NATIONAL COMPETENCY STANDARDS
FOR
AUTO ELECTRICIAN
(NC2 & NC3)

Department of Occupational Standards
Ministry of Labour and Human Resources
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FOREWORD

The Department of Occupational Standards of the Ministry of Labour and Human Resources proudly presents the National Competency Standards (NCS) for Auto Electrician as part of TVET reform initiative for improving the quality of Vocational Education and Training System in Bhutan. The standards represent the fruits of hard work and invaluable experiences gained by the department since its establishment in the latter half of 2003. The main aim of developing National Competency Standards is to set up a well-defined nationally recognized Vocational Qualification and Certification system that will help set a benchmark for the Technical Vocational Education and Training (VET) System in our country aligned to international best practices.

National Competency Standards is one of the base pillars in the Bhutan Vocational Qualification Framework (BVQF) and is the first step in its implementation. The standards are developed to ensure that employees or vocational graduates possess and acquire the desired skills, knowledge and attitude required by industries and employers. In order to ensure this close match in supply and demand of skills, knowledge and attitude, standards have been developed in close consultation and partnership with industry experts and trainers from training institutes.

A vocational education and training system based on National Competency Standards shall ensure that training is of a high quality and relevant to the needs of the labour market. As a result, future TVET graduates will be better equipped to meet the need and expectations of industries and employers. This positive impact on the employability of TVET graduates will enhance the reputation of vocational education and training and make it attractive to school leavers.

While acknowledging the existing level of cooperation and collaboration, the ministry earnestly requests employers and training providers to extend the fullest support and cooperation in developing or implementing the National Competency Standards. The ultimate objective is to build a competent and productive national workforce that will contribute to the socio-economic development of our country.

We gratefully acknowledge the valuable contributions made by experts from industries during the consultation and validation processes of the standards. I look forward to improved engagement and active participation of the industry and employers in the development of a quality assured demand driven TVET system in the near future.

Department of Occupational Standards,
Ministry of Labour and Human Resources

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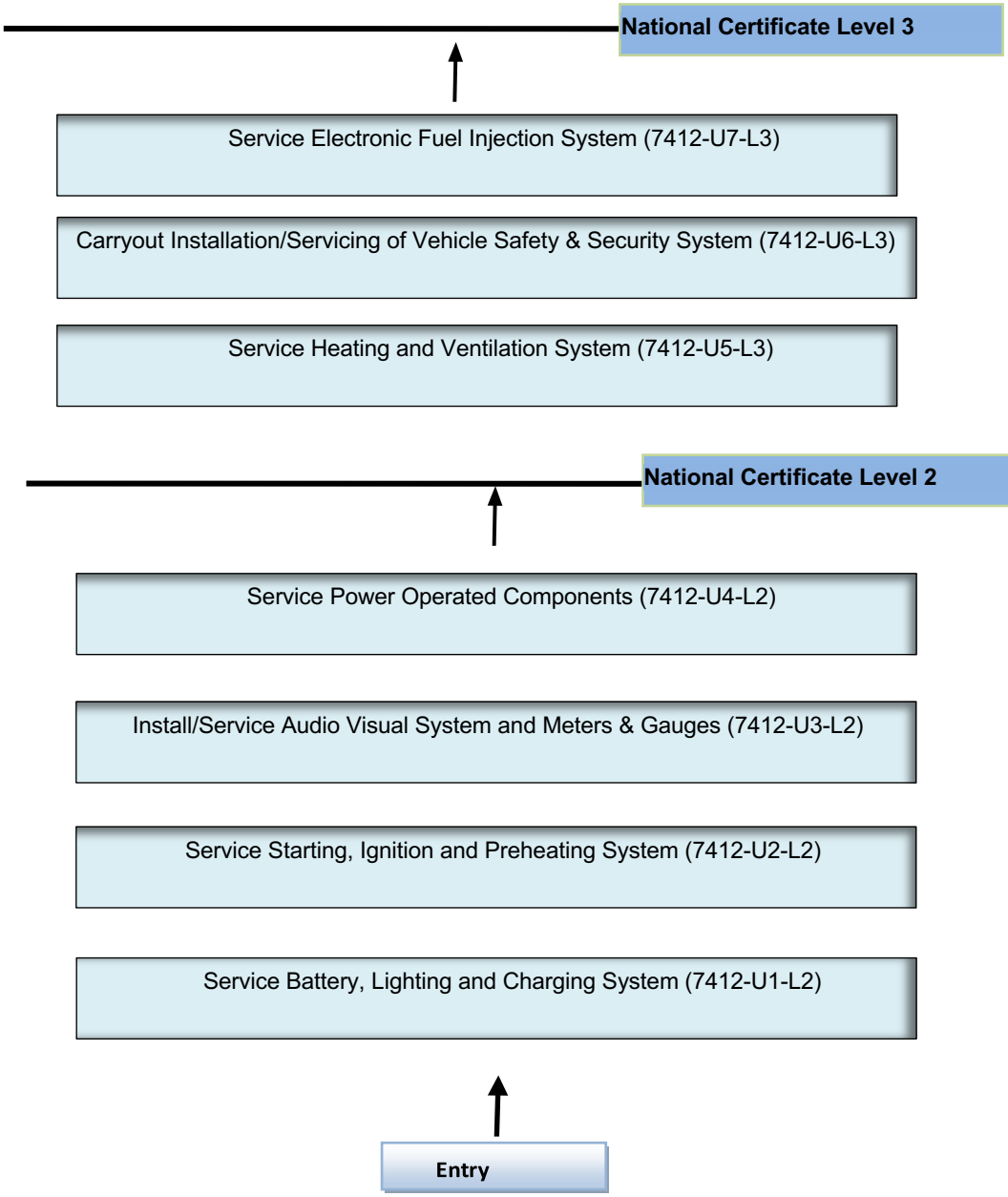
PACKAGING OF QUALIFICATIONS



OVERVIEW OF UNIT COMPETENCIES

National Certificate - Level 2

UNIT TITLE	ELEMENTS OF COMPETENCE
Service Battery, Lighting and Charging System	1. Maintain Battery 2. Service Lighting System 3. Service Charging System
Service Starting, Ignition and Preheating System	1. Service Starting System 2. Service Ignition System 3. Service Preheating System
Install/Service Audio Visual System and Meters & Gauges	1. Install/ Service Audio System 2. Install/ Service Video System 3. Service Meters and Gauges
Service Power Operated Systems	1. Service Electronic Power Steering System 2. Service Wiper and Washer System 3. Service Power Mirror System 4. Service Power Window System

OVERVIEW OF COMPETENCY STANDARDS FOR AUTO ELECTRICIAN (NC3)

National certificate- Level 3

UNIT TITLE	ELEMENTS OF COMPETENCE
Service Heating and Ventilation System	1. Service Electrical Components of Heating System 2. Service Components of Ventilation System 3. Service Electrical Components of MAC System
Install / Service Vehicle Safety and Security System	1. Install/Service Components of Central Locking System and Burglar Alarm 2. Service Supplemental Restraint System (SRS) 3. Service Engine Immobilizer System 4. Service Antilock Braking System (ABS)
Service Electronic Fuel Injection System	1. Service Electronic Fuel (Petrol) Injection System 2. Service Common Rail Direct (Diesel) Injection (CRDI) –System 3. Service Electrical Components of Emission Control System

UNIT TITLE : Service Battery, Lighting and Charging System

DESCRIPTOR: This unit covers the competencies required to service battery, lighting system and charging system.

CODE : 7412-U1-L2

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Maintain Battery	1.1 Select and use ***tools, materials and equipment*** as per the job requirement. 1.2 Diagnose ***battery faults*** following the standard procedures. 1.3 Replace the battery following the standard procedures. 1.4 ***Service the battery*** following the standard procedures. 1.5 Repair battery poles following the standard procedures. 1.6 Perform jump start following the standard procedures. 1.7 Perform battery charging following the standard procedures.
2. Service Lighting System	2.1 Select and use ***tools, materials and equipment*** as per the job requirement. 2.2 Diagnose the ***faults of lighting system*** following standard procedure. 2.3 Replace the ***bulb*** as per the job requirement following standard procedure. 2.4 Replace the ***fuses***/smart junction box as per the job requirement following standard procedure. 2.5 Replace the ***switches*** as per the job requirement following standard procedure. 2.6 Replace the ***relays*** or flashers as per the job requirement following standard procedure. 2.7 Repair the wires, terminals and connectors as per the

	job requirement following standard procedure. 2.8 Replace wire harness as per the job requirement following standard procedure. 2.9 Adjust headlight as per the job requirement following standard procedure.
3. Service Charging System	3.1 Diagnose the ***faults of charging system*** following standard procedure. 3.2 Repair the alternator as per the job requirement following standard procedures. 3.3 Replace alternator as per the job requirement following standard procedures.

RANGE STATEMENT

Equipment may include but not limited to conducting:

- Battery charger
- Hydrometer
- Paraffin blower/brazing torch

Tools may include but not limited to:

- Hand tools set
- Hydrometer
- Multimeter
- Copper brush
- Battery carrier
- Jumper cable
- Test lamp

Battery faults may include but not limited to:

- Undercharge
- Low Voltage
- Overcharge
- Damages

Service the battery may include but not limited to:

- Pole Cleaning
- Topping Up Distilled Water
- Body Cleaning

Materials may include but not limited to:

- Lead
- Battery terminals
- Flux
- Battery
- Distilled water
- Petroleum jelly
- Soldering Iron

Faults of lighting system may include but not limited to:

- Bulb
- Relay
- Fuse
- Wire harness
- Wires
- Switches
- Smart Junction box
- Body Control Module

Faults of charging system may include but not limited to:

- Fuse
- Alternator
- Wires
- Voltage regulator
- Terminals

Fuses may include but not limited to:

- Blade type
- Continental type
- Cartridge type
- Cylindrical type
- Mini blade type

Bulb may include but not limited to:

- Halogen bulb
- Projector headlight
- LED
- DRL (Daytime running light)

Switches may include but not limited to:

- Combination switch
- Ignition switch
- Brake light switch
- Reverse gears switch
- Parking light switch
- Courtesy light switch
- Fog light switch
- Dome light switch

Relays may include but not limited to:

- 3-pin
- 4-pin
- 5-pin
- 6-pin
- 7-pin relays

Critical aspects:

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Diagnose the faults related to lighting, charging and starting system following standard procedure.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Lighting system • Circuit diagram • Types of bulbs • Measurement and testing procedures • Basic electricity and electronics • Basic auto-electrical engineering drawings • Working principles of charging systems • Working principles of alternator • Working principles of battery • Types of battery	• Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

UNIT TITLE : Service Starting, Ignition and Preheating System

DESCRIPTOR: This unit covers the competencies required to service the starting system, ignition system and pre-heating system.

CODE : 7412-U2-L2

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Service Starting System	1.1 Select and use ***tools, material and equipment*** as per the job requirement. 1.2 Diagnose the ***faults in the starting system*** following the standard procedure. 1.3 Repair wire connection as per the job requirement following standard procedure. 1.4 Repair/replace self-starter as per the job requirement following standard procedure. 1.5 Replace clutch safety switch as per the job requirement following standard procedure.
2. Service Ignition System	2.1 Diagnose the ***faults in ignition system*** following the standard procedure. 2.2 Service/replace spark plug as per the job requirement following standard procedure. 2.3 Replace high tension cable as per the job requirement following standard procedure. 2.4 Replace ***ignition coil*** as per the job requirement following standard procedure. 2.5 Service/replace distributor and distributor less ignition as per the job requirement following standard procedure. 2.6 Replace ignitor as per the job requirement following standard procedure. 2.7 Set ignition timing as per the job requirement following standard procedure. 2.8 Replace crankshaft position sensor as per the job requirement following standard procedure.

	2.9	Replace camshaft position sensor as per the job requirement following standard procedure.
3. Service Preheating System	3.1	Diagnose the ***fault in preheating system*** following standard procedure.
	3.2	Replace glow plug as per the job requirement following standard procedure.
	3.3	Replace glow plug timer as per the job requirement following standard procedure.

RANGE STATEMENT

Tools may include but not limited to:

- Pliers
- Screw driver set
- Mini socket set
- Test-lamp
- Special Service tools
- Wire stripper
- Jumper cables
- Crimping pliers
- Soldering iron

Equipment may include but not limited to:

- Jump Starter
- Multimeter
- Diagnostic scanner
- Oscilloscope
- Timing light

Materials may include but not limited to:

- Wires
- Insulation tape
- Wire terminals
- Kerosene
- Terminal ends
- Soldering lead & flux
- Water paper
- Grease

Faults in the starting system may include but not limited to:

- Dead battery
- Faulty self-starter
- Clutch safety switch
- Ignition key
- Wire connection
- Starter Relay
- Fuse

Faults in ignition system may include but not limited to:

- Spark plug
- High tension cable
- Ignition coil
- Cam shaft position sensor
- Electronic Control Unit (ECU)
- Ignition switch
- Ignition timing
- Distributors
- Crank shaft position sensor
- Ignitor
- Crank speed sensor

Fault in preheating system may include but not limited to:

- Glow plug
- Relay
- Fuse
- Glow plug timer

Ignition coil may include but not limited to:

- Distributor-less ignition coil
- Conventional

Distributor may include but not limited to:

- Integrated ignition assembly
- Conventional

Critical aspects:

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Diagnose the faults related to the starting system, ignition and pre-heating system following standard procedures

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Starting system construction and operation • Measurement and testing procedures • Ignition system construction and operation • Pre-heating system construction and operation • Ignition scope patterns • Flemings left hand and right-hand rules • Four stroke cycle operation • Basic electricity and electronics • Functions and operations of CMP and CRK sensors. • Working principle of engine • Basic auto-electrical engineering drawing	• Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

UNIT TITLE : Install/Service Audio Visual System and Meters & Gauges

DESCRIPTOR: This unit covers the competencies required to install/service audio system, install/service video system and service meters and gauges.

CODE : 7412-U3-L2

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Install/ Service Audio System	1.1 Select and use ***tools, materials and equipment*** as per the job requirement. 1.2 Diagnose ***faults in the audio system*** following the standard procedure. 1.3 Repair ***connections*** as per the job requirement following standard procedure. 1.4 Install audio unit as per the job requirement following standard procedure. 1.5 Replace speakers as per the job requirement following standard procedure. 1.6 Install antenna as per the job requirement following standard procedure.
2. Install/ Service Video System	2.1 Diagnose ***faults in the video system*** as per the job requirement following standard procedure. 2.2 Repair ***connections*** as per the job requirement following standard procedure. 2.3 Install video units as per the job requirement following standard procedure. 2.4 Install rear view camera as per the job requirement following standard procedure. 2.5 Set Global Positioning System as per the job requirement following standard procedure.

3. Service Meters and Gauges	3.1	Diagnose ***faults of meters and gauges*** following standard procedures.
	3.2	Repair/replace instrument cluster assembly as per the job requirement following standard procedure.
	3.3	Replace fuel gauge as per the job requirement following standard procedure.
	3.4	Replace fuel gauge sender unit as per the job requirement following standard procedure.
	3.5	Replace speedometer cable/sensor as per the job requirement following standard procedure.
	3.6	Replace temperature gauge as per the job requirement following standard procedure.
	3.7	Replace temperature switch as per the job requirement following standard procedure.
	3.8	Replace oil pressure switch as per the job requirement following standard procedure.
	3.9	Replace oil pressure gauge as per the job requirement following standard procedure.

RANGE STATEMENT

Tools may include but not limited to:

- Pliers
- Screw driver set
- Mini socket set
- Multimeter
- Crimping pliers
- Test-lamp
- Wire stripper
- Soldering iron

Materials may include but not limited to:

- Wires
- Wire terminals
- Insulation tape
- Soldering lead & flux

Faults in audio system may include but not limited to:

- Connections
- Fuse
- Audio unit
- Speaker

Connections may include but not limited to:

- Power connection
- ACC connection
- Speaker wire

Faults in video system may include but not limited to:

- Connections
- Fuse
- Rear view camera
- Video unit
- Speaker

Faults of meters and gauges may include but not limited to:

- Instrument cluster assembly
- Fuel gauge
- Fuel gauge sender unit
- Speedometer cable/sensor
- Temperature gauge
- Temperature switch

Critical aspects:

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Diagnose the faults of the audio-visual system, meter and gauges following standard procedure.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Wiring diagram of audio-visual system • Circuit diagram of instrument cluster assembly • Circuit diagram of meter and gauges • Global Positioning System	• Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

UNIT TITLE : Service Power Operated System

DESCRIPTOR: This unit covers the competencies required to service electric power steering system, wiper & washer system, power mirror system and power window system.

CODE : 7412-U4-L2

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Service Electronic Power Steering System	1.1 Select and use ***tools, materials and equipment*** as per the job requirement. 1.2 Diagnose ***faults in electric power steering system*** following standard procedures. 1.3 Replace EPS motor as per the job requirement following standard procedure. 1.4 Replace EPS ECU as per the job requirement following standard procedure. 1.5 Replace vehicle speed sensor as per the job requirement following standard procedure. 1.6 Replace torque sensor and steering angle sensor as per the job requirement following standard procedure.
2. Service Wiper and Washer System	2.1 Diagnose ***faults of the wiper and washer system*** following standard procedures. 2.2 Replace wiper switch as per the job requirement following standard procedure. 2.3 Repair/Replace washer motor as per the job requirement following standard procedure. 2.4 Repair/Replace wiper motor as per the job requirement following standard procedure. 2.5 Replace wiper arms and linkages system as per the job requirement following standard procedure.

3.	Service Power Mirror System	3.1	Diagnose ***faults in power mirror system*** following standard procedure.
		3.2	Repair motor as per the job requirement following standard procedure.
		3.3	Replace power mirror switch as per the job requirement following standard procedure.
		3.4	Replace wire harness as per the job requirement following standard procedure.
		3.5	Repair auto fold ORVM system as per the job requirement following standard procedure.
4.	Service Power Window System	4.1	Diagnose ***faults in power window system*** following standard procedure.
		4.2	Service power window motor as per the job requirement following standard procedure.
		4.3	Service power window switch as per the job requirement following standard procedure.
		4.4	Service power window regulator as per the job requirement following standard procedure.

RANGE STATEMENT

Tools may include but not limited to:

- Pliers
- Screw driver set
- Mini socket set
- Wrench set
- Wire stripper
- Soldering iron
- Test-lamp
- Socket set
- Crimping pliers

Materials may include but not limited to:

- Wires
- Insulation tape
- Wire terminals
- Terminal ends
- Wire harness
- Grease
- Water paper
- Petrol
- Fuse
- Soldering lead & flux

Equipment may include but not limited to:

- Multimeter
- Scanner

Faults in power steering system may include but not limited to:

- EPS motor
- Vehicle speed sensor
- Steering angle sensor
- EPS ECU
- Torque sensor

Faults of wiper & washer system may include but not limited to:

- Fuse
- Switch
- Wiper arm
- Relay
- wire
- Wiper motor calibration
- Arm and linkages
- Washer motor
- Blade

Faults in power mirror system may include but not limited to:

- Motor
- Fuse
- Relay
- Switch
- Wire harness

Faults in power window system may include but not limited to:

- Motor
- Fuse
- Switch
- Power window regulator
- Wire harness

Critical aspects:

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Diagnose the faults related to power operated systems following standard procedures.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Working principle of power window system • Working principle of power mirror system • Circuit diagram of power operated systems • Working principle of wiper system • Working principle of electric power steering system • Functions and operations of Torque sensors • Functions and operations of Vehicle Speed sensors • Functions and operations of steering angle sensors	• Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

UNIT TITLE : Service Heating and Ventilation System

DESCRIPTOR: This unit covers the competencies required to service electrical components of heating system, service components of ventilation system and to service electrical components of MAC system.

CODE : 7412-U5-L3

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Service Electrical Components of Heating System	1.1 Select and use ***tools, materials and equipment*** as per the job requirement. 1.2 Diagnose ***faults of electrical components of heating systems*** following standard procedures. 1.3 Replace control panel assembly as per the job requirement following standard procedures. 1.4 Replace blower resistor as per the job requirement following standard procedures. 1.5 Replace blower control switch as per the job requirement following standard procedures. 1.6 Replace heater core as per the job requirement following standard procedures. 1.7 Replace heater control valve as per the job requirement following standard procedures.
2. Service Components of Ventilation System	2.1 Diagnose ***faults of ventilation system*** following standard procedure. 2.2 Replace air inlet damper control/actuator as per the job requirement following standard procedures. 2.3 Replace blower unit as per the job requirement following standard procedures. 2.4 Replace air duct as per the job requirement following standard procedures.

3. Service Electrical Components of MAC System	3.1	Diagnose ***faults of electrical components*** of MAC systems following standard procedure.
	3.2	Replace AC push button switch as per the job requirement following standard procedures.
	3.3	Replace AC air filter as per the job requirement following standard procedures.
	3.4	Service condenser cooling fan motor as per the job requirement following standard procedures.
	3.5	Replace magnetic compressor clutch as per the job requirement following standard procedures.
	3.6	Replace LP&HP switches as per the job requirement following standard procedures.

RANGE STATEMENT
Tools may include but not limited to: • Pliers • Screw driver set • Mini socket set • Test-lamp • Wrench set • Wire stripper • Crimping pliers • Soldering iron • Socket set
Materials may include but not limited to: • Wires • Wire terminals • Insulation tape • Soldering lead & flux
Equipment may include but not limited to: • Multimeter
Faults of electrical components of heating system may include but not limited to: • Control panel assembly • Blower resistor • Heater control valve • Wire harness • Heater core • Blower control switch • Fuse
Faults of ventilation system may include but not limited to: • Air duct control/actuator • Air inlet damper • Blower unit
Faults of electrical components of MAC system may include but not limited to: • AC push button switch • Condenser cooling fan motor • AC air filter • Fuse • Relay • Magnetic compressor clutch • Compressor clutch • LP & HP switch • Wire harness

Critical aspects:

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Diagnose the faults of the heating and ventilation system following standard procedure.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Circuit diagram of HVAC system • Working principle of HVAC system • Working principle of magnetic compressor clutch • Functions and operation of LP & HP switches	• Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

UNIT TITLE : Install/Service Vehicle Safety and Security System

DESCRIPTOR: This unit covers the competencies required to service install/service components of central locking system and burglar alarm, service Supplemental Restraint System (SRS), service engine immobilizer system and to service Anti-Lock Braking System (ABS).

CODE : 7412-U6-L3

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Install/Service Components of Central Locking System and Burglar Alarm	1.1 Select and use ***tools, materials and equipment*** as per the job requirement. 1.2 Install central locking system and burglar alarm as per the job requirement following standard procedure. 1.3 Diagnose ***faults of central locking system*** following standard procedure. 1.4 Replace actuators as per the job requirement following standard procedure. 1.5 Replace Electronic Control Module (ECM) as per the job requirement following standard procedure. 1.6 Replace courtesy door light switch as per the job requirement following standard procedure.
2. Service Supplemental Restraint System (SRS)	2.1 Replace SRS module as per the job requirement following standard procedure. 2.2 Replace air bag inflator as per the manufacturer's instructions following standard procedure. 2.3 Replace spiral cable as per the manufacturer's instructions following standard procedure. 2.4 Replace airbag impact sensor as per the manufacturer's instructions following standard procedure. 2.5 Replace occupant detection sensor as per the manufacturer's instructions following standard procedure.

3.	Service Engine Immobilizer System	3.1	Diagnose ***fault in engine immobilizer system*** following standard procedure.
		3.2	Perform key programming as per the job requirement following standard procedure.
		3.3	Replace ECU as per the manufacturer's instruction following standard procedure.
		3.4	Replace receiver as per the job requirement following standard procedure.
4.	Service Antilock Braking System (ABS)	4.1	Diagnose ***fault of antilock braking system*** following standard procedure.
		4.2	Replace brake pedal switch as per the job requirement following standard procedure
		4.3	Replace/service wheel speed sensor as per the job requirement following standard procedure.
		4.4	Replace brake modulator unit as per the job requirement following standard procedure.
		4.5	Replace skid electronic control unit as per the job requirement following standard procedure.

RANGE STATEMENT
Tools may include but not limited to: • Screw driver set • Test-lamp • Mini socket set • Wrench set • Wire stripper • Pliers • Socket set • Crimping pliers • Allen key set • Soldering iron
Materials may include but not limited to: • Wires • Petrol • Insulation tape • Wire terminals • Soldering lead & flux
Equipment may include but not limited to: • Scanner • Multi meter
Faults of central locking system may include but not limited to: • Actuator • Electronic control module • Remote • Courtesy door light switch • Wire harness
SRS components may include but not limited to: • Airbag inflator • Spiral cable • Airbag impact sensor • Occupant detection sensor • SRS module
Fault in engine immobilizer system may include but not limited to: • Immobilizer key set • Receiver
Fault of antilock braking system may include but not limited to: • Brake pedal switch • Wheel speed sensor • Brake modulator unit • Skid electronic control unit

Critical aspects:

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Diagnose the faults of vehicle safety and security system following standard procedure.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Working principle of SRS • Working principle of ABS • Working principle of engine immobilizer • Working principles of central locking system • Circuit diagrams of SRS • Circuit diagram of ABS	• Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

UNIT TITLE : Service Electronic Fuel Injection System

DESCRIPTOR: This unit covers the competencies required to service electronic fuel (petrol) injection system, service Common Rail Direct Injection system (CRDI) and to service electronics components of emission control system.

CODE : 7412-U7-L3

ELEMENTS OF COMPETENCE	PERFORMANCE CRITERIA
1. Service Electronic Fuel (Petrol) Injection System	1.1 Select and use ***tools, materials and equipment*** as per the job requirement. 1.2 Diagnose ***faults of electronic fuel (petrol) injection system*** using scan tool following standard procedures. 1.3 Replace fuel pump motor as per the job requirement following standard procedures. 1.4 Replace ***sensors*** as per the job requirement following standard procedures. 1.5 Replace ECU as per the job requirement following standard procedures. 1.6 Repair wire as per the job requirement following standard procedures. 1.7 Replace injectors as per the job requirement following standard procedures. 1.8 Replace/service Idle Air Control (IAC) valve as per the job requirement following standard procedures.
2. Service Common Rail Direct Injection (Diesel) System	2.1 Diagnose ***faults of electronic diesel injection system*** using scan tool following standard procedures. 2.2 Replace fuel pump as per the job requirement following standard procedures. 2.3 Replace ***sensors*** as per the job requirement following standard procedures. 2.4 Repair wire as per the job requirement following standard procedures. 2.5 Replace injectors as per the job requirement following standard procedures. 2.6 Replace element cut off valve as per the job requirement following standard procedures. 2.7 Replace common rail pressure control valve as per the job requirement following standard procedures. 2.8 Replace fuel metering control valve as per the job

		requirement following standard procedures
3. Service Electrical Components of Emission Control System	3.1	Diagnose ***faults of emission control system*** following standard procedure.
	3.2	Replace canister purge solenoid as per the job requirement following standard procedure.
	3.3	Service vacuum modulator as per the job requirement following standard procedure.
	3.4	Regenerate diesel particulate filter as per the job requirement following standard procedure.
	3.5	Service EGR valve as per the job requirement following standard procedure.
	3.6	Replace exhaust gas temperature sensor and NOx sensor as per the job requirement following standard procedure.

RANGE STATEMENT

Tools may include but not limited to:

- Pliers
- Screw driver set
- Mini socket set
- Wire stripper
- Crimping pliers
- Soldering iron
- Test-lamp
- Wrench set
- Socket set

Materials may include but not limited to:

- Wires
- Insulation tape
- Wire terminals
- Soldering lead & flux

Equipment may include but not limited to:

- Scanner
- Multi meter

Faults of electronic petrol injection system may include but not limited to:

- Fuse
- ECU
- Relay
- Wires
- Fuel pump motor
- Injectors
- Sensors
- Idle air control valve

Sensors for petrol injection system may include but not limited to:

- TP sensor
- IAT sensor
- MAP sensor
- O_2 sensor
- CMP sensor
- CRP sensor
- MAF sensor
- ECT sensor

Faults of electronic diesel injection system may include but not limited to:

- Fuse
- Wires
- Relay
- Injectors
- In-tank pump
- Element cut off valve
- Sensors
- Pressure control valve
- ECU
- Fuel metering control valve

Sensors for diesel injection system may include but not limited to:

- TP sensor
- IAT sensor
- MAP sensor
- CMP sensor
- knock sensor
- CRP sensor
- MAF sensor
- ECT sensor
- O2 sensor
- Rail pressure sensor

Faults of emission control system may include but not limited to:

- Canister purge solenoid
- EGR valve
- NOx sensor
- Exhaust gas temperature sensor
- Diesel Particulate Filter (DPF)

Critical aspects:

- Demonstrate safe working practices at all times in accordance with OHS regulations.
- Diagnose the faults of electronic fuel injection system and emission control system following standard procedure.

UNDERPINNING KNOWLEDGE	UNDERPINNING SKILLS
• Ethics and integrity • Working of electronic fuel (petrol) injection system • Working of CRDI • Working of emission control system • Circuit diagram of fuel injection system • Norms of emission • Functions and Working principle of sensors	• Team work • Negotiation • Communication skills • Problem solving • Analytical Skills • Time Management

Annexure:

1.1 National Competency Standards (NCS)

National Competency Standards specify the skill, knowledge and attitudes applied to a particular occupation. Standards also specify the standards or criteria of performance of a competent worker and the various contexts in which work may take place. Standards provide explicit advice to assessors regarding the skill and knowledge to be demonstrated by candidates seeking formal recognition either following training or through work experience.

1.2 Purpose of National Competency Standards

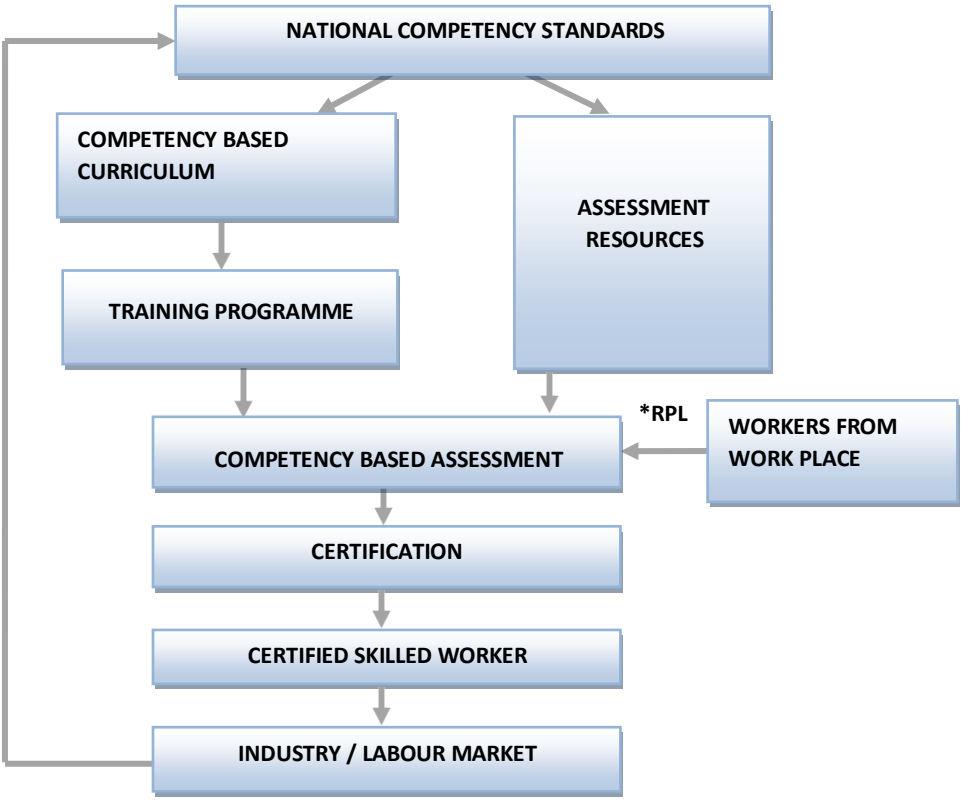
Competency Standards serve a number of purposes including:

- Providing advice to curriculum developers about the skill and knowledge to be included in curriculum.
- Providing specifications to assessment resource developers about the skill, knowledge and attitudes within an occupation to be demonstrated by candidates.
- Providing advice to industry/employers about job functions, which in turn can be used for the development of job descriptions, performance appraisal systems and work flow analysis.

1.3 Bhutan Vocational Qualifications Framework (BVQF)

Bhutan Vocational Qualifications Framework is an agreed system of Assessing, Certifying and Monitoring nationally recognized qualifications for all learning in the VET sector against national standards, in training institutions, in the workplace, in schools or anywhere where learning takes place.

Components of the Bhutan Vocational Qualification Framework (BVQF)



*** RPL = Recognition of Prior Learning**

1.4 BVQF Levels

The Bhutan Vocational Qualifications Framework has three levels classified based on the competency of the skilled workers. The three levels are:

- National Certificate Level 3 (NC 3) -Master Craftsman
- National Certificate Level 2 (NC 2) -Craftsman
- National Certificate Level 1 (NC 1) -Semi Skilled Worker

BVQF Level Descriptors

The qualification levels are decided based on level descriptors. The detail of the qualification level descriptor is as follows:

National Certificate Level 1 (Semi skilled)

Carry out processes that:	Learning demand:	Responsibilities Which are applied:
• Are narrow in range. • Are established and familiar. • Offer a clear choice of routine responses. • Involve some prioritizing of tasks from known solutions.	• Basic operational knowledge and skill. • Utilization of basic available information. • Known solutions to familiar problems. • Little generation of new ideas.	• In directed activity. • Under general supervision and quality control. • With some responsibility for quantity and quality. • With no responsibility for guiding others.

National Certificate Level 2 (Craftsman)

Carry out processes that:	Learning demand:	Responsibilities which are applied:
• Require a range of well-developed skills. • Offer a significant choice of procedures requiring prioritization. • Are employed within a range of familiar context.	• Some relevant theoretical knowledge. • Interpretation of available information. • Discretion and judgment. • A range of known responses to familiar problems	• In directed activity with some autonomy. • Under general supervision and quality checking. • With significant responsibility for the quantity and quality of output. • With some possible responsibility for the output of others.

National Certificate Level 3 (Master Craftsman)

Carry out processes that:	Learning demand:	Responsibilities which are applied:
• Requires a wide range of technical or scholastic skills. • Offer a considerable choice of procedures requiring prioritization to achieve optimum outcomes. • Are employed in a variety of familiar and unfamiliar contexts.	• A broad knowledge base which incorporates some theoretical concepts. • Analytical interpretation of information. • Informed judgment. • A range of sometimes innovative responses to concrete but often unfamiliar problems.	• In self–directed activity. • Under broad guidance and evaluation. • With complete responsibility for quantity and quality of output. • With possible responsibility for the output of others.

1.5 CODING USED FOR NATIONAL COMPETENCY STANDARDS

The coding and classification system developed in Bhutan is logical, easy to use, and also aligned with international best practices. The Bhutanese coding and classification system is based on the International Standard Classification of Occupations, 2008 (ISCO-08) developed by the International Labour Organisation (ILO).

The coding of the National Competency Standards forms the basis of the identification code for the Vocational Education and Training Management Information System (VET – MIS) both in terms of economic sector identification and that of the individual standard.
Coding the individual unit competency standard is to identify the level in qualification package to which it belongs.

While packaging, in order to follow a logical order, only competency standards related to each other and following a logical sequence in terms of training delivery, from the simple to the complex, are clustered into a qualification package.

1.6 ASSESSMENT GUIDE

Form of assessments

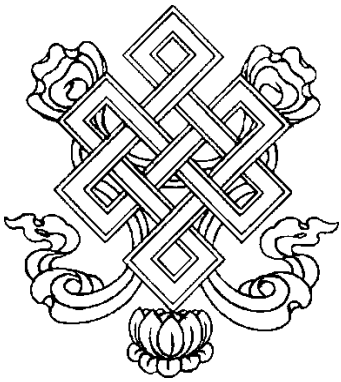
- Continuous assessment together with collected evidence of performance will be used.
- Evidence of the performance shall be based on practical demonstration.
- Knowledge can be assessed through diagrams, in writing or orally (viva- voce).

Assessment context

- Competency may be assessed in the actual work place or in a simulated workplace setting.

Assessment condition

- The candidate shall have access to all required tools, equipment, materials and documents.
- Candidate must complete the assessment in industry accepted time frame.



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