and replacement activities following manufacturers' instructions and workplace health and safety requirements.
		2.5 Work in a way which minimises the risk of damage to the vehicle and its systems and to other persons and their property.
3.	Conduct service and repair on non-live electric and hybrid vehicle systems	3.1 Identify problems associated with the performance of high voltage electrical systems and components, following manufacturers' instructions and specifications.
		3.2 Carry out repairs, replacement or adjustments to the high voltage electrical systems and components following manufacturers' instructions and workplace procedures.
		3.3 Confirm that the manufacturers' recommendations and operating specifications have been met when replacing high voltage electrical components.
		3.4 Compile and submit a report on additional faults or damage noticed during the service and repair of the vehicle following workplace procedures.

		3.5 Carry out suitable testing methods to evaluate the performance of the reassembled high voltage electrical system according to manufacturers' recommendations.
4.	Complete work activities	4.1 Carry out final inspection to ensure the reassembled system performs to the vehicle manufacturers' operating specifications before returning to customer.
		4.2 Clean thr area related to work activities according to workplace procedures.
		4.3 Remove and dispose of waste material according to manufacturers' workplace and health and safety requirements.
		4.4 Clean, maintain and store tools and equipment according to workplace requirements and manufacturers' instructions.
		4.5 Complete documentation according to workplace procedures and pass to the relevant persons.

RANGE STATEMENT

All range statements must be assessed:

1. **Personal protective equipment** may include but not limited to:

   - Overalls
   - Insulated gloves
   - Protective footwear
   - Protective eye wear
   - Protective ear wear
   - Vehicle protective equipment (HV signage, wing protectors, insulated matting)

2. **Work activities** may include but not limited to:

   - Servicing non-live high voltage electrical systems and components
   - General repair of non-live high voltage electrical systems and components

3. **Components** may include but not limited to:

   - Batteries (Low voltage and high voltage)
   - Motor/generator
   - Cabling/wiring
   - Relays/Control units
   - Charger and charging points
   - Isolators
   - Inverters
   - Ignition/key-on control switch
   - Driver display panel
   - Drive trains
   - Ancillary systems and components

4. **Precautions** may include but not limited to:

   - Awareness of magnetic components and their effects on equipment and tools
   - Checking voltage prior to working near or on high voltage systems
   - Isolation of high voltage electrical system
   - Isolation of the work area

5. **Information** may include but not limited to:

   - Job requirements/specifications
   - Manufacturer's data
   - Third party data
   - On vehicle data/warnings
   - Wiring diagrams
   - Repair instructions

   - Bulletins
   - Verbal instructions

6. **High voltage electrical** may include but not limited to:

   - >60 V and ≤ 1500 V DC
   - >30 V and ≤ 1000 V AC root mean square (rms)

7. **Tools and equipment** may include but not limited to:

    - Insulated hand tools
    - Power tools
    - Code readers
    - Specialist tools e.g. manufacturer specific software
    - Safe and appropriate electrical testing equipment
    - Relevant safety equipment
    - Calibrated equipment (multi-meters, torque wrenches, measuring equipment, manufacturers specialist tools)

8. **Minimise the risk of damage** may include but not limited to:

    - Protecting the vehicle
    - Taking precautions when using electrical equipment
    - Disposing of waste material
    - Having awareness of the actions of others

9. **Testing methods** may include but not limited to:

    - Visual
    - Aural
    - Functional
    - Measurement

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. Why it is important to select and wear suitable personal protect equipment throughout work activities and what are the workplace safety requirements for doing so.
2. Why it is important to select and use appropriate vehicle coverings throughout work activities and how to do so.
3. What are the specific components of the electric/hybrid vehicle.
4. Why it is important to identify the specific components of the electric/hybrid vehicle following the manufacturers' specifications and instructions and how to do so.
5. What are the safety precautions to be conducted to ensure that it is safe to work on the vehicle.
6. Why it is important to conduct safety precautions to ensure that the vehicle is safe to work on and how to do so.
7. Why it is important to have an awareness of magnetic components and their effects on equipment and tools.
8. What are the types of medical conditions that may be affected by high voltage or magnetic fields.
9. Why it is important to locate, interpret and use sources of information applicable to the component repair and replacement within high energy electrical systems and how to do so.
10. What are the testing and diagnostic tools and equipment required.
11. What is the process for conducting a diagnostic test on an electric or hybrid vehicle.
12. Why is it important to conduct a diagnostic test and how to do so.
13. Why it is important to prepare and test the required diagnostic tools and equipment required, and how to do so.
14. What are the manufacturers' instructions and workplace procedures for preparing and testing the required diagnostic tools and equipment.
15. How to carry out diagnostic testing for electrical efficiency of the high energy electrical system and components and what are the manufacturers' instructions, workplace procedures and safety requirements for doing so.
16. Why it is important to identify the faults within electrical systems and components and recommend the corrective action and how to do so.
17. What are the types of removal and replacement activities that may need to be carried out.
18. Why it is important to carry out removal and replacement activities following manufacturers' instructions and health and safety requirements and how to do so.

19. Why it is important to work in a way which minimises the risk of damage to the vehicle and its systems and other people and their property and how to do so.
20. What are the types of problems associated with the performance of the high energy electrical systems and components.
21. How to identify problems associated with the performance of the high energy electrical systems and components.
22. How to carry out repairs, replacement or adjustments to the high energy electrical systems and components and what are the manufacturers' instructions and workplace procedures for doing so.
23. Why it is important to confirm that the manufacturers' recommendations conform to operating specifications when replacing high energy electrical components and how to do so.
24. Why it is important to compile a record and submit a report on additional faults or damage noticed during the service and repair of the vehicle and how to do so.
25. What are suitable testing methods to evaluate the performance of the reassembled high energy electrical system.
26. How to use suitable testing methods to evaluate the performance of the reassembled high energy electrical system.
27. Why it is important to carry out a final inspection to ensure the reassembled system performs to the vehicle operating specifications and legal requirements before returning to customer and how to do so.
28. Why it is important to clean the area related to the work activity.
29. Why it is important to remove and dispose of all waste material according to manufacturers' instructions and health and safety requirements and how to do so.
30. Why it is important to clean, maintain and store tools and equipment according to manufacturer's recommendations and how to do so.
31. What are the company procedures and manufacturers' recommendations for cleaning, maintaining and storing tools and equipment.
32. Why it is important to complete appropriate workplace documentation according to workplace procedures and pass to the relevant persons and how to do so.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real work environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Products of work

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **may be used**, in circumstances where natural work evidence is unlikely to occur.

UA13903 Diagnose and repair electric and hybrid vehicle high voltage batteries

Unit Descriptor

This unit deals with the knowledge, skills and attitudes required by senior technicians to carry out work on live or potentially live battery systems and related high voltage components in electric and hybrid vehicles.

It has been recommended by industry experts that only those with appropriate training and experience working with high voltage components of electric and hybrid vehicles should carry out the functions below.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Follow health and safety procedures	1.1 Observe workplace and manufacturers' safety information prior to commencing work on high voltage battery and components.
	1.2 Establish job requirements following workplace procedures.
	1.3 Assess the risks of the vehicle and the work to be carried out following manufacturers' instructions and/or workplace safety procedures.
	1.4 Select and wear personal protective equipment according to workplace procedures and manufacturers' instructions.
	1.5 Take the necessary precautions to ensure that the vehicle is safe to work on following workplace procedures and safety requirements.
	1.6 Identify high voltage cabling and associated components according to manufacturers' specifications.
	1.7 Take the necessary precautions when working with high voltage components following manufacturers' instructions and workplace safety requirements.

		1.8 Perform an inspection of the external and visible parts of the high voltage battery for signs of damage, following manufacturers' instructions, workplace procedures and safety requirements.
2.	Diagnose damaged high voltage batteries and components	2.1 Analyse and select the appropriate diagnostic options for the circumstances according to manufacturers' specifications and instructions and workplace procedures.
		2.2 Select and check diagnostic tools and equipment for serviceability following manufacturers' recommendations and workplace safety procedures.
		2.3 Use diagnostic and test equipment in line with manufacturers' instructions to ensure the integrity of the high voltage battery and system prior to commencing any repairs.
		2.4 Identify and determine faults from diagnostic test results following manufacturers' instructions and specifications, workplace procedures and safety requirements.
		2.5 Report diagnostic findings and recommendations for required repairs or adjustments according to workplace procedures.
3.	Prepare to repair damaged high voltage batteries and components	3.1 Interpret the results obtained from the diagnostic test equipment according to manufacturers' specifications and workplace procedures.
		3.2 Carry out re-inspection following timelines recommended by the manufacturer when work is not conducted immediately after the initial inspection.
		3.3 Isolate high voltage system and reduce battery voltage to a safe working limit according to workplace procedures and manufacturers' specifications.

		3.4 Select and perform a visual inspection of the lifting/supporting tools and equipment prior to use following workplace procedures.
		3.5 Remove the high voltage battery and place in a safe, suitable, isolated area with restricted access following manufacturers' instructions.
		3.6 Remove the high voltage battery housing or inspection covers to carry out a visual inspection avoiding contact with any components following manufacturers' instructions.
4.	Repair damaged high voltage batteries and components	4.1 Inspect all new components for damage prior to installation using visual inspection methods.
		4.2 Perform removal and replacement activities following manufacturers' instructions, workplace procedures and health and safety requirements.
		4.3 Carry out a full inspection with a suitably experienced colleague, where possible, to ensure the integrity of the repair, prior to re-establishing the normal operating battery system voltage, according to manufacturers' specifications and workplace procedures.
		4.4 Check that the normal operating battery voltage has been re-established in line with manufacturers' instructions.
		4.5 Reassemble the battery housing/inspection covers according to manufacturers' instructions.
		4.6 Recommission the battery in line with manufacturers' instructions using specialist, high voltage test equipment.
		4.7 Reinstall the battery following manufacturers' recommendations with particular attention to potential equalisation connections.

	4.8 Reinstate the vehicle following manufacturers' guidelines.
	4.9 Carry out diagnostic test after completing repairs and prior to the handing over of the vehicle, following manufacturers' recommendations and workplace procedures.
	4.10 Record and report any additional faults noticed during service and repairs, following workplace procedures.
	4.11 Make suitable recommendations based on the results of carrying out the service and repairs, following workplace procedures.
5. Complete work processes	5.1 Carry out final inspection to ensure the reassembled system performs to the vehicle operating specifications and workplace requirements before returning to customer.
	5.2 Clean area related to work activities following workplace procedures.
	5.3 Remove and dispose of all waste material according to manufacturers' instructions, workplace health and safety procedures and environmental requirements.
	5.4 Clean, maintain and store tools and equipment according to workplace procedures and manufacturers' instructions.
	5.5 Complete appropriate documentation according to workplace procedures and pass to the relevant persons.

RANGE STATEMENT

All range statements must be assessed:

1. **High voltage** may include but not limited to:

   - > 60 V and ≤ 1500 V DC
   - > 30 V and ≤ 1000 V AC root mean square (rms)

2. **Personal protective clothing and equipment** may include but not limited to:

   - Overalls
   - Insulated gloves
   - Protective footwear, e.g. di-electric boots
   - Protective eye wear
   - Protective ear wear
   - Protective headwear (when required)
   - Vehicle protective equipment (HV signage, insulated matting)

3. **Precautions** may include but not limited to:

   - Awareness of magnetic components and their effects on equipment and tools
   - Checking voltage prior to working near or on high voltage systems
   - Isolation of high voltage electrical system
   - Isolation of the work area

4. **Components** may include but not limited to:

   - Batteries (Low voltage and high voltage)
   - DC-DC converter
   - Battery Management System
   - Motor/generator
   - Cabling/wiring
   - Relays/Control units
   - Charger and charging points
   - Isolators
   - Inverters
   - Ignition/key-on control switch
   - Driver display panel
   - Drive trains
   - Ancillary systems and components

5. **Damage** may include but not limited to:

    - Overheating
    - Physical impact damage
    - Chemical leakage
    - Smoke damage
    - Water damage

6. **Tools and equipment** may include but not limited to:

    - Insulated hand tools
    - Power tools
    - Code readers
    - Specialist tools e.g., manufacturer specific software, insulated hand tools
    - Safe and appropriate electrical testing equipment
    - Relevant safety equipment
    - Calibrated equipment (multi-meters, torque wrenches, measuring equipment, manufacturers' specialist tools)

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. What are the current health and safety legislation and specific vehicle manufacturers' repair and safety procedures relevant to working with electric and hybrid vehicles.
2. Why it is important to observe workplace and manufacturers' safety information prior to commencing work on high voltage vehicles and how to do so.
3. How to establish the job requirements following workplace procedures.
4. Why it is important to carry out a risk assessment of the vehicle and the work to be carried out and how to do so.
5. Why it is important to select and wear personal protective clothing and equipment and what are the manufacturer's and workplace instructions for doing so.
6. What are the workplace safety requirements and precautions to be taken to ensure that the vehicle is safe to work on.
7. What are the high voltage cabling and associated components.
8. Why it is important to identify high voltage cabling and associated components and how to do so.
9. What are the precautions that should be taken when working with hybrid components.
10. Why it is important to take precautions when working with high voltage components and how to do so.
11. Why it is important to have an awareness of magnetic components and their effects on equipment and tools.
12. What are the types of medical conditions that may be affected by high voltage or magnetic fields.
13. What are the manufacturers' recommendations and workplace safety requirements for working with high voltage components.
14. What are the signs of damage to a high voltage battery.
15. Why it is important to carry out a thorough inspection of the external and visible parts of the high voltage battery for signs of damage and how to do so.
16. Why it is important to analyse and select the appropriate diagnostic options for the circumstances and how to do so.
17. How to select and check diagnostic tools and equipment for serviceability.

18. What are the manufacturers' recommendations and workplace safety requirements for selecting and checking diagnostic tools and equipment for serviceability.
19. What is the process for conducting a diagnostic test on an electric or hybrid vehicle.
20. Why is it important to conduct a diagnostic test and how to do so.
21. How to use diagnostic and test equipment in line with manufacturers' instructions to ensure the integrity of the high voltage battery and the high voltage system prior to commencing any repairs.
22. Why it is important to check for external damage to high voltage connections or cables how to do so.
23. Why it is important to identify and determine faults from diagnostic test results how to do so.
24. How to interpret the results obtained from the diagnostic test equipment.
25. Why it is important to report diagnostic findings and recommendations for required repairs or adjustments and how to do so.
26. What are the workplace procedures for reporting diagnostic findings and recommendations for required repairs.
27. When to carry out re-inspection following timelines recommended by the manufacturer when work is not conducted immediately after inspection and how to do so.
28. What is the safe working limit when reducing the battery voltage.
29. Why is it important to isolate the high voltage system and reduce battery voltage to a safe working limit and how to do so.
30. What are the appropriate lifting/supporting tools and equipment to select.
31. Why it is important to perform a visual inspection of the lifting/supporting tools and equipment prior to use and how to do so.
32. Why it is important to remove the high voltage battery and place in a safe, suitable, isolated area with restricted access and how to do so.
33. How to remove the high voltage battery housing or inspection covers to carry out a visual inspection avoiding contact with any components.
34. Why it is important to inspect all new components for damage prior to installation using visual inspection methods and how to do so.
35. How to carry out all removal and replacement activities following manufacturers' instructions, workplace procedures, and health and safety requirements.
36. How to carry out a full inspection, with a suitably experienced colleague, to ensure the integrity of repairs, prior to reestablishing the normal operating battery system voltage.

37. What are the workplace procedures for carrying out a full inspection with a suitably experienced colleague to ensure the integrity of repairs, prior to reestablishing the normal operating battery system voltage.
38. How to check that the normal operating battery voltage has been re-established in line with manufacturers' instructions.
39. How to reassemble the battery housing/inspection covers according to manufacturers' instructions.
40. How to recommission the battery in line with manufacturers' instructions using specialist, high voltage test equipment.
41. Why it is important to reinstall the battery following manufacturers' recommended instructions with particular attention to any potential equalisation connections and how to do so.
42. How to reinstate the vehicle following manufacturers' guidelines.
43. Why it is important to carry out a diagnostic test after the completion of repairs and prior to handing over of the vehicle and how to do so.
44. Why it is important to record and report any additional faults noticed during the service and repairs and what are the workplace procedures for doing so.
45. Why it is important to make suitable recommendations based on the results of carrying out the service and repairs and how to do so.
46. Why it is important to clean areas related to work activities and what are the workplace procedures for doing so.
47. Why it is important to remove and dispose of waste material and how to do so.
48. What are the workplace health and safety requirements for disposing of waste material.
49. Why it is important to clean, maintain and store tools and equipment and how to do so.
50. What are the manufacturers' recommendations and workplace procedures for cleaning, maintaining and storing tools and equipment.
51. How to complete appropriate documentation according to workplace procedures and pass to the relevant persons.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real work environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Products of work

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **may be used**.

UA14003 Conduct work on non-functioning and damaged electric and hybrid vehicles

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required by technicians to work safely around broken down or accident damaged electric and hybrid vehicles, for example, roadside recovery.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Prepare to work on non-functioning or accident damaged electric/hybrid vehicles	1.1 Select and wear personal protective equipment for the work activities to be carried out according to manufacturers' instructions and workplace safety requirements.
	1.2 Use relevant sources to locate information about the electric/hybrid vehicle to identify potential hazards.
	1.3 Interpret sourced information about the electric/hybrid vehicle to identify potential hazards.
	1.4 Select the appropriate tools and equipment required for roadside work activities.
	1.5 Conduct a risk assessment and identify the hazards on approaching a vehicle that has broken down roadside or involved in an accident, following manufacturers' instructions and roadside and workplace safety procedures.
2. Perform repairs on non-functioning or accident damaged electric/hybrid vehicles	2.1 Confirm that the electric/hybrid vehicle is safe prior to starting work activities including, where necessary, isolating high voltage electrical systems, following manufacturers' instructions and roadside safety procedures.
	2.2 Carry out work activities in a way that minimises personal risks to self and other persons following roadside safety and workplace procedures and manufacturers' instructions.

2.3 Refer problems with the electric/hybrid vehicle that you cannot deal with to relevant persons in the workplace and follow their instructions.

2.4 Report work activities you have conducted on or near the electric/hybrid vehicle to relevant persons according to workplace procedures.

RANGE STATEMENT

All range statements must be assessed:

1. **Personal protective equipment** may include but not limited to:

   - Overalls
   - Insulated gloves
   - Protective footwear
   - Protective eye wear
   - Vehicle protective equipment (HV signage, wing protector, insulated matting)

2. **Work activities** may include but not limited to:

   - Recovering electric/hybrid vehicles
   - Dealing with electric/hybrid vehicles as part of an emergency response
   - Onsite valuation

3. **Sources of information** may include but not limited to:

   - Manufacturer data
   - Third party data
   - On vehicle data/warnings
   - Wiring diagrams
   - Repair instructions
   - Verbal instructions

4. **Tools and equipment** may include but not limited to:

   - Hand tools
   - Power tools
   - Diagnostic
   - Pneumatic
   - Electrical

5. **High voltage electrical** may include but not limited to:

   - > 60 V and ≤ 1500 V DC
   - > 30 V and ≤ 1000 V AC root mean square (rms)

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. What are the pieces of personal protective clothing and equipment that must be worn to conduct work activities and what are the workplace and manufacturers' requirements for doing so.
2. Why it is important to wear protective clothing and equipment appropriate to the work activities to be carried out.
3. What are the appropriate tools and equipment that should be selected for roadside work activities.
4. Why it is important to conduct a risk assessment and identify the hazards on approaching a vehicle that has broken down roadside or been involved in an accident.
5. What are the roadside safety procedures, workplace safety instructions and manufacturers' instructions that should be followed when conducting a risk assessment and identifying the hazards of a vehicle that has broken down roadside or been involved in an accident.
6. How to conduct a risk assessment on approaching a vehicle that has broken down roadside or been involved in an accident.
7. What are the potential hazards associated with high and low voltage systems including batteries and other high energy electrical vehicle components.
8. What are the differences between electric/hybrid vehicles and non-electric vehicles.
9. What are the charging systems associated with electric/hybrid vehicles and how to charge them safely, including the use of plug-in charging equipment.
10. Why it is important to follow the correct procedures to make the electric/hybrid vehicle safe prior to starting any work activities including, where necessary, isolating high voltage electrical systems and how to do so.
11. Why it is important to carry out work activities in a way that minimises risks to yourself and other people.
12. How to reduce the risk of hazards when working on and around electric/hybrid vehicles.
13. What are the hazards associated with electric/hybrid vehicle batteries when exposed to extreme temperatures, impact and other adverse conditions.
14. What are the specific vehicle manufacturer restrictions regarding non-start and recovery, for example, jump starting (hybrid only) and towing/lifting.
15. What are the implications of electrical conductivity through the human body and the potential medical conditions that can occur regardless of voltage or current type present in an electric/hybrid vehicle.

16. What are the workplace procedures for reporting problems and work carried out when working with electric/hybrid vehicles.

17. Why it is important to report the work activities you have carried out on or near the electric/hybrid vehicle to relevant persons.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, range and underpinning knowledge **on more than one occasion**. This evidence must come from a real work environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Products of work

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **may be used**.

U47403 Communicate with customers and others

Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to politely and effectively communicate with other persons encountered while working.

Clear communication is important to pass on all necessary information and make sure health and safety information and workplace procedures are understood.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Communicate information to customers and others	1.1 Adhere to organisational standards of dress and deportment.
	1.2 Obtain relevant and current information for working effectively.
	1.3 Communicate with colleagues and other personnel using appropriate communication strategies.
	1.4 Communicate information clearly in a systematic and structured manner.
2. Respond to customers and others	2.1 Answer customers' questions and comments in a positive manner.
	2.2 Acknowledge and respond to communication clearly, courteously in accordance with organisational procedures.
	2.3 Question persons to confirm that the information received is understood.
	2.4 Record information in an appropriate manner in accordance with organisational procedures.
	2.5 Present accurate and current information in a clear and concise manner to relevant persons.

2.6 Take corrective action when there are difficulties in relaying information.

2.7 Report faults with communication equipment immediately to appropriate persons.

2.8 Acknowledge and respond to customers' needs and attitudes.

RANGE STATEMENT

All range statements must be assessed:

1. **Customers** may include but not limited to:

    - Internal (colleagues, supervisors, etc.)
    - External (other organisations, business places, the public)

2. **Communication** may include but not limited to:

    - Telephone calls
    - Emails/Internet
    - Faxes
    - Letters
    - Social media
    - Face-to-face/verbal

3. **Faults** may include but not limited to:

    - Electronic
    - Mechanical
    - Physical

4. **Communication equipment** may include but not limited to:

    - Telephones (fixed line, mobile)
    - Computer equipment
    - Smart phones, tablets
    - Faxes

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. What are the reasons for communicating with others.
2. What are the organisational procedures for personal appearance and behaviour.
3. How does your behaviour and attitude reflect on your workplace and organisation.
4. What is the importance of creating a positive impression.
5. How to obtain your work instructions and verify that the work instructions are up-to-date.
6. What is the reason for checking that the information is understood correctly.
7. What are the different forms of communication available and how they are used.
8. How to use appropriate strategies to communicate with colleagues and other personnel.
9. Why it is important to communicate clearly and provide necessary information.
10. How to communicate information clearly and systematically.
11. Why it is important to respond positively to questions and queries from customers.
12. How to respond to customers' questions and queries courteously, promptly and in a positive manner.
13. What are the organisational procedures for acknowledging and responding to incoming information.
14. How to use effective questioning techniques to ensure information is understood.
15. What are the organisational and workplace procedures for recording information.
16. What is the correct process for transferring information.
17. How to ensure that the correct or authorised person receives the information.
18. How to identify problems in the relaying of information.
19. What are the corrective measures or actions taken to rectify problems in relaying information and how these should be applied.
20. What is the procedure for reporting faults with communication equipment.
21. How to identify customers' needs and attitudes.
22. How to respond correctly to customers' needs and attitudes.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge, **on more than one (1) occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used** except in exceptional circumstances where natural work evidence is unlikely to occur.

U56502 Plan and allocate work to team members

Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to ensure that the work required of your team is effectively and fairly allocated, taking account of workloads and opportunities for development.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Plan work	1.1 Clarify and confirm work required of the team with your manager.
	1.2 Plan work and identify priorities or critical activities, making use of the available resources.
	1.3 Allocate work to team members taking into account skills, knowledge, attitudes, background, existing workloads and opportunities for development.
2. Allocate work	2.1 Brief team members on the work allocated and the standard of performance expected.
	2.2 Motivate team members to ask questions, make suggestions and seek clarification in relation to work allocated.
	2.3 Address concerns team members have about work.
3. Improve team performance	3.1 Identify ways of improving team performance.
	3.2 Provide team members with feedback to improve their performance.
	3.3 Implement ways of improving team performance.

RANGE STATEMENT

All range statements must be assessed:

1. **Improving team performance** may include but not limited to:

    - Training
    - One-on-one discussions
    - Feedback on overall team performance
    - Team talks and meetings

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. Why it is important to plan, confirm and clarify priorities and critical activities with the manager and how to do this effectively.
2. How to identify available resources.
3. Why and how work should be allocated fairly.
4. Why and how to brief team members on the work and what is the standard or level of expected performance.
5. How to encourage team members to ask questions, seek clarification and make suggestions in relation to work allocated.
6. How to address concerns of the team members about work allocated.
7. What are your organisation's policy and procedures for personal and professional development.
8. What are the organisation's standards or levels of expected performance.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates have to prove that they can carry out **all** of the elements, meeting all the performance criteria, underpinning knowledge and range on more than one occasion. This evidence must come from a real work environment.

The underpinning knowledge may be assessed off-the-job with the use of written or verbal items inclusive of short answer or reflection.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

This unit must be assessed through practical demonstrations on-the-job dealing with a variety of situations and a range of communication processes with colleagues until competency is achieved.

Simulation is not accepted for this unit.

U68402 Contribute to the protection of the environment

Unit Descriptor: This unit deals with the knowledge, skills and attitudes required to conduct work activities in a manner that protects the environment. Candidates should take steps to minimise any negative impact on the environment by completing tasks and activities in a way which causes as little damage or disturbance as possible to the environment while following organisational procedures.

ELEMENT	PERFORMANCE CRITERIA
Candidates must be able to:	
1. Work in an environmentally conscious way	1.1 Perform duties in accordance with relevant policies and legislation.
	1.2 Execute duties in a manner which minimises environmental damage.
	1.3 Operate and handle equipment and materials in a manner that minimises environmental damage.
2. Contribute to continuous improvements in protecting the environment	2.1 Identify instances of possible or actual environmental damage and take appropriate action.
	2.2 Identify improvements to procedures and practices in terms of good environmental practice and report to relevant persons.
	2.3 Dispose of hazardous and non-hazardous waste according to approved legislative procedures and practices.
	2.4 Contribute to sustainable development particularly in the conservation of energy, water, use of resources and equipment to minimise environmental damage.

RANGE STATEMENT

All range statements must be assessed:

1. **Relevant policies and legislation** may include but not limited to:

    - Organisational policies
    - Health and safety at work
    - Environmental legislation
    - Solid waste management policies
    - Recyclable policies

2. **In a manner which minimises environmental damage** may include but not limited to:

    - Using recycled/reused items and materials where appropriate
    - Disposing of polluting substances safely
    - Reducing the volume of waste
    - Using biodegradable and eco-friendly chemicals
    - Planning tasks to reduce the use of fuel and electricity

3. **Equipment and materials** may include but not limited to:

    - Hand tools
    - Power tools
    - Personal protective equipment
    - Cleaning chemicals
    - Soaps and sanitisers
    - Paper towels
    - Garbage disposal bags
    - Cloths and towels
    - Containers
    - Access equipment

4. **Hazardous waste** may include but not limited to:

    - Oils
    - Chemicals and solutions
    - Harmful materials (asbestos, fibreglass)
    - Electronic equipment
    - Organic hazards (pest excrement, pest carcasses)

5. **Non-hazardous waste** may include but not limited to:

    - Food
    - Plant matter
    - Paper

UNDERPINNING KNOWLEDGE AND SKILLS

Candidates should know and understand:

1. What are the relevant policies and legislation governing environmental protection.
2. How to recognise any likely or actual environmental damage.
3. What are the appropriate actions to take in the discovery of likely or actual environmental damage.
4. What are the ways in which tools and materials should be used in order to minimise environmental damage.
5. What are the different types of pollution.
6. What are the consequences of pollution.
7. How to recognise wastage of energy, water, equipment and materials.
8. What are the methods of working that will minimise pollution and wastage of resources.
9. What are the types of damage which may occur, the impact these can have on the environment and corrective actions to be taken.
10. What are the methods of waste disposal which will minimise the risk to the environment.
11. What are the organisational requirements to prevent wastage.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on no less than three (3) occasions**. This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

(3) Context of Assessment

This unit may be assessed on the job, off the job or using a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, products and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **must not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

Level 3 Glossary of Terms

Assessment methods

The methods which can be used to determine competence in performance and underpinning knowledge.

Assessors

The Assessor guides and assesses the candidate. His/her role is to determine whether evidence presented by a candidate for assessment within the programme, meets the required standard of competence in the relevant unit or element. The Assessor needs to be competent to assess to national standards in the area under assessment.

Approved Centre

Organisation/Centre approved by the TVET Council/National Training Agency to offer full Caribbean Vocational Qualifications.

Case Studies

In situations where it is difficult for workplace assessment to take place, case studies can offer the candidate an opportunity to demonstrate potential competence.

A case study is a description of an actual or imaginary situation presented in some detail. The way the case study is presented will vary depending upon the qualification, but the most usual methods are written, taped or filmed.

The main advantage of a case study is the amount of evidence of underpinning knowledge they can generate and the specific nature of the evidence produced.

Competence

In the context of vocational qualifications, competence means: the ability to carry out prescribed activities to nationally pre-determined standards in an occupation. The definition embraces cognitive, practical and behavioural skills, underpinning knowledge and understanding and the ability to react appropriately in contingency situations.

CVQ

National Vocational Qualifications (CVQs) are work-based qualifications that assess an individual's competence in a work situation and certify that the individual can perform the work role to the standards expected in employment.

CVQs are based on national occupational standards of competence drawn up by standards-setting bodies known as Industry Lead Bodies. The standards describe the level and breadth of performance that is expected of persons working in the industry or sector which the CVQ covers.

Level 3 Glossary of Terms

CVQ Coordinator

The CVQ Coordinator is the centre contact within each approved Centre offering CVQs. He/she has overall responsibility for the operation and administration of the CVQ system

Element

An element is a description of an activity which a person should be able to do. It is a description of an action, behaviour or outcome which a person should be able to demonstrate.

Explanation of CVQ Levels

CVQs cover five (5) levels of competence, from entry level staff at Level 1 through to senior management at Level 5.

Level 1 - Entry Level

Recognises competence in a range of varied work activities performed in a variety of contexts. Most work activities are simple and routine. Collaboration with others through work groups or teams may often be a requirement. Substantial supervision is required especially during the early months evolving into more autonomy with time.

Level 2 - Skilled Occupations

Recognises competence in a broad range of diverse work activities performed in a variety of contexts. Some of these may be complex and non-routine and involve some responsibility and autonomy. Collaboration with others through work groups or teams and guidance of others may be required.

Level 3 - Technician and Supervisory Occupations

Recognises competence in a broad range of complex, technical or professional work activities performed in a wide variety of contexts, with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources are often a requirement. The individual is capable of self-directed application, exhibits problem solving, planning, designing and supervisory capabilities.

Level 4 - Technical Specialist and Middle Management Occupations

Recognises competence involving the application of a range of fundamental principles and complex techniques across a wide and unpredictable variety of contexts. Requires very substantial personal autonomy and often significant responsibility for the work of others, the allocation of resources, as well as personal accountability for analysis, diagnosis, design, planning, execution and evaluation.

Level 3 Glossary of Terms

Level 5 - Chartered, Professional and Senior Management Occupations

Recognises the ability to exercise personal professional responsibility for the design, development or improvement of a product, process, system or service. Recognises technical and management competencies at the highest level and includes those who have occupied positions of the highest responsibility and made outstanding contribution to the promotion and practice of their occupation.

External Verifier

The External Verifier is trained and appointed by the TVET Council/National Training Agency and is competent to approve and ensure an approved Centre's quality of provision.

Internal Verifier

The Internal Verifier acts in a supporting role for Assessors to ensure consistent quality of assessment and competence. They need to be competent to assess to national standards in the area under assessment.

Observation

Observation of the candidate carrying out his/her job in the workplace is the assessment method recommended in the vast majority of units and elements. Observation of staff carrying out their duties is something that most supervisors and managers do every day.

Performance Criteria

Performance criteria indicate what is required for the successful achievement of an element. They are descriptions of what you would expect to see in competent performance.

Product of Work

This could be items produced during the normal course of work, which can be used for evidence purposes such as reports, menus, promotional literature, training plans, etc.

Questioning

Questioning is one of the most appropriate ways to collect evidence to assess a candidate's underpinning knowledge and understanding.

Questioning can also be used to assess a candidate in those areas of work listed in the range which cannot be assessed by observation. Guidance on when this assessment method can be used is given in the assessment guidance of each individual element.

As an assessment method, questioning ensures you have all of the evidence about a candidate's performance. It also allows you to clarify situations.

Level 3 Glossary of Terms

Range statements

The range puts the element of competence into context. A range statement is a description of the range of situations to which an element and its performance criteria is intended to apply.

Range statements are prescriptive therefore each category must be assessed.

Role-plays

Role-plays are simulations where the candidate is asked to act out a situation in the way he/she considers "real" people would behave. By using role-play situations to assess a candidate you are able to collect evidence and make a judgment about how the candidate is most likely to perform. This may be necessary if the range specified includes a situation in which the candidate is unlikely to find himself/herself in the normal course of their work, or where the candidate needs to develop competence, before being judged competently, for example, in a disciplinary situation,

Simulations

Where possible, assessment should always be carried out by observing **natural performance** in the workplace. **Simulated performance,** however, can be used where specified to collect evidence about an aspect of the candidate's work which occurs infrequently or is potentially hazardous; for example, dealing with fires.

By designing the simulated situation, briefing the candidate and observing his/her performance, you will be able to elicit evidence which will help you judge how a candidate is **most likely** to perform in real life.

Supplementary evidence

Supplementary evidence can be used to confirm and support performance evidence. Types of supplementary evidence include witness testimonies, reports, journals or diaries, records of activities, personal statements, simulation (see note in glossary).

Underpinning knowledge

Underpinning knowledge indicates what knowledge is <u>essential</u> for a person to possess in order to successfully achieve an element and prove total competence.

Units

A unit of competence describes one or more activities which form a significant part of an individual's work. Units are accredited separately but in combination can make up a vocational qualification. There are three categories of units:

Mandatory units - are core to a qualification and must be completed.

Optional units - candidates must choose the required number of individual units, specified in the qualification structure, to achieve the qualification.

Work-based projects

Work-based projects are a useful way for you to collect evidence to support any decision you make about a candidate's performance. They are particularly appropriate in determining the level of a candidate's underpinning knowledge and understanding where it may be insufficient to rely only on questioning observation.

A project often involves the identification of a solution to a specific problem identified by you and/or the candidate (such as looking at ways to redress a recent drop in sales), or may be a structured programme of work built around a central situation or idea (such as the introduction of a new job rostering process)