Specification of Competency Standards
for the Automotive
Unit of Competency

Functional Area - Common Competency

Title	Risk of Handling and Storage of High Electric Voltage and Pressurised Gas Vehicles
Code	111658L3
Range	This unit of competencies is applicable to the practitioners of automotive industry such as automotive technicians, mechanics, parts and vehicle storage technicians and the practitioners who are required to perform tasks in environments where these vehicles are present, identify, assess, and control risks associated with working on and storing vehicles with high-voltage (HV) electrical systems (e.g., Battery Electric Vehicles - BEVs, Hybrid Electric Vehicles - HEVs) and vehicles with pressurised gas systems (e.g., Hydrogen Fuel Cell Vehicles - FCEVs, CNG/LPG vehicles).
Level	3
Credit	4 *(For Reference Only)*

Competency	**Performance Requirements**
	1. Performance Requirement
	2. Knowledge (systematic risk management principles to ensure personal safety, the safety of others, and the protection of the vehicle and workshop infrastructure.)
	• Master the Fundamentals of HV Systems: Principles of DC and AC high-voltage circuits (tpically 60V to 800V+); concept of "Voltage, Current, Resistance"; energy storage in lithium-ion batteries, such as Lithium Nickel Manganese Cobalt Oxide (NMC), Lithium Iron Phosphate (LFP), Lithium Nickel Cobalt Aluminium Oxide (NCA) and the 2nd generation EV batteries such as Solid-State Batteries, Sodium-Ion (Na-ion), Lithium-Sulfur (Li-S).
	• Master the Fundamentals of Pressurised Gas Systems: Properties of common automotive gases (Hydrogen, CNG, LPG); concepts of pressure (e.g., bar, psi), gas flammability limits, and embrittlement.
	• Understanding hazard Identification: Knowledge of specific hazards: Electric Shock (AC/DC), Arc Flash, Thermal Runaway (in HV batteries), Fire, Explosion, Asphyxiation, and high-pressure jet releases.
	• Master the Vehicle Technology: Ability to identify different types of electrified and alternative fuel vehicles and their basic system architecture such as the hydrogen internal combustion engine vehicle, the alternative fuel (methanol) engine.
	• Master the Safety Procedures & Standards: In-depth knowledge of:
	  ◦ Manufacturer-specific shutdown and isolation procedures.
	  ◦ Use and interpretation of HV warning labels and service plugs/disconnects.
	  ◦ Procedures for safe handling of damaged vehicles.
	  ◦ Relevant Hong Kong legislation, standards, and codes of practice (e.g., EMSD Guidelines, Factories and Industrial Undertakings Ordinance).
	• Master the Emergency Preparedness: Knowledge of first aid for electric shock, firefighting procedures for electrical and gas fires and site-specific emergency response plans.
	• Master the Risk Management Principles: Understanding of the hierarchy of controls (Elimination, Substitution, Engineering, Administrative, PPE).

	3. Performance (Safety Procedures)
	• Master the Technical Skills:
	  ◦ Ability to correctly use a certified digital multimeter or HV tester.
	  ◦ Inspect PPE, such Class 0 electrical insulating gloves correctly.
	  ◦ Ability to locate and interpret vehicle-specific service information.
	• Master the Cognitive Skills:
	  ◦ Problem-solving skills to assess unpredictable situations, such as a damaged vehicle.
	  ◦ Planning and organizing skills to sequence tasks safely.
	  ◦ Ability to conduct a dynamic risk assessment before starting any task.
	• Master the Interpersonal Skills:
	  ◦ Clear communication to warn others of dangers and to report hazards.
	  ◦ Ability to work effectively in a team, including supervising assistants to ensure their safety.
	• Master the Identify Hazards Associated with HV and Pressurised Gas Systems
	  ◦ Correctly identify vehicle types containing high-voltage and pressurised gas systems using manufacturer identification marks, labels, and symbols.
	  ◦ Locate and identify major high-voltage components (e.g., traction battery, power inverter, electric motor, orange cabling).
	  ◦ Locate and identify major pressurised gas system components (e.g., hydrogen storage tanks, CNG/LPG cylinders, pressure regulators, associated piping).
	  ◦ Identify potential ignition sources and flammable environments relevant to pressurised gas systems.
	  ◦ Identify physical and environmental hazards in the work area that could interact with these systems (e.g., water, heat, sharp objects, trip hazards).
	• Able to assess the risks associated with identified hazards
	  ◦ Evaluate the likelihood and potential severity of incidents arising from identified hazards.
	  ◦ Assess the risk of electric shock, arc flash, and thermal runaway from high-voltage systems.
	  ◦ Assess the risk of fire, explosion, and asphyxiation from pressurised gas systems.
	  ◦ Determine the level of risk (e.g., high, medium, low) for different tasks and situations, including post-collision vehicle recovery.
	• Able to contribute to safe storage practices
	  ◦ Park and store HV and pressurised gas vehicles in designated, well-ventilated areas as per workplace policy.
	  ◦ Maintain clear access to emergency equipment and exit routes
	  ◦ Report any identified storage hazards
	• Implement and monitor risk control measures
	  ◦ Follow established workshop procedures for making the vehicle safe (e.g., ignition-off, key-fob storage, disabling HV system as per manufacturer's instructions).
	  ◦ Select, inspect, and correctly use appropriate Personal Protective Equipment (PPE) including Category 0 [1000V] electrical insulating gloves with leather protectors, face shields, and flame-retardant clothing.
	  ◦ Isolate the high-voltage system and verify zero energy state using a certified voltage tester following a safe isolation procedure.
	  ◦ Secure and manage pressurised gas systems, ensuring isolation valves are closed and systems are depressurised where required and safe to do so.
	  ◦ Implement correct procedures for handling a damaged HV battery or pressurised gas cylinder, including containment and isolation of the area.
	  ◦ Correctly position and use safety signage, barriers, and designated work zones.
	  ◦ Follow emergency procedures for incidents

Assessment Criteria	The integrated outcome requirements of this unit of competency are that the practitioner being assessed shall prove that he/she is capable to respond appropriately to a simulated emergency, and demonstrating knowledge of emergency procedures. • All relevant workplace health and safety regulations.

	• Access to vehicles with live (but made safe for assessment) or simulated HV and pressurised gas systems, appropriate PPE, service manuals, and isolation equipment is required. • Taking effective measures covering hazards, principles, procedures, and legislation. • Identify hazards, assess risks, and propose a safe action plan. • Demonstrates a proactive approach to hazard identification and risk assessment. • Correctly and confidently applies the safe isolation procedure for a high-voltage system • Shows a clear understanding of the severe consequences of failure to follow procedures. • Performs a safe shutdown and isolation procedure on a designated HV vehicle, including the correct use of a voltage tester and PPE. • Conducts a risk assessment for a given scenario (e.g., replacing a component near the HV system, storing a vehicle with a suspected gas leak) and articulate the control measures required.
Remark	The credits value of this unit of competency assumes that the practitioner has already possessed basic knowledge on industrial safety regulations and automotive technology.