



Tertiary and Vocational Education Commission

National Competency Standards

For

Diesel Engine Mechanic

NVQ Level 4

Diesel Engine Mechanic

Course synopsis

This course is designed to train students in the diesel engine repair and maintenance field. This course covers the competencies required to repair cooling system, lubricating system, air intake and exhaust system, fuel supply system, overhaul engines and diagnoses and repair faults in modern fuel injection systems.

Course Title	Course Duration
Diesel Engine Mechanic	NVQ Level 4 – 2years
Job outlook, objectives of the course and career paths available following completion of the course	
<p>Diesel engines are used in many vehicles such as cars, jeeps, vans, busses, trucks, tractors etc. Due to their durability and fuel economy, these engines are more popular than gasoline engines in commercial applications as well as private vehicles. In addition to the automobiles, many businesses and organizations make use of backup diesel generators in order to maintain power even if the main power grid suffers an interruption.</p> <p>Diesel engine mechanics is a person who service, repair and overhaul diesel engines of all types. In most cases, diesel mechanics work in a fixed location, although some mechanics may travel to work on engines in a remote location. Diesel mechanics work in a wide range of settings, ranging from those working in large repair centers to individual mechanics working as part of a self-owned garage. Many passenger and private vehicles are equipped with diesel engines and diesel mechanics working at local neighborhood garages work to maintain and repair these engines. They occasionally repair vehicles on roadsides or at worksites.</p> <p>With the rapid development of technology modern engines are equipped with electronically controlled Common Rail Direct Injection (CRDI) supply pumps, sensor, actuators and other varies components. Therefore this industry requires well trained people on modern technology.</p> <p>.</p>	

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Occupation: DIESEL ENGINE MECHANIC – NVQ LEVEL 04

Competency Unit /Job function:

Repair Engine Cooling System

Unit Code:

01

Unit Aim/Performance out put

This Unit covers competencies required to service and repair liquid cooling systems of automobile ensuring safe working condition and safe use of tools equipment and materials.

Elements of Job function	Performance Standards
1. Check components of cooling system	1.1 Visually check drive belts, hoses, radiator cap, radiator core, radiator fan, thermo switch, auxiliary tanks and temperature indicators for any defects
2. Check cooling system for leaks	2.1 Visually check for coolant / water leaks 2.2 Pressurize the cooling system and visually check for leaks 2.3 Check pressure cap for proper functioning
3. Check radiator cooling fan	3.1 Visually check the drive system (mechanical/ electrical/ hydraulic) for defects 3.2 Check the speed / direction of rotation of the fan unit
4. Check Radiator	4.1 Check the coolant level and contamination 4.2 Visually check the radiator core for deformation/ damage of radiator fins. 4.3 Check radiator for blockage of radiator tubes by measuring the rate of flow of the coolant 4.4 Check the condition of top and bottom tank and radiator mounting system
5. Check the cooling function for proper operation	5.1 Check opening and closing of the thermostat at prescribed temperature
6. Repair, readjust or replace the components of cooling system	6.1 Repair, readjust or replace drive belt, cooling fan, coolant hoses, radiator, thermostat, water jacket, thermo switch and related fuses, temperature indicators, .relays and sensors

RANGE STATEMENT

Work may take place in an automobile workshop or in a training center. The cooling system of automobiles consisting of various types and makes such as engine driven, motor driven cooling fans and electronically controlled cooling system.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Heat transfer methods • Types of engine cooling systems and method of heat transfer • Purposes of radiator cap valves • Distribution of heat energy in an engine and necessity of a cooling system. • Flow circuit of the coolant in an engine • Engine operating temperature & system pressures • Thermostat valve & it's location in different systems • Relationship of heat transfer of metals with temperature. • Read and interpret manufactures repair procedures and their respective repair manuals. • Knowledge of all saf • Advantages and disadvantages of water and air cooling systems • Properties of anti-freeze and anti-corrosive additives • Welding and brazing techniques. • Types of radiators • Functions of sensors, relays, control units in cooling system 	<ul style="list-style-type: none"> • Use of measuring and testing equipment for temperature and pressure • Use of radiator pressure tester and cap tester • Measuring of electrical resistance in sensors • Practice of safety precautions • Flushing the radiators • Read and interpret manufacturer's manuals • Measuring of temperature • Service and repair procedures connected with the repair of cooling systems • Soft soldering • Welding & brazing • Interpretation of measurements • Testing and replacing of thermostats • Testing and replacing of water pumps • radiator replacements

Occupation: DIESEL ENGINING MECHANIC – NVQ LEVEL 04

Unit Title:

Repair Engine Lubricating System

Unit Code:

02

Unit Aim/Performance out put

This unit covers the competencies required to repair different types of engine lubricating systems of automobiles ensuring safe working condition and safe use of tools equipment, machinery and materials.

Element of Job function	Performance standards
01. Diagnose faults in lubricating system	1.1 Check the Condition of oil and change if necessary. 1.2 Check External oil leaks while the engine operating and non-operating 1.3 Check Operation of oil pressure warning lamp/gauge and ensure proper functioning, while engine is hot and cold 1.4 Check Oil pressure as per manufacturer’s specifications. 1.5 Check Oil leaks to cooling system. 1.6 check Oil pan and strainer for any dents and damages and the condition of drain plug. 1.7 check Oil filter and replace as per manufacturer’s instructions.
02. Service and repair engine-lubricating system.	2.1 Removed Oil pan and strainer, clean and repair dents, 2.2 Check Drain plug and replaced if necessary 2.3 Remove Oil pump, dismantle and check for wear / damage, and repair /replace as per manufacturer’s specifications 2.4 Install oil pump to the engine 2.5 Clean Oil pan and strainer and fit with new gasket and top up with oil recommended by manufacturer. 2.6 Remove Oil cooler , check for damage, leaks, and refit 2.7 Refill with Recommended oil and check the level as specified 2.8 Check relief valve and replace as necessary 2.9 Remove Oil pressure sensor/switch and gauge, check for proper functioning and replace if necessary.
03. Test lubrication system	3.1 Check Oil leaks and oil pressure indicator lamps while engine operating. 3.2 Check Oil pressure connecting an external pressure gauge and ensure correct working pressure 3.3 Carry out Repair, recheck and confirm as per standards

RANGE STATEMENT

Work Connected to this unit may take place in an auto mobile service / training work shop or in a work site .it includes all lubricating systems and types of lubricants used by all diesel auto mobiles of varying capacities of power.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
<ul style="list-style-type: none"> • Principles of lubrication types of lubricants, characteristics , viscosity and grades • Flow circuit of the oil in engine • Regulation of oil pressure and its purpose • Types and operation of oil pressure indicator systems and oil level indicator systems • Types of oil pumps • Types of oil Coolers • Types of oil filters • Electrical controls and switches in lubrication system • Standard safety procedures to be followed • Points & Places from where oil leaks could occur 	<ul style="list-style-type: none"> • Checking oil pressure by using external pressure gauge • Use of torque wrench to specified torques • Checking clearances and measurements as per service manual • draining and filling of oil • replacing of oil filter • Follow safety precautions at work • Replacements / repair of oil filter, pump , electrical indicator & systems • Cleaning of oil passages and gallery • Servicing of oil pump and oil cooler • Trouble shooting in lubrication systems

Occupation: DIESEL ENGINING MECHANIC – NVQ LEVEL 04

Competency Unit / job function

Repair Fuel Supply system

Unit Code:

03

Unit Aim/ performance out put

This unit covers the competencies required to diagnose ,repair & service diesel fuel tank, fuel lines, filter assembly & feed pump adhering to occupational health & safety practices & manufacturer’s guidelines

Element of Job function	Performance standards
01. Perform preliminary inspection & identify defects	1.1 Inquiries made from customer to verify experienced symptoms 1.2 Visual test performed to check leakage from, or damage to components of fuel system and air intake system 1.3 Visual test performed and electrical and mechanical connections checked for proper condition 1.4 Road test performed to identify defects if required 1.5 Operation of air intake & fuel intake system checked using equipment as per manufacturer’s specifications 1.6 Job information & technical data recorded & maintained as per workplace procedure
02. Inspect and remove diesel tank and lines	2.1 Diesel tank inspected for sediment and strainer blockage, air vent blockage & leakage 2.2 Diesel lines inspected for blockage & leakage 2.3 Diesel tank removed, checked and serviced /replaced if necessary 2.4 Diesel line removed, checked and serviced /replaced if necessary
03. Inspect and remove diesel filter assembly and feed pump	3.1 Filter head removed and checked to ascertain its serviceability. 3.2 Filter removed and checked to ascertain its serviceability. 3.3 Water drained from fuel system and complete draining of Water ensured by visual inspection 3.4 Water sediment trap sensor checked & replaced if necessary 3.5 Diaphragm type feed pump removed, checked, serviced / Replaced as per manufacturer’s instructions 3.6 Piston type feed pump removed, checked ,serviced / replaced as per manufacturer’s instructions 3.7 Electric type feed pump removed, checked, serviced /replaced as per manufacturer’s instructions

RANGE STATEMENT

Work connected to this unit may take place in a workshop / training center or at a worksite. It includes the operations undertaken to attend to different types of diesel injection systems that are found in current models of automobiles, locomotives, marine vehicles and industrial & construction equipment.

UNDERPINNING KNOWLEDGE

- Various types of diesel fuel systems, components & operations
- Importance of cleanliness in handling diesel fuel components
- Atomization and ignition of diesel fuel
- Working pressures of diesel supply systems
- Basic auto-electrical systems
- Functions of sensors and actuators
- Diesel combustion process
- Types of injection pumps
- Types of fuel filters, elements, water separators/sediment traps and indicators
- Diesel engine emission testing procedure
- Occupational health & safety
- Quality of diesel fuel
- Intake and exhaust system
- Diesel engine – components and operating principles
- Engine torque and power
- Interpretation of manual/guide lines
- Handling special tools & testing equipment
- Malfunction indicator lamps (MIL)

UNDERPINNING SKILLS

- Maintaining cleanliness in diesel fuel system & components
- Bleeding air from diesel fuel system
- Removing of water and other contaminants from the diesel filter & tank
- Cleaning of diesel fuel tank
- Checking and replacement of electrical / electronic sensors, actuators and switches
- Diesel engine emission testing & adjustments
- Removing, checking, servicing, repairing and refitting of diesel fuel system components
- Handling special tools & testing equipment
- Safe handling of pressurized fuel system
- Checking & cleaning air filter
- Checking boost pressure
- Checking correct operation of components in air intake & exhaust system
- Communication skills
- Adhering to workplace ethics and guidelines
- Use of PPE

Occupation: DIESEL ENGINING MECHANIC – NVQ LEVEL 04

Competency Unit / job function

Unit Code:

Repair Air Intake and Exhaust System

04

Unit Aim/ performance out put

This unit covers the competencies required to diagnose, repair & service air intake and exhaust system adhering to occupational health & safety practices & manufacturer’s guidelines.

Element of Job function	Performance standards
01 Perform preliminary inspection & identify defects	1.1 Inquiries made from customer to verify experienced symptoms 1.2 Visual test performed to check leakage from, or damage to components of fuel system and air intake system 1.3 Visual test performed and electrical and mechanical connections checked for proper condition 1.4 Road test performed to identify defects if required 1.5 Operation of air intake & fuel intake system checked using equipment as per manufacturer’s specifications 1.6 Job information & technical data recorded & maintained as per workplace procedure
02. Service air cleaner system	2.1 Correct procedures for cleaning followed 2.2 Reusability is decided by visually observing
03. Service super charger system	3.1 Correct procedures for cleaning followed 3.2 Puller and press used proper appropriately when removing and re-fixing bearings
04. Service air intake control system	4.1 Correct procedures followed for removing, cleaning and assembling 4.2 Safety of sensors connected to throttle body without damage
05. Service turbo charger system	5.1 Recommended torque applied when loosen and tighten the nuts 5.2 Turbine shaft end play adjusted according to manufacturer’s specifications
06. Service exhaust manifold	6.1 Recommended torque applied when loosen and tighten the nuts 6.2 Packings used for all required points
07. Service exhaust brake system	7.1 Appropriate hand tools used during the service 7.2 Parts to be replaced decided by visual observations 7.3 Manufacturer’s instructions followed

08. Service exhaust lines	8.1 Appropriate hand tools used during the service 8.2 Parts to be replaced decided by visual observations 8.3 Manufacturer's instructions followed
09. Service catalytic converter	9.1 Scanner used according to manufacturer's data
RANGE STATEMENT Work connected to this unit may take place in a workshop / training center or at a worksite.	
UNDERPINNING KNOWLEDGE <ul style="list-style-type: none"> • Structure, operation and advantages of turbo charger • Inaction of a turbo charger • Information about I.A.C / A.A.C valves • Special points to consider when servicing air filter system • Special care to be taken when servicing exhaust lines • Operation of catalytic converter • Difference between two way and three way catalytic converters 	UNDERPINNING SKILLS <ul style="list-style-type: none"> • Use of PPE • Use of basic hand tools

Occupation: DIESEL ENGINING MECHANIC – NVQ LEVEL 04

Competency Unit /Job function:

Unit Code:

Overhaul Diesel Engine

04

Unit Aim/Performance out put

This unit covers the competencies required to repair any diesel engine of an automobile ensuring safe working conditions and the safe use of tools, equipment machinery and material according to manufacturer's guideline.

Element of Job function	Performance Standards
<p>1. Remove engine from the vehicle</p>	<p>1.1 Identify the workplace health and safety requirements and their application for the work 1.2 Perform visual check to locate engine oil and other oil/fluid leakages by following standard procedure 1.3 Perform compression test (dry and wet) to check the engine internal condition by following standard procedure 1.4 Drain All fluids by following standard procedure 1.5 Disconnect all electrical connections as per standard procedure 1.6 Remove other specified components by following standard procedure 1.7 Remove engine from the vehicle by following standard procedure</p>
<p>2. Dismantle the engine</p>	<p>2.1 Carry out Cleaning of the engine following manufacture standard procedure 2.2 Mounting of the engine on an engine stand as specified remove main external parts from the engine as per standard procedure 2.3 dismantle engine as per the manufacturer's instructions 2.4 Cleaning of the of dismantle parts ensured as per requirement and standard procedure 2.5 Mark and keep Engine components in suitable way for easy handling</p>
<p>3. Inspect, repair and assemble Engine</p>	<p>3.1 Measure critical components of the engine to decide whether required for machining or/and replacing 3.2 Reassemble engine as per <i>technical aspects</i> given by manufacturer standards</p>
<p>4. Install the engine on vehicle and perform test run</p>	<p>4.1 Install engine on the vehicle and all other components as per given instruction 4.2 Restore engine oil, transmission oil, coolant, fuel and power steering oil to required level 4.3 Start and check engine for any leakages, oil pressure, engine temperature, ,abnormal noises vibrations and abnormal smell</p>

RANGE STATEMENT

Work connected to this unit may take place in an auto mobile work shop /training center or in a worksite. It includes engines of different horse powers diesel driven auto mobiles engine.

UNDERPINNING KNOWLEDGE

- Engine mechanisms in diesel engines
- Engine components and their functions
- Repair and servicing of engine cylinders including, measurement of wear, honing, grinding, re- sleeving
- Measurement of wear in engine bore, piston, bearings, bushes and shims
- Measurement of wear in crankshaft and in camshaft
- Identification of serviceable and unserviceable engine components.
- Tightening torque, sequence of tightening head/ bearings.
- Engine compression ratios and measurement.
- Engine torque, Power and efficiencies
- Occupational Health and safety procedures to be followed
- Measurements and measuring points

UNDERPINNING SKILLS

- Repair and servicing of engine piston including, measurement of Circular Wear, longitudinal Wear, Ring Groove Wear and damage
- Taking Wear Measurements in Cam Shaft & Crank Shaft.
- Repair and servicing of engine piston rods including measurement of big-end Bearing Wear, Side Slap Straightness, twist and Serviceability .
- Repairing and Servicing of engine Valves and Valve Seats, guides and other components of the Valve gear train including measurement of their wear and judgement of serviceability
- Fixing Different of Types Bearings and Oil Seals and Cutting Various types of Packing
- Repair and Servicing of engine fuel pump components and parts including the fuel lift pumps and filters including measurement of Wear fine tuning of engines serviceability
- Fine Tuning of Engine.

Occupation: **DIESEL ENGINING MECHANIC – NVQ LEVEL 04**

Competency Unit / job function

Unit Code:

Test & Calibrate Conventional Type Fuel Injection Pumps

05

Unit Aim/ performance out put

This unit covers the competencies required to test & calibrate conventional inline type and rotary type fuel injection pumps adhering to occupational health & safety practices & manufacturer's guidelines

Element of Job function	Performance standards
01. Test & calibrate Conventional inline type fuel injection pumps	<p>1.1 Whether the conventional inline type fuel injection pump is in suitable condition to be fixed to the test bench ensured visually</p> <p>1.2 Conventional inline type fuel injection pump attached to the test bench as per test bench manufacturer's guidelines</p> <p>1.3 <i>Calibration test</i> performed as per calibration data sheet</p> <p>1.4 Necessary adjustments made as per calibration test results</p> <p>1.5 Test result recorded as per standard operational procedures</p>
02. Test & calibrate conventional rotary type fuel injection pumps	<p>2.1 Whether the conventional rotary type fuel injection pump is in suitable condition to be fixed to the test bench ensured visually</p> <p>2.2 Conventional rotary type fuel injection pump attached to the test bench as per test bench manufacturer's guidelines</p> <p>2.3 <i>Calibration test</i> performed as per calibration data sheet</p> <p>2.4 Necessary adjustments made as per calibration test results</p> <p>2.5 Test result recorded as per standard operational procedures</p>

RANGE STATEMENT

Work connected to this unit may take place in a workshop / training center or at a worksite. It includes the operations undertaken to attend to different types of diesel injection systems that are found in current models of automobiles, locomotives, marine vehicles and industrial & construction equipment.

UNDERPINNING KNOWLEDGE

- Various types of diesel fuel systems, components & operations
- Importance of cleanliness in handling diesel fuel components
- Basic auto electrical systems
- Types of injection pumps
- Occupational health & safety
- Quality of diesel fuel
- Diesel engine – components and operating principles (torque & power, combustion process)
- Manual/guide lines
- Special tools & testing equipment
- Testing equipment
- Types of injector pump test bench
- Noise & vibration of diesel engines
- Condition of exhaust gas
- Purpose and methodology of diesel fuel injection pump calibration
- Workplace procedures and instructions

UNDERPINNING SKILLS

- Maintaining cleanliness in diesel fuel system & components
- Checking and replacement of electrical / electronic sensors, actuators and switches
- Removing, checking, servicing, repairing and refitting of diesel fuel system components
- Handling special tools & testing equipment
- Interpretation of manual/guide lines
- Handling various types of injector pump test benches
- Communication skills
- Adhering to workplace ethics and guidelines
- Use of PPE

Occupation: DIESEL ENGING MECHANIC – NVQ LEVEL 04

Unit Title/Job function:

Troubleshoot Diesel Electronic Fuel Injection Engine

Unit Code:

06

Unit Aim/Performance out put

This unit covers the competencies required to service and repair diesel electronic fuel injection and ensuring safe working condition and the safe use of tools, equipment and materials.

Element of Job function	Performance Standards
01 Check and repair diesel electronic fuel injection system	<ul style="list-style-type: none">1.1 Air flow control system checked and accurate functioning ensured.1.2 Fuel flow control system, electronic control system and sensors checked and proper operation ensured.1.3 Switches checked and correct on-off operation ensured.1.4 Electronic control unit , self-diagnosis code checked and its operation ensured.1.5 Idle speed ,test idle speed, fuel pump operation and electronic governor control actuators, sensor , injectors throttle position sensor (TPS), fuel pressure and temperature sensors , checked for proper operation and replaced where necessary.
02 Identify, check and diagnose faults of the common rail fuel Injection systems.	<ul style="list-style-type: none">2.1 Intake air control system checked for expected controlling2.2 Fuel Control system checked for proper operation of the Components.2.3 Engine control electronic system checked for proper signal flow.2.4 Sensors checked for proper functioning.2.5 Actuators checked for proper operation.2.6 Vacuum solenoid valve (VSV) checked for correct on- of Operation2.7 Engine control unit checked for its operation.2.8 Self - diagnosis code checked for operation

<p>03. Locate and rectify faults in common – rail fuel injection system</p>	<p>3.1 Fuel injection volume control checked. 3.2 Injection timing control checked. 3.3 Injection volume and timing control checked during starting. 3.4 Idle speed control checked. 3.5 Fast Idle speed control checked 3.6 Fuel pressure control checked. 3.7 Pilot injection control checked. 3.8 Common rail and pressure limiter and fuel pressure sensor checked. 3.9 Electronic Drive unit (EDU) checked and replaced. 3.10 Injectors checked and replaced. 3.11 Fuel supply pump replaced. 3.12 Injection and fuel inlet pipes checked and replaced.</p>
<p>RANGE STATEMENT Work connected to this unit may take place in an automobile workshop/training center or in a work site. This unit includes all diesel automobiles fitted with electrically –controlled fuel injection systems.</p>	
<p>UNDERPINNING KNOWLEDGE</p> <ul style="list-style-type: none"> • Principles of electricity and basic electronics • Diesel combustion process • Type of injection pumps • injection pump timing and settings • Sensors , actuators, and control modules • Emission control devices on fuel system • soft soldering principles and selection of solder • Safety procedures to be followed 	<p>UNDERPINNING SKILLS</p> <ul style="list-style-type: none"> • servicing electronically controlled fuel system • Use of testing units and special tools for injectors • Use of scan tools • Use of analysers • setting of injection timing • Checking and replacement of electrical / electronic sensors ,actuators and switches • Soft soldering • Wire jointing and terminations • Observe safety procedures •

Occupation: DIESEL ENGINING MECHANIC – NVQ LEVEL 04

Competency Unit / job function

Unit Code:

Test and Calibrate Common-Rail High Pressure Pump (Supply Pump) and Injectors

07

Unit Aim/ performance out put

This unit covers the competencies required to test & calibrate common- rail high pressure pump (supply pump) and injector, adhering to occupational health & safety practices & manufacturer’s guidelines

Element of Job function	Performance standards
01. Test & calibrate high pressure pump (supply pump)	1.1 Whether the high pressure pump (supply pump) is in Suitable condition to be fixed to the test bench ensured visually 1.2 Electronic actuators & sensors tested for proper operation as per manufacturer’s guidelines 1.3 High pressure pump (supply pump) attached to the test Bench as per test bench manufacturer’s guidelines 1.4 <i>Calibration test</i> performed as per calibration data sheet 1.5 Necessary adjustments made as per calibration test results 1.6 Test result recorded as per standard operational procedures
02. Test & calibrate common- rail injector	2.1 Whether the injector is in suitable condition to be fixed to the test bench ensured visually 2.2 Solenoid & sensors tested for proper operation as per manufacturer’s guidelines 2.3 Injector attached to the test bench as per test bench manufacturer’s guidelines 2.4 <i>Calibration test</i> performed as per calibration data using Injector pressure tester according to manufacturer’s specifications 2.5 Injector dismantled, cleaned, inspected, serviced / repaired or replaced 2.6 Injector adjusted and tested according to manufacturer’s specification 2.7 Injector Compensation Code created using testing machine & recorded as specified

RANGE STATEMENT

Work connected to this unit may take place in a workshop / training center...

UNDERPINNING KNOWLEDGE

- Various types of diesel fuel systems, components & operations
- Importance of cleanliness in handling diesel fuel components
- Basic auto electrical systems
- Sensors and actuators
- Types of CDI pumps
- Types of fuel filters & elements
- Diesel engine emission testing procedure
- Occupational health & safety
- Quality of diesel fuel
- Diesel engine – components and operating principles (torque & power, combustion process)
- Interpretation of manual/guide lines
- Handling special tools & testing equipment
- Malfunction indicator lamps (MIL)
- Testing equipment
- Test and calibration methodology of unit injection assembly and PT pump
- Electronic diesel control injection pump operating principles
- Condition of exhaust gas
- Purpose and methodology of diesel fuel injection pump calibration
- Workplace procedures and work instructions

UNDERPINNING SKILLS

- Maintaining cleanliness in diesel fuel system & components
- Removing of water and other contaminants from the diesel filter & tank
- Checking and replacement of electrical /electronic sensors, actuators and switches
- Handling special tools & testing equipment
- Communication skills
- Adhering to workplace ethics and guidelines
- Use of PPE

Occupation: **DIESEL ENGINING MECHANIC – NVQ LEVEL 04**

Competency Unit / job function

Service Storage Batteries and Charging System

Unit Code:

10

Unit Aim/ performance out put

This unit covers the competencies required to maintain different types of storage batteries, test and charging.

Element of Job function	Performance standards
01. Check battery Condition	<ul style="list-style-type: none">1.1 Physical Condition of battery checked and ensured that it supplies and store power as expected.1.2 Battery electrolyte level checked and ensured that the correct electrolyte level is maintained.1.3 Specific gravity of electrolyte is measured and ensured That it is within the tolerable level for correct functioning.1.4 Charge retention capability checked and ensured with high rated discharge tester.
02. Remove & install battery	<ul style="list-style-type: none">2.1 Battery terminals checked and ensured and replaced as necessary.2.2 Capacity rating of the battery interpreted and good terminal contact ensured for the correct rating to be maintained in the auto mobile.2.3 Booster batteries connected when required to supplement the ampere rating .
03. Charge battery	<ul style="list-style-type: none">3.1 Battery topped up with distilled water up to the specified level3.2 Battery charger set for recharging and battery charged to required specifications.3.3 Electrolyte temperature measured while charging and ensured that none of the cells are weak.3.4 In the case of a dry charged battery , battery activated for connection to circuit of auto mobile .3.5 Relevant safety procedures followed and ensured personal as well as material safety.

RANGE STATEMENT

Work may take place in an auto mobile work shop or at a battery service center .

UNDERPINNING KNOWLEDGE

- Basic electricity
- Types and construction of batteries and their purpose
- Principle of operation of a battery – it's chemical reactions
- Definition of battery capacity rating
- Specific gravity levels of electrolyte and the relationship between specific gravity and temperature.
- Recharging of batteries, battery & the charging circuit.
- Soft soldering principles and selection of solder
- Relevant safety procedures to be followed in handling batteries
- Battery maintenance & trouble shooting , including terminal oxidation
- Occupational health & safety regulations.
- Repair procedures in carrying out minor repairs.
- Vehicle safety requirements
- Personal safety procedures.

UNDERPINNING SKILLS

- Use of measuring and testing equipment
- Use of relevant tools & equipment
- Interpretation of manufacturers data and specifications
- Cleaning & painting of battery case
- Cleaning of battery vent holes
- Soft soldering
- Cleaning of battery terminals
- Safety procedures to be followed in auto mobile repair shop
- Welding & brazing
- Preparation of wire & cable ends
- Removal and installation of battery
- Servicing of batteries
- Checking of the charging voltage & current and isolating the faults
- Access interpret and apply technical information
- Safe and correct use tools , equipment and material
- Perform electrical connections , crimping and soldering
- Test and identify faults in charging systems
- Repair charging systems / direct current motors
- Apply manual handling methods
- Apply manual handling methods
- Apply personal safety procedures
- Maintain customer records

Module Title	Course Duration
Career Skills 2	At least 60 hours in any 3 month course
<p>Objectives of the module</p> <p>This module is compulsory in all NVQ Level 4 courses. It builds on the soft skills developed on Level 3 NVQ courses, and will enable students to enjoy productive employment that requires fulfilling responsibilities. This course develops communicative skills in English and the ability to read and write constructively, and a command of grammar to facilitate this. It also develops cognitive skills with regard to effective work and the ability to work efficiently alone and in a team.</p>	
<p>Competencies</p> <p>a Understand and use simple expressions to communicate</p> <p>This subject provides the necessary communication skills so that students can express individual ideas, emotions, preferences, frame and answer questions with regard to reasons and methods, explain simple procedures, understand and respond to complex instructions, describe daily routines, conduct and respond to interviews, express ability and inability and describe a process sequentially</p> <p>b Read and write effectively</p> <p>This subject provides students with the necessary skills to write about how they feel, connect sentences meaningfully, read and carry out instructions, understand/produce arguments, read/write longer texts and summarise them, prepare reports and charts, write Personal and Official Letters and apply for jobs</p> <p>c. Use English correctly</p> <p>This subject is not taught separately but is included in the development of the productive and receptive skills above, since awareness of the structure of the language is necessary for these The development of appropriate vocabulary is also targeted to deploy the above skills</p> <p>d. Develop the capacity to think and plan productively</p> <p>This subject develops cognitive abilities and skills with regard to effective work, with strengthening of the ability to organize information and assess information to solve problems systematically, understand chronological order, develop the concepts of mind and task mapping and apply them, understand governmental structures and coordination mechanisms, collect information and prepare development plans and make</p> <p>e. Develop effective working capacity</p> <p>This subject develops the capacity to work effectively individually and in collaboration with others through presenting themselves positively, understanding the advantages of working together, understanding the characteristics of different people and the impact these have, speaking persuasively and understanding and working with maps</p> <p>f. Students will be able to work with computers so as to enter information swiftly and store it systematically, retrieve it easily, communicate on email, and use social media with due attention to ethics</p> <p>g. Students will plan and implement two group projects, one with regard to environmental protection, the other a social service project in response to identified community needs. Students should plan the project systematically, target specific outcomes, report on progress, and evaluate the project on completion.</p>	