

14. Competency Profile (CP)

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| SECTION | (G)Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452)Maintenance And Repair Of Motor Vehicles | |
| AREA | Light Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| NOSS LEVEL | Two (2) | NOSS CODE G452-002-2:2018 |

| CU TITLE & CU CODE | CU DESCRIPTOR | WORK ACTIVITIES | PERFORMANCE CRITERIA |
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| 1. Vehicle Workshop Housekeeping G452-002-2:2018-CU01 | Vehicle Workshop Housekeeping is the essential role of vehicle maintenance shops hygiene, safety and security conformant to enable services are rendered at worthiness condition. It is to utilize all resources for safeguarding vehicle maintenance shops to be at optimum comfort, at the same time complying with the legislative compliances. The importance of this competency unit is the ability to apply the standards procedures and measures to avoid injuries of people working in automotive workshops, creating and maintaining work safes expectations, and the principles to address health and safety problems in automotive workshops for enabling worthiness operation. | <p>1. Identify workshop housekeeping requirements.</p> <p>2. Prepare workshop housekeeping setup.</p> <p>3. Perform workshop housekeeping activities.</p> | <p>1.1 Workshop housekeeping instructions is obtained for sorting housekeeping activities schedule.</p> <p>1.2 Type of housekeeping area is determined for identifying workplace housekeeping requirement.</p> <p>1.3 Type of tools, equipment and materials are determined for desirable housekeeping activities preparation.</p> <p>2.1 Signage for work procedures are arranged to allow risks mitigation.</p> <p>2.2 Safety equipment are arranged for work safety.</p> <p>2.3 Standard Operating Procedure (SOP) for workshop housekeeping is adhered to complying with standards working procedures.</p> <p>2.4 Maintenance schedule for workshop housekeeping activities are listed for work arrangement.</p> <p>3.1 Workshop safety practices are carried out for workplace housekeeping.</p> <p>3.2 Workshop tools maintenance activities are carried out to enable safe functionality and application.</p> <p>3.3 Workshops equipment housekeeping</p> |

| CU TITLE & CU CODE | CU DESCRIPTOR | WORK ACTIVITIES | PERFORMANCE CRITERIA |
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| | <p>prepare workshop periodic report.</p> <p>The outcome of this competency is to perform essential roles of vehicle workshops layout organization structure, hygiene, safety and security conformant to enable services are rendered at worthiness condition. It is to utilize all resources for safeguarding vehicle workshops are at optimum comfort complying with the legislative compliances.</p> | <p>4. Check workshop housekeeping conformance.</p> <p>5. Prepare workshop periodic report.</p> | <p>and re-allocation are carried out for worthiness operation.</p> <p>3.4 Housekeeping compliances for legislative condition are checked to meet workplace standards.</p> <p>4.1 Workshop activities are being assessed for determining housekeeping performance.</p> <p>4.2 Workshop activities checklist is compiled for documenting housekeeping outcome.</p> <p>4.3 Tools, equipment & materials placement condition are checked for assessing worthiness operation.</p> <p>5.1 Housekeeping information and remarks are compiled for administrative function.</p> <p>5.2 Activities summary is reported to supervisor/ manager.</p> <p>5.3 Housekeeping compliance is documented for standards verification.</p> |
| <p>2. Vehicle Engine Service G452-002-2:2018-CU02</p> | <p>Vehicle Engine Service is an essential role for vehicle maintenance to ensure that oil levels are sufficiently topped up to avoid major faulty repair. The importance of this competency unit is to exchange the engine oil, replace the oil filter and change minor components of the engine.</p> <p>The competency includes to change lubrication oil & oil filter, change engine drive belt and tensioner, inspect exhaust systems components condition,</p> | <p>1. Change lubrication oil & oil filter.</p> | <p>1.1 Job order obtained and interpreted.</p> <p>1.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>1.3 Oil filter replaced in accordance with the workshop manual.</p> <p>1.4 Lubricant refilled out to meet the vehicle requirement according to the workshop manual.</p> <p>1.5 Lubrication leakage is checked to ensure worthiness of lubrication services.</p> <p>1.6 Next service indicator updated and presented.</p> |

| CU TITLE & CU CODE | CU DESCRIPTOR | WORK ACTIVITIES | PERFORMANCE CRITERIA |
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| | <p>change air filter, change fuel filter and change spark plugs.</p> <p>The outcome of this competency is to be able to service the engine vehicle regularly or periodically to avoid major faulty after long mileage and ensuring vehicle are at optimum condition after lubrication service complying with vehicle lubrication manual & practice.</p> | <p>1.7 Lubrication oil & oil filter replacement checklist updated in accordance with the workshop manual.</p> <p>2. Change engine drive belt and tensioner.</p> <p>2.1 Job order obtained and interpreted.</p> <p>2.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>2.3 Engine drive belt and tensioner checked according to service manual.</p> <p>2.4 Engine drive belt and tensioner replaced in accordance with the workshop manual.</p> <p>2.5 Engine drive belt and tensioner replacement checklist updated in accordance with the workshop manual.</p> <p>3. Inspect exhaust system components condition.</p> <p>3.1 Job order obtained and interpreted.</p> <p>3.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>3.3 Exhaust system components condition are checked for leakages in accordance with the workshop manual.</p> <p>3.4 Exhaust system components condition inspection checklist updated in accordance with the workshop manual.</p> <p>4. Change air filter.</p> <p>4.1 Air filter condition is checked in accordance with the workshop manual.</p> <p>4.2 Air filter replaced in accordance with the workshop manual.</p> <p>4.3 Air filter replacement checklist updated in accordance with the workshop manual.</p> <p>5. Change fuel filter.</p> <p>5.1 Fuel filter condition are checked in accordance with the workshop manual.</p> <p>5.2 Fuel filter replaced in accordance with</p> | |

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| | | <p>6. Change spark plugs.</p> | <p>the workshop manual.</p> <p>5.3 Fuel filter replacement checklist updated in accordance with the workshop manual.</p> <p>6.1 Spark plugs condition are checked in accordance with the workshop manual.</p> <p>6.2 Spark plugs replaced in accordance with the workshop manual.</p> <p>6.3 Spark plug gap adjusted in accordance with the workshop manual.</p> <p>6.4 Spark plugs replacement checklist updated in accordance with the workshop manual.</p> |
| <p>3. Vehicle Engine Overhauling G452-002-2:2018-CU03</p> | <p>Vehicle Engine Overhauling is a scope of competency to examine and restore the diesel / petrol engine components to meet manufacturers specifications and tolerances during overhaul. Proper dimensions and tolerances must be met to obtain proper performance and maximum engine life. The importance of this competency unit is about the engine which has been removed, disassembled (torn down), cleaned, inspected, and replace parts as necessary and tested using workshop manual approved procedures. The</p> | <p>1. Conduct engine compression test.</p> | <p>1.1 Job order obtained and interpreted.</p> <p>1.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>1.3 Engine compression tests are completed in accordance with the workshop manual.</p> <p>1.4 Engine compression test reports prepared.</p> <p>1.5 Engine compression test reports compared to the manufacturers specifications.</p> <p>1.6 Engine overhaul recommendation is prepared in accordance with the workshop manual.</p> |

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| | <p>procedure generally involves honing, new piston rings, bearings, gaskets, oil seals.</p> <p>The competency includes to conduct engine compression test, conduct engine cylinder leakages test, remove engine from vehicle, perform engine overhaul, reinstall engine onto vehicle and conduct engine test.</p> <p>The outcome of this competency is to make sure no abnormal knocking sound, no visible and possible leaking from the engine and free from defect to ensure the engine functions in full optimal performance also defect free.</p> | <p>2. Conduct engine cylinder leakages test.</p> <p>3. Remove engine from vehicle.</p> <p>4. Perform engine overhaul.</p> | <p>2.1 Engine cylinder leakage test using diagnostic tool are completed in accordance with the workshop manual.</p> <p>2.2 Engine cylinder leakage test reports compared to the manufacturers specifications.</p> <p>2.3 Engine overhaul recommendation is prepared and printed in accordance with the workshop manual.</p> <p>3.1 Vehicle operation fluids and lubricant are drained out in accordance with the workshop manual.</p> <p>3.2 Refrigerant gases are recovered in accordance with the workshop manual.</p> <p>3.3 Engine auxiliary components and attachments are removed in accordance with the workshop manual.</p> <p>3.4 Crane-out the engine from vehicle in accordance with the workshop manual.</p> <p>4.1 Engine external components are removed in accordance with workshop manual.</p> <p>4.2 Engine internal components are removed and strip down in accordance with workshop manual.</p> <p>4.3 Engine parts and components are cleaned-up in accordance with workshop manual.</p> <p>4.4 Engine parts and components are inspected in accordance with the workshop manual.</p> <p>4.5 Engine part and components wear and tear are measured in accordance with the workshop manual.</p> |

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| | | <p>4.6 Machine shop work is prepared according with the workshop manual are coordinated.</p> <p>4.7 Worn or damaged parts and components changed in accordance with the workshop manual.</p> <p>4.8 External and internal engine components reassembled.</p> | <p>4.6 Machine shop work is prepared according with the workshop manual are coordinated.</p> <p>4.7 Worn or damaged parts and components changed in accordance with the workshop manual.</p> <p>4.8 External and internal engine components reassembled.</p> |
| | | <p>5. Reinstall engine onto vehicle.</p> | <p>5.1 Vehicle operation fluids and lubricants are refilled.</p> <p>5.2 Refrigerant gases are refilled.</p> <p>5.3 Engine auxiliary components and attachments are fitted.</p> <p>5.4 Engine is craned-in onto vehicle in accordance with the OEM specification.</p> |
| | | <p>6. Conduct engine test.</p> | <p>6.1 Leakages are checked in accordance with the service manual.</p> <p>6.2 Abnormal noises are checked through audio inspection in accordance with the workshop manual.</p> <p>6.3 On Board Diagnostic (OBD) test is performed in accordance with the workshop manual.</p> <p>6.4 Vehicle test drive is carried out to determine the engine performance in accordance with the workshop manual.</p> <p>6.5 Final control test on the overall vehicle performance is performed in accordance with the OEM specification.</p> <p>6.6 Engine test report is prepared in accordance with the workshop manual.</p> |

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| <p>4. Vehicle Brake System Service G452-002-2:2018-CU04</p> | <p>Vehicle Brake System Service is a scope of competency to restore drum brake system or disc brake system in order to slow or stops the wheels and the vehicle. Importance of this competency unit is that the person can perform service on the brake system of the vehicle.</p> <p>The competency includes to inspect brake system condition, change brake system and change parking brake system components.</p> <p>The outcome of this competency is to make sure the continuous of the brake functions, free of any fluid leakages, and to ensure the safeness of the driver.</p> | <p>1. Inspect brake system condition.</p> <p>2. Change brake system components.</p> <p>3. Change parking brake system components.</p> | <p>1.1 Job order obtained and interpreted. 1.2 Tools, equipment and parts confirmed according to job requirement. 1.3 Brake leakages condition is checked in accordance with hydraulic brake system condition inspection procedure. 1.4 Water vapour contamination level of the brake fluid is checked according with the workshop manual. 1.5 Inspection brake system condition checklist is prepared in accordance with the workshop manual.</p> <p>2.1 Brake system components replaced in accordance with workshop manual. 2.2 Brake system components replacement checklist prepared in accordance with the workshop manual.</p> <p>3.1 Parking brake components condition checked in accordance with the workshop manual. 3.2 Parking brake components replaced in accordance with the workshop manual. 3.3 Vehicle brake system service report is prepared in accordance with the workshop manual.</p> |
| <p>5. Engine Cooling System Replacement G452-002-2:2018-CU05</p> | <p>Engine Cooling System Replacement is a scope of competency to examine and replace faulty engine cooling system and prevent engine from over-heating. Importance of this competency unit is that the person can perform faulty parts replacement for the engine cooling system.</p> | <p>1. Conduct cooling system pressure test.</p> <p>2. Conduct cooling system parts functionality test.</p> | <p>1.1 Job order obtained and interpreted. 1.2 Tools, equipment and parts confirmed according to job requirement. 1.3 Cooling system pressure test completed in accordance with the workshop manual. 1.4 Pressure test result acquired.</p> <p>2.1 Noise, vibration & harshness (NVH) abnormalities confirmed by cooling</p> |

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| | <p>This competency includes conduct cooling system pressure test, conduct cooling system parts functionality test and change cooling system parts</p> <p>The outcome of this competency is to provide smooth engine cooling functions, free of noise and defects, maintain the temperature of the engine and to ensure efficiency of the cooling system.</p> | <p>3. Change cooling system parts.</p> | <p>system components functionality test.</p> <p>2.2 Cooling system components functionality test status checklist updated.</p> <p>3.1 Cooling system parts replaced in accordance with workshop manual.</p> <p>3.2 Cooling system parts functionality confirmed in accordance with workshop manual.</p> <p>3.3 Engine cooling system replacement report prepared in accordance with workshop manual.</p> |
| <p>6. Rear / Front Axle Rectification G452-002-2:2018-CU06</p> | <p>Rear / Front Axle Unit Rectification is a scope of competency to restore final-drive gears in order to reduce the speed of the axle shafts while increasing the torque applied to them and axle differential unit to allow different rates of wheel rotation on curves. Importance of this competency unit is that the person can perform rectification work on the rear / front axle of the vehicle.</p> <p>The competency includes inspect rear / front axle condition, dismantle rear / front axle differential unit and change rear / front axle differential components & parts.</p> <p>The outcome of this competency is to provide free of leakages, other defects and smooth performance of the rear / front axle.</p> | <p>1. Inspect rear / front axle condition.</p> <p>2. Dismantle rear / front axle differential unit.</p> <p>3. Change rear / front axle differential components &</p> | <p>1.1 Job order obtained and interpreted.</p> <p>1.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>1.3 Rear / front axle leakages are visually checked according to the workshop manual.</p> <p>1.4 Rear / front axle abnormal noise and vibration confirmed to determine the possibility worn out condition.</p> <p>2.1 Wheels are removed from the rear / front axle differential unit in accordance with the workshop manual.</p> <p>2.2 Differential gear oil drained in accordance with removing rear axle differential unit requirement.</p> <p>2.3 Drive shaft removed from vehicle in accordance with workshop manual.</p> <p>2.4 Rear / front axle differential unit attachment parts removed in accordance with the workshop manual.</p> <p>3.1 Rear / front axle differential unit dismantled in accordance with</p> |

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| | | parts. | <p>workshop manual.</p> <p>3.2 Rear / front axle differential unit parts & components replaced in accordance with workshop manual.</p> <p>3.3 Rear / front axle differential unit assembled in accordance with the workshop manual.</p> <p>3.4 Rear / front axle differential unit installed into rear / front axle in accordance with workshop manual.</p> <p>3.5 Wheel installed to the vehicle in accordance with workshop manual.</p> <p>3.6 Pre-delivery inspection test is performed in accordance with workshop manual.</p> <p>3.7 Rear / front axle rectification report is prepared in accordance with the workshop manual.</p> |
| <p>7. Exhaust System Rectification</p> <p>G452-002-2:2018-CU07</p> | <p>Exhaust System Rectification is a scope of competency to ensure the exhaust gases discharged away from the engine into the air and muffle the noise of the exhaust. Importance of this competency unit is that the person can perform rectification work on exhaust system of the vehicle.</p> <p>The competency includes to inspect exhaust system components condition, change exhaust system components, and test exhaust system performance.</p> <p>The outcome of this competency is to provide free of leakages, noise &</p> | <ol style="list-style-type: none"> 1. Inspect exhaust system components condition. 2. Change exhaust system components. 3. Conduct exhaust system components performance test. | <ol style="list-style-type: none"> 1.1 Job order obtained and interpreted. 1.2 Tools, equipment and parts confirmed according to job requirement. 1.3 Exhaust System Components Condition checked in accordance with the workshop manual. 1.4 Exhaust System Components Condition status checklist prepared in accordance with the workshop manual. 2.1 Exhaust system components replaced in accordance with workshop manual. 2.2 Exhaust system components replacement checklist status prepared. 3.1 Exhaust system components replaced in accordance with workshop manual. 3.2 Exhaust system components |

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| 8. Vehicle Electrical & Electronic System Service G452-002-2:2018-CU08 | <p>vibration, good cosmetic value & performance of engine exhaust system and also to make sure safer environment.</p> <p>Vehicle Electrical & Electronic System Service is a scope of competency to restore electrical and electronic system, producing electricity and delivering electric energy from these sources on demand to any other electrical components in the vehicle. Importance of this competency unit is that the person can perform service and replacement of parts on the electrical & electronic system of the vehicle.</p> <p>The competency includes the inspection of electrical & electronic components functionality, change electrical & electronic system parts & components, inspect chassis electrical system and change vehicle chassis electrical system components.</p> <p>The outcome of this competency is to provide clear engine ignition, combustion of the engine and a smooth fuel injection operation.</p> | <p>1. Inspect electrical & electronic system parts & components functionality.</p> <p>2. Change electrical & electronic system parts & components.</p> <p>3. Inspect chassis electrical system.</p> <p>4. Change chassis electrical system components.</p> | <p>replacement checklist status prepared.</p> <p>3.3 Exhaust system rectification report prepared in accordance with the workshop manual.</p> <p>1.1 Job order obtained and interpreted.</p> <p>1.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>1.3 Electrical & electronic system parts & components functionality checked in accordance with the workshop manual.</p> <p>1.4 Inspection technical report prepared and submitted in accordance with workshop manual.</p> <p>2.1 Electrical & electronic system parts & components replaced in accordance with workshop manual.</p> <p>2.2 Electrical & electronic system parts & components performance test performed in accordance with workshop manual.</p> <p>2.3 Electrical & electronic system parts & components replacement report prepared in accordance with the workshop manual.</p> <p>3.1 Electrical & electronic system parts & components functionality checked in accordance with the workshop manual.</p> <p>3.2 Inspection technical report prepared and submitted in accordance with workshop manual.</p> <p>4.1 Chassis electrical system components replaced in accordance with workshop manual.</p> |

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| <p>9. Vehicle Steering, Suspension and Wheel System Service</p> <p>G452-002-2:2018-CU09</p> | <p>Vehicle Steering, Suspension and Wheel System Service is a scope of competency to ensure steering, wheel and suspension system are responsible for providing optimal ride comfort and handling performance. Importance of this competency unit is that the person can perform service and replacement of parts & components on the steering, suspension and wheel system of the vehicle.</p> <p>The competency includes to inspect steering, suspension and wheel system functionality, change steering system parts, replace suspension system parts and change vehicle tyres and rims.</p> <p>The outcome of this competency is to provide free leakages, vibration and stiff defect, smooth performance and operational of vehicle steering & wheels, free stiff, noise defect and safety ensure for suspension.</p> | <ol style="list-style-type: none"> 1. Inspect steering, suspension and wheel system functionality. 2. Change steering system parts. 3. Change suspension system parts. | <p>4.2 Chassis electrical system components performance test performed in accordance with workshop manual.</p> <p>4.3 Chassis electrical system components replacement report prepared in accordance with the workshop manual.</p> <ol style="list-style-type: none"> 1.1 Job order obtained and interpreted. 1.2 Tools, equipment and parts confirmed according to job requirement. 1.3 Steering, suspension and wheel system functionality checked in accordance with the workshop manual. 1.4 Inspection steering, suspension and wheel system functionality technical report prepared and submitted in accordance with workshop manual. 2.1 Steering system replaced in accordance with workshop manual. 2.2 Steering system performance test performed in accordance with workshop manual. 2.3 Steering system replacement report prepared in accordance with the workshop manual. 3.1 Suspension system parts replaced in accordance with workshop manual. 3.2 Suspension system parts performance test performed in accordance with workshop manual. 3.3 Suspension system parts replacement report prepared in accordance with the workshop manual. |

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| 10. Vehicle Heated Ventilation Air Conditioning (HVAC) System Rectification G452-002-2:2018-CU10 | <p>Vehicle Heated Ventilation Air Conditioning (HVAC) System Rectification is a competency to restore damaged or faulty air conditioning system components back to its original function. Importance of this competency unit is that the person can perform rectification work and parts replacement on the heated ventilation air conditioning (HVAC) system of the vehicle.</p> <p>The competency includes inspect heated ventilation air conditioning (HVAC) system condition, change heated ventilation air conditioning (HVAC) system parts and components and conduct heated ventilation air conditioning (HVAC) system performance test.</p> <p>The outcome of this competency is to ensure free leakages, free defect and temperature accuracy for cooling effect.</p> | <p>4. Change vehicle tyres and rims</p> <p>1. Inspect heated ventilation air conditioning (HVAC) system condition.</p> <p>2. Change heated ventilation air conditioning (HVAC) system parts and components.</p> | <p>4.1 Tyres and rims replaced in accordance with workshop manual.</p> <p>4.2 Tyres and rims performance test performed in accordance with workshop manual.</p> <p>4.3 Tyres and rims replacement report prepared in accordance with the workshop manual.</p> <p>1.1 Job order obtained and interpreted.</p> <p>1.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>1.3 Heated ventilation air conditioning (HVAC) system functionality checked in accordance with the workshop manual.</p> <p>1.4 Heated ventilation air conditioning (HVAC) system functionality inspection technical report prepared and submitted in accordance with workshop manual.</p> <p>2.1 Air filter replaced in accordance with the workshop manual.</p> <p>2.2 Condenser fan unit replaced in accordance with the workshop manual.</p> <p>2.3 Heated ventilation air conditioning (HVAC) refrigerant recharged in accordance with the workshop manual.</p> <p>2.4 Blower motor replaced in accordance with the workshop manual.</p> <p>2.5 Perform blower motor switch & control resistor replacement.</p> <p>2.6 Heated ventilation air conditioning (HVAC) system parts and components replacements prepared and submitted</p> |

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| 11. Automatic Transmission / Transaxle Unit Overhauling G452-002-2:2018-CU11 | Automatic Transmission / Transaxle Unit Overhauling is a scope of competency to restore automatic transmission / transaxle unit providing torque needed to move the vehicle under a variety of road and load condition. The importance of this competency unit is about the automatic transmission / transaxle unit which to be removed, disassembled (torn down), cleaned, inspected, and replace parts as necessary and tested using workshop manual approved procedures. The procedure generally involves honing, new parts, bearings, gaskets, oil seals. The competency includes to conduct automatic transmission / transaxle unit functional test, remove automatic transmission / transaxle from vehicle, perform automatic transmission / transaxle overhauling and install automatic transmission / transaxle into | 3. Conduct heated ventilation air conditioning (HVAC) system performance test. | in accordance with workshop manual. 3.1 Leakages checked in accordance with the workshop manual. 3.2 Noise, vibration and harshness (NVH) checked in accordance with the workshop manual. 3.3 Abnormal defect checklist prepared in accordance with the workshop manual. |
| | | 1. Conduct automatic transmission / transaxle unit functional test. | 1.1 Job order obtained and interpreted. 1.2 Tools, equipment and parts confirmed according to job requirement. 1.3 Vehicle test is carried out to determine Automatic Transmission / Transaxle Unit functionality in accordance with the workshop manual. 1.4 Automatic transmission / transaxle unit shifting condition is checked in accordance with workshop manual. 1.5 Functional test report is prepared in accordance with workshop manual. |
| | | 2. Remove automatic transmission / transaxle from vehicle. | 2.1 Automatic transaxle/transmission fluid (ATF) drained in accordance with workshop manual. 2.2 Automatic transmission / transaxle attachments detached in accordance with workshop manual. 2.3 Torque converter removed from the vehicle in accordance with workshop manual. 2.4 Automatic transmission / transaxle mount onto the overhaul stand in accordance with workshop manual. |

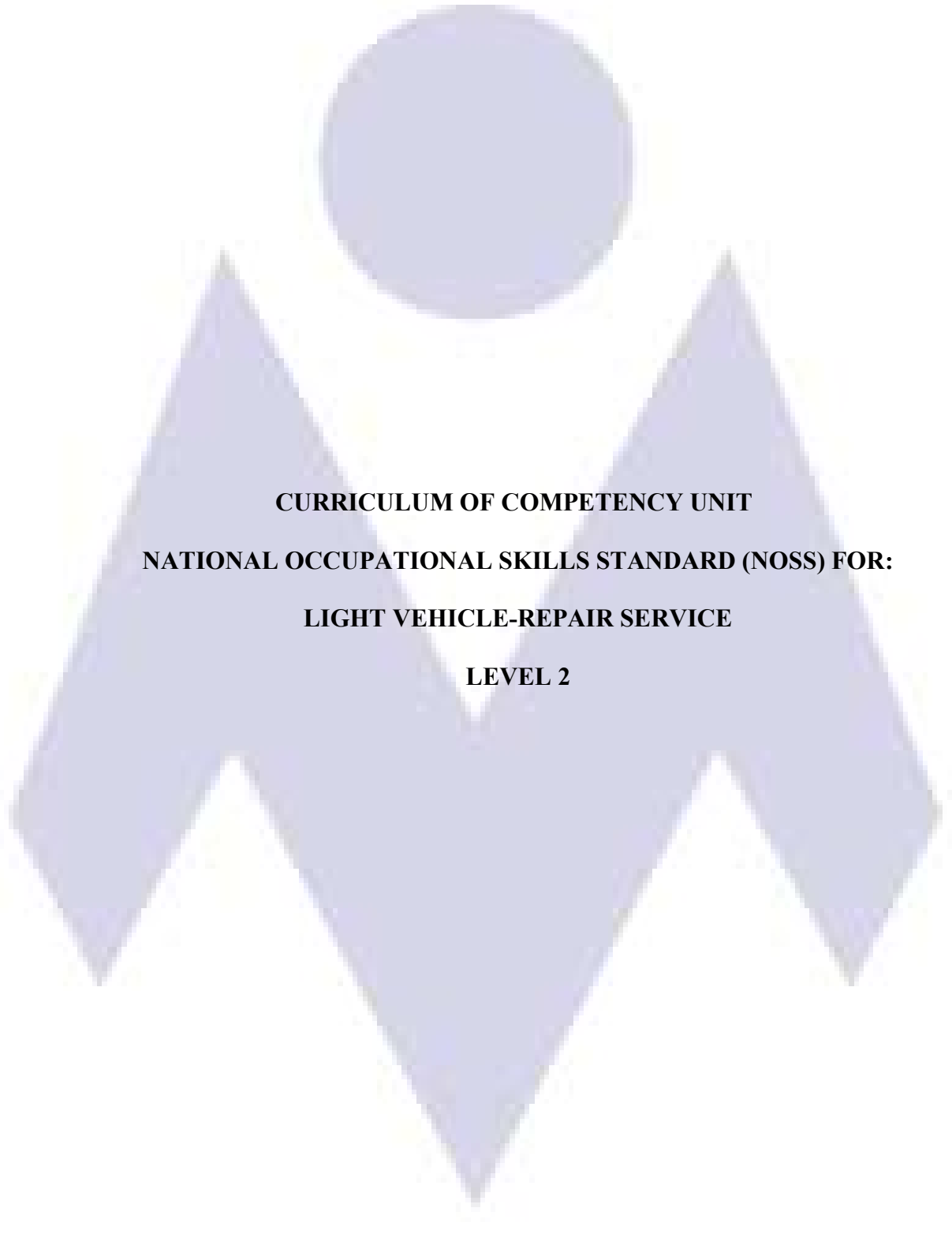
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| | <p>vehicle.</p> <p>The outcome of this competency is to ensure the smoothness of the transmission / transaxle unit shifting time, the quality of the shifting and free defect and malfunctions in accordance with OEM specifications.</p> | <p>3. Perform automatic transmission / transaxle overhauling.</p> <p>4. Install automatic transmission / transaxle into vehicle.</p> | <p>3.1 Automatic transmission / transaxle internal components dismantled in accordance with workshop manual.</p> <p>3.2 Automatic transmission / transaxle components parts condition inspected in accordance with workshop manual.</p> <p>3.3 Automatic transmission / transaxle components parts replaced in accordance with workshop manual.</p> <p>3.4 Automatic transmission / transaxle unit reassembled in accordance with workshop manual.</p> <p>4.1 Automatic transmission / transaxle attachments reattached in accordance with workshop manual.</p> <p>4.2 Torque converter installed to the automatic transmission / transaxle unit.</p> <p>4.3 Automatic transmission / transaxle unit installed in accordance with workshop manual.</p> <p>4.4 Automatic Transmission / Transaxle Fluid (ATF) refilled in accordance with workshop manual.</p> <p>4.5 Automatic transmission / transaxle functionality test performed in accordance with the workshop manual.</p> |
| <p>12. Manual Transmission / Transaxle Unit Overhauling</p> <p>G452-002-2:2018-CU12</p> | <p>Manual Transmission / Transaxle Unit Overhauling is a scope of competency to restore manual Transmission / Transaxle providing torque needed to move the vehicle under a variety of road and load condition. The importance of this competency unit is about the manual</p> | <p>1. Conduct manual transmission / transaxle unit functional test.</p> | <p>1.1 Job order obtained and interpreted.</p> <p>1.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>1.3 Vehicle test is carried out to determine Manual Transmission / Transaxle Unit functionality in accordance with the workshop manual.</p> <p>1.4 Manual transmission / transaxle unit shifting condition is checked in</p> |

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| | <p>transmission / transaxle unit which to be removed, disassembled (torn down), cleaned, inspected, and replace parts as necessary and tested using workshop manual approved procedures. The procedure generally involves honing, new parts, bearings, gaskets, oil seals.</p> <p>The competency includes to conduct manual transmission / transaxle unit functional test, remove manual transmission / transaxle from vehicle, perform clutch system overhaul, perform manual transmission / transaxle overhauling and install manual transmission / transaxle into vehicle</p> <p>The outcome of this competency is to ensure the smoothness of the transmission unit shifting time, the quality of the shifting and free defect and malfunctions in accordance with OEM specifications.</p> | <p>2. Remove manual transmission / transaxle from vehicle.</p> <p>3. Perform clutch system overhaul.</p> <p>4. Perform manual transmission / transaxle overhauling.</p> | <p>accordance with workshop manual.</p> <p>1.5 Functional test report is prepared in accordance with workshop manual.</p> <p>2.1 Manual transaxle/transmission fluid (MTF) drained in accordance with workshop manual.</p> <p>2.2 Manual transmission / transaxle attachments detached in accordance with workshop manual.</p> <p>2.3 Manual transmission / transaxle mount on the overhaul stand in accordance with workshop manual.</p> <p>3.1 Clutch system functionality test performed in accordance with workshop manual.</p> <p>3.2 Clutch system assembly disassembled in accordance with workshop manual.</p> <p>3.3 Clutch system parts & components replaced in accordance with workshop manual.</p> <p>3.4 Clutch system assembly assembled in accordance with workshop manual.</p> <p>4.1 Manual transmission / transaxle internal components dismantled in accordance with workshop manual.</p> <p>4.2 Manual transmission / transaxle components parts condition inspected in accordance with workshop manual.</p> <p>4.3 Manual transmission / transaxle components parts replaced in accordance with workshop manual.</p> <p>4.4 Manual transmission / transaxle unit reassembled in accordance with workshop manual.</p> |

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| | | <p>5. Install manual transmission / transaxle into vehicle.</p> | <p>5.1 Manual transmission / transaxle attachments reattached in accordance with workshop manual. 5.2 Manual transmission / transaxle unit installed in accordance with workshop manual. 5.3 Manual Transmission / Transaxle Fluid (MTF) refilled in accordance with workshop manual. 5.4 Manual transmission / transaxle functionality test performed in accordance with the workshop manual.</p> |
| <p>13. Transfer Case Overhauling G452-002-2:2018-EU01</p> | <p>Transfer Case Overhauling is a scope of competency to ensure transfer case to provide power-flow to front and rear axle. The importance of this competency unit is about the transfer case which to be removed, disassembled (torn down), cleaned, inspected, and replace parts as necessary and tested using workshop manual approved procedures. The procedure generally involves honing, new parts, bearings, gaskets, oil seals.</p> <p>The competency includes conduct transfer case unit functional test, remove transfer case unit from vehicle, perform transfer case unit overhauling and install transfer case unit into vehicle.</p> <p>The outcome of this competency is to ensure the smoothness of the gear</p> | <p>1. Conduct transfer case unit functional test.</p> <p>2. Remove transfer case unit from vehicle.</p> <p>3. Perform transfer case unit overhauling.</p> | <p>1.1 Job order obtained and interpreted. 1.2 Tools, equipment and parts confirmed according to job requirement. 1.3 Vehicle test is carry out to determine transfer case unit functionality in accordance with the workshop manual. 1.4 Transfer case unit shifting condition is checked in accordance with workshop manual. 1.5 Transfer case functional test report is prepared in accordance with workshop manual.</p> <p>2.1 Transfer case gear oil drained in accordance with workshop manual. 2.2 Transfer case attachments detached in accordance with workshop manual. 2.3 Transfer case mount on the overhaul stand in accordance with workshop manual.</p> <p>3.1 Transfer case unit internal components dismantled in accordance with workshop manual. 3.2 Transfer case unit components parts</p> |

| CU TITLE & CU CODE | CU DESCRIPTOR | WORK ACTIVITIES | PERFORMANCE CRITERIA |
|---|---|---|---|
| | engage, the quality of the shifting and free defect and malfunctions in accordance with OEM specifications. | | <p>condition inspected in accordance with workshop manual.</p> <p>3.3 Transfer case unit components parts replaced in accordance with workshop manual.</p> <p>3.4 Transfer case unit reassembled in accordance with workshop manual.</p> |
| 14. Vehicle Carburettor Service G452-002-2:2018-EU02 | <p>Vehicle Carburettor Service is a scope of competency to rectify faulty carburettor system in accordance with manufactures workshop manual.</p> <p>The competency includes inspect carburettor functionality, overhaul carburettor and perform carburettor tuning.</p> <p>The outcome of this competency is to ensure the smoothness of the engine, optimum performance and free defect and malfunctions in accordance with OEM specifications.</p> | <p>4. Install transfer case unit into vehicle.</p> <p>1. Inspect carburettor functionality.</p> <p>2. Overhaul carburettor.</p> | <p>4.1 Transfer case unit attachments reattached in accordance with workshop manual.</p> <p>4.2 Transfer case unit installed in accordance with workshop manual.</p> <p>4.3 Transfer case unit gear oil refilled in accordance with workshop manual.</p> <p>4.4 Transfer case unit functionality test performed in accordance with the workshop manual.</p> <p>1.1 Job order obtained and interpreted.</p> <p>1.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>1.3 Carburettor leakages condition is visually checked in accordance with inspection procedure.</p> <p>1.4 Carburettor idling speed performance is checked in accordance to workshop manual.</p> <p>1.5 Carburettor acceleration performance is checked in accordance with workshop manual.</p> <p>2.1 Job order obtained and interpreted.</p> <p>2.2 Tools, equipment and parts confirmed according to job requirement.</p> <p>2.3 Carburettor attachments are removed in accordance with workshop manual.</p> |

| CU TITLE & CU CODE | CU DESCRIPTOR | WORK ACTIVITIES | PERFORMANCE CRITERIA |
|--------------------|---------------|---------------------------------------|---|
| | | | <p>2.4 Carburettor is removed from the intake manifold in accordance with the workshop manual.</p> <p>2.5 Carburettor components are dismantled in accordance with the workshop manual.</p> <p>2.6 Carburettor components worn out or damage conditions are determined in accordance with the workshop manual.</p> <p>2.7 Carburettor components are cleaned in accordance with service requirement.</p> <p>2.8 Carburettor components are changed in accordance with the workshop manual.</p> <p>2.9 Carburettor components are reassembled in accordance with workshop manual.</p> <p>2.10 Carburettor is mounted to intake manifold in accordance with the workshop manual.</p> <p>2.11 Carburettor attachments are reassembled in accordance with workshop manual.</p> <p>3.1 Carburettor idling tuning test is performed in accordance with service manual.</p> <p>3.2 Carburettor acceleration tuning test is performed in accordance with service manual.</p> <p>3.3 Carburettor choke tuning test is performed in accordance with service manual.</p> |
| | | <p>3. Perform carburettor tuning.</p> | |



CURRICULUM OF COMPETENCY UNIT
NATIONAL OCCUPATIONAL SKILLS STANDARD (NOSS) FOR:
LIGHT VEHICLE-REPAIR SERVICE
LEVEL 2

15. Curriculum of Competency Unit
15.1. Vehicle Workshop Housekeeping

| | |
|-----------------------------------|--|
| SECTION | (G)Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles |
| GROUP | (452)Maintenance And Repair Of Motor Vehicles |
| AREA | Passenger Vehicle Maintenance & Service |
| NOSS TITLE | Light Vehicle-Repair Service |
| COMPETENCY UNIT TITLE | Vehicle Workshop Housekeeping |
| LEARNING OUTCOMES | The outcome of this competency unit is able to perform essential roles of vehicle workshops layout organization structure, hygiene, safety and security conformant to enable services are rendered at worthiness condition. It is to utilize all resources for safeguarding vehicle workshops are at optimum comfort complying with the legislative compliances. Upon completion of this competency unit, trainees shall be able to: 1. Identify workshop housekeeping requirements. 2. Prepare workshop housekeeping setup. 3. Perform workshop housekeeping activities. 4. Check workshop housekeeping conformance. 5. Prepare workshop periodic report. |
| TRAINING PRE-REQUISITE (SPECIFIC) | N/A |
| CU CODE | G452-002-2:2018-CU01 |
| | NOSS LEVEL |
| | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|--|---|--|
| 1. Identify workshop housekeeping requirements. | 1.1 Workshop housekeeping administrative functions such as: <ul style="list-style-type: none"> • Schedule housekeeping work • Adhoc housekeeping work • Reporting hierarchy and priority | 1.1 Assess workshop housekeeping instructions. 1.2 Determine types of workshop housekeeping requirements. 1.3 Determine workshop cleaning area. 1.4 Determine | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Accurate in determining workshop housekeeping requirement and condition. <u>SAFETY:</u> | 1.1 Workshop safe working condition are achieved following the workshop manual. 1.2 Types of workshop housekeeping requirements and compliances are listed. 1.3 Workshop area cleanliness requirement are identified. 1.4 Workshop tools, equipment |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|--|---|--|
| | <ul style="list-style-type: none"> • Supervision and administrative functions • Source of information • Risks mitigation • First aids kit <p>1.2 Types of workshop housekeeping activities and requirements such as:</p> <ul style="list-style-type: none"> • Oil spillage condition • Tools, equipment, and materials re-allocation • Consumables and dangerous goods maintenance • Waste materials discharge and disposal • Electrical installation <p>1.3 Workshop area cleaning standards such as:</p> <ul style="list-style-type: none"> • Workshop cleaning requirement • Types of workplace area cleaning activities | <p>housekeeping workshop tools, equipment and materials.</p> <p>1.5 Determine workshop housekeeping supporting resources.</p> <p>1.6 Determine workshop housekeeping schedule.</p> <p>1.7 Determine workshop housekeeping compliances.</p> | <ul style="list-style-type: none"> • Practice integrity in determining workshop housekeeping compliances. • Comply CHRA (Chemical Health Risk Assessment). • Use relevant PPE (Personal Protective Equipment). • Interpret MSDS (Material Safety Data Sheet). <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice waste management concept in making printed documents. | <p>and materials housekeeping condition are identified.</p> <p>1.5 Workshop housekeeping supporting resources and utilization are obtained.</p> <p>1.6 Workshop housekeeping schedule and working standards are listed.</p> <p>1.7 Workshop housekeeping legislative and in-house conditions are listed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|-------------------------------|---------------------|
| | <ul style="list-style-type: none"> • Tools, equipment and materials cleaning • Cleaning liability and responsibility person-in-charge <p>1.4 Workshop tools, equipment and materials housekeeping such as:</p> <ul style="list-style-type: none"> • Area safety requirement • Workplace housekeeping arrangement • Workshop housekeeping compliances • Housekeeping liability and responsibility person-in-charge <p>1.5 Workshop housekeeping tools and equipment such as:</p> <ul style="list-style-type: none"> • Cleaning apparatus • Safety tools and materials <p>1.6 Workshop housekeeping</p> | | | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|--|---|--|---|
| | <p>schedule such as:</p> <ul style="list-style-type: none"> • Internal & external housekeeper • Area of work • Responsible person-in-charge • Supervision hierarchy <p>1.7 Workshop housekeeping compliances such as:</p> <ul style="list-style-type: none"> • Legislative condition • In-house requirement • Electrical safety regulation <p>1.8 Workshop housekeeping supporting resources</p> <ul style="list-style-type: none"> • Type • Function | | | |
| <p>2. Prepare workshop housekeeping setup.</p> | <p>2.1 Workshop signage for work procedures such as:</p> <ul style="list-style-type: none"> • Safety signage • Working precaution aids | <p>2.1 Determine workshop signage.</p> <p>2.2 Select workshop risks mitigation method.</p> <p>2.3 Sort out workshop safety equipment.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Ethics and discipline in arranging workshop housekeeping tools, equipment and materials. | <p>2.1 Workshop warning and safety signage work procedures are selected.</p> <p>2.2 Workshop risks mitigation for hazardous control are arranged.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|---|--|---|
| | <ul style="list-style-type: none"> ● Housekeeping service charter 2.2 Workshop risks mitigation such as: <ul style="list-style-type: none"> ● Fire protection aids such as fire extinguisher, fire fighting hose ● Waste handling and service charter ● Injuries and supporting aids ● Workplace directory ● Electrical protection and alarm 2.3 Workshop safety equipment such as: <ul style="list-style-type: none"> ● Health and safety toolbox ● Lifting equipment ● Warning signs ● Workplace protecting tools, equipment and materials 2.4 Workshop housekeeping SOP such as: <ul style="list-style-type: none"> ● Work safe expectation ● Workshop operation | <p>2.4 Determine workshop housekeeping SOP.</p> <p>2.5 Setup workshop housekeeping materials.</p> <p>2.6 Arrange workshop housekeeping tools & equipment.</p> | <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> ● Practice integrity in arranging workshop warning and safety signage. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> ● Practice waste management concept in making printed documents. | <p>2.3 Workshop safety equipment and materials are arranged.</p> <p>2.4 Workshop housekeeping SOP and legislative compliances are listed.</p> <p>2.5 Workshop housekeeping materials and resources are arranged.</p> <p>2.6 Workshop housekeeping tools & equipment are arranged.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|-------------------------------|---------------------|
| | <p>compliance</p> <ul style="list-style-type: none"> • Administrative policies and procedures • Preventive and corrective manual • Tag out/lock out system of workshop tools, equipment and materials • Storage and racking of resources/parts <p>2.5 Workshop housekeeping materials such as:</p> <ul style="list-style-type: none"> • Spillage and cleaning resources • Used materials, debris and disposal containers • Hazardous substances clearance materials <p>2.6 Workshop housekeeping tools & equipment</p> <ul style="list-style-type: none"> • Stairs and ladders • Floor map and storage layout • First aids provisions and tools | | | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|--|---|---|
| <p>3. Perform workshop housekeeping activities.</p> | <p>3.1 Workshop housekeeping schedule and working condition such as:</p> <ul style="list-style-type: none"> • Servicing and mechanical repair workplace housekeeping activities • Vehicle bodies, painting and storage requirements • Electrical installation debris, waste and removal activities • Preventive, and corrective housekeeping activities <p>3.2 Workshop area requirement and condition such as:</p> <ul style="list-style-type: none"> • Lubricant, spillages, and waste cleaning • Properties and hazards handling • Utilization and storage of consumables <p>3.3 Working condition for housekeep workshop</p> | <p>3.1 Access workshop housekeeping schedule.</p> <p>3.2 Clean workshop area.</p> <p>3.3 Housekeep workshop tools, equipment & materials.</p> <p>3.4 Dispose workshop waste materials.</p> <p>3.5 Arrange workshop housekeeping support.</p> <p>3.6 Check workshop resources safety, security and validity.</p> <p>3.7 Check workshop housekeeping conformant.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Responsible in performing workshop housekeeping activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Careful and avoid procedure facilities malfunction. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Consider energy saving when sourcing the procedure facilities. | <p>3.1 Workshop housekeeping schedule and working condition are listed.</p> <p>3.2 Workshop area cleaning condition and requirement are carried out.</p> <p>3.3 Housekeep workshop tools, equipment & materials housekeeping activities are carried out.</p> <p>3.4 Workshop waste materials handling are carried out.</p> <p>3.5 Workshop housekeeping support.</p> <p>3.6 Workshop resources safety, security and validity are arranged.</p> <p>3.7 Workshop housekeeping conformant are adhered.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|-------------------------------|---------------------|
| | <p>tools, equipment & materials such as:</p> <ul style="list-style-type: none"> • Application and utilization of work tools, equipment and materials • Accessibility and store work tools, equipment and materials • Compliance to the Department of Safety and Health (DOSH) requirements <p>3.4 Workshop waste materials handling such as:</p> <ul style="list-style-type: none"> • Types of oil & fluid disposal such as Engine oil, Brake fluid, Gasoline/Diesel/Aviation fuel, Antifreeze, Transmission fluid, Hydraulic fluid, Degreasers, Part cleaning solvents, Power steering fluid • Waste disposal & | | | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|-------------------------------|---------------------|
| | <p>procedures</p> <ul style="list-style-type: none"> ● Waste hazardous housekeeping support <p>3.5 Workshop such as:</p> <ul style="list-style-type: none"> ● Safety and injuries supporting aids such as first aids, fire combating tools, inspection and troubleshooting tools ● Hazard early warning ● Storage and traffic support such as warning signs, slips & trips preventing aids ● Housekeeping, safety zones and compliances condition such as warning cones or warning triangles, flashing light on service vehicle, mechanic/tyre fitter wears a high-visibility vest/clothing | | | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|-------------------------------|---------------------|
| | <p>3.6 Workshop resources safety, security and validity such as:</p> <ul style="list-style-type: none"> ● Storages validity ● Workplace waste, safety and security procedures ● Workplace standards of ventilation, lighting, fluid, fume extraction, access, egress and ingress <p>3.7 Workshop housekeeping conformant such as:</p> <ul style="list-style-type: none"> ● Environment compliances ● Workplace safety and security compliances ● Workman Health Safety & Environment (HSE) compliances ● Workplace operation legislative compliances ● In-house Health Safety & Environment (HSE) compliances | | | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|--|---|--|
| <p>4 Check workshop housekeeping conformance.</p> | <p>4.1 Workshop safety condition such as:</p> <ul style="list-style-type: none"> • Workshop traffic such as customers drop off area safety, pedestrian and parking bay safety • Workplace safety such as avoiding spills/wet patches, available of absorbent to avoid slippery • Tripping hazards in floor surfaces are clear and clean • Retractable reels, power and pneumatic outlets are located close to the safe area <p>4.2 Workshop security condition such as:</p> <ul style="list-style-type: none"> • Hazardous substances are clear and clean • Avoiding the exposure to harmful chemicals or other risks • Place available | <p>4.1 Inspect workshop safety condition.</p> <p>4.2 Inspect workshop security condition.</p> <p>4.3 Inspect workshop tools, equipment and materials housekeeping condition.</p> <p>4.4 Confirm workshop housekeeping activities performance.</p> <p>4.5 Confirm workshop housekeeping activities compliances.</p> <p>4.6 Inspect workshop housekeeping support and arrangement.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Accurate meticulous in analysing workshop housekeeping compliances. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Practice integrity in making finding on safety and security practices in workshop. • Comply CHRA (Chemical Health Risk Assessment). • Use relevant PPE (Personal protective equipment). • Interpret MSDS (Material Safety Data Sheet). <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice energy saving in using application tools. | <p>4.1 Workshop safety condition and requirement are identified.</p> <p>4.2 Workshop security condition and requirement are identified.</p> <p>4.3 Workshop tools, equipment and materials housekeeping condition and conformant are listed.</p> <p>4.4 Workshop housekeeping activities performance and compliances are listed.</p> <p>4.5 Workshop housekeeping activities conformant and outcome are listed.</p> <p>4.6 Workshop housekeeping support and arrangement are arranged.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|-------------------------------|---------------------|
| | <p>warning cones or warning triangles, flashing light on service vehicle, mechanic/tyre fitter wears a high-visibility vest/clothing</p> <p>4.3 Workshop tools, equipment and materials housekeeping condition such as:</p> <ul style="list-style-type: none"> ● Availability of lifting aids for lift/manage heavy objects ● Handling aids and on-site equipment availability ● Work area, lighting and visibility ● Hydraulic jacks and trolley jacks housekeeping ● Forklifts and lifting equipment upkeep in safe place ● Storage system with proper warning signs <p>4.4 Workshop</p> | | | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|-------------------------------|---------------------|
| | <p>housekeeping activities performance such as:</p> <ul style="list-style-type: none"> ● Fix risks or zero-down the injuries ● Disposal of prohibited items ● Safety and security hazards monitoring ● Legislative and operational procedures adherence <p>4.5 Workshop housekeeping activities compliance</p> <ul style="list-style-type: none"> ● Fire department compliances ● DOSH compliances ● Local authority operational compliances ● Environment compliances <p>4.6 Workshop housekeeping support and arrangement</p> <ul style="list-style-type: none"> ● External or outsource housekeeping providers | | | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|--|--|---|
| <p>5 Prepare workshop periodic report.</p> | <ul style="list-style-type: none"> • Availability of safety, security and hygiene maintenance tools, equipment and materials • Advance signage and first aids <p>5.1 Workshop housekeeping checklist and information such as:</p> <ul style="list-style-type: none"> • Types of checklist for workshop safety hygiene, safety and security assessment • Workshop housekeeping policy and procedures • Incident and occurrence remarks <p>5.2 Workshop housekeeping analysis and summary such as:</p> <ul style="list-style-type: none"> • Frequency of housekeeping and service • Administrative terms and | <p>5.1 Compile workshop housekeeping checklist and information.</p> <p>5.2 Draft up workshop housekeeping summary.</p> <p>5.3 Report to superior workshop housekeeping outcome.</p> <p>5.4 Documents workshop housekeeping database.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Practice integrity and ethics in arranging housekeeping reports. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Get client response and certifying client feedback and information. • Comply CHRA (Chemical Health Risk Assessment). • Use relevant PPE (Personal protective equipment). • Interpret MSDS (Material Safety Data Sheet). <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reduce, Reuse, Recycle (3R) concept in producing | <p>5.1 Workshop housekeeping checklist and information checklist updated.</p> <p>5.2 Workshop housekeeping summary draft prepared.</p> <p>5.3 Workshop housekeeping outcome compiled.</p> <p>5.4 Workshop housekeeping database documented.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|-------------------------------|---------------------|
| | condition <ul style="list-style-type: none"> • Reporting hierarchy and priority 5.3 Workshop housekeeping outcome such as: <ul style="list-style-type: none"> • Workshop housekeeping database • Housekeeping activities records and log • Housekeeping administrator commentary | | clients analysis finding. | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

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- 2 Tony Candela, Automotive Electrical Performance Projects (S-A Design Projects), August 24, 2011, Publisher:CarTech (August 24, 2011), ISBN-10: 1934709557, ISBN-13: 978-1934709559
- 3 Matt Joseph , Automotive Bodywork & Rust Repair Paperback – October 5, 2009, Publisher:CarTech (October 5, 2009), ISBN-10: 1932494979, ISBN-13: 978-1932494976
- 4 Ed May (2003), Automotive Mechanic Vol 2, 7th Edition, Mc Graw-Hill Australia ISBN: 0074712969
- 5 S Srinivasan (2001), Automotive Engines, Tata McGraw-Hill Education, ISBN 0070402655, 9780070402652

15.2. Vehicle Engine Service

| | | |
|------------------------|--|-----------------------|
| SECTION | (G) Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452) Maintenance And Repair Of Motor Vehicles | |
| AREA | Passenger Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| COMPETENCY UNIT TITLE | Vehicle Engine Service | |
| LEARNING OUTCOMES | <p>The person who is competent in this CU shall be to enable vehicle are service regularly or periodically to avoid major faulty after long mileage and ensuring vehicle are at optimum condition after lubrication service complying with vehicle lubrication manual & practice.</p> <p>Upon completion of this competency unit, trainees shall be able to:</p> <ol style="list-style-type: none"> 1 Change lubrication oil & oil filter. 2 Change engine drive belt and tensioner. 3 Inspect exhaust system components condition. 4 Change air filter. 5 Change fuel filter. 6 Change spark plugs. | |
| TRAINING PRE-REQUISITE | N/A | |
| CU CODE | G452-002-2:2018-CU02 | NOSS LEVEL Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|--|--|--|
| 1. Change lubrication oil & oil filter. | 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Schedule maintenance service Booklet. 1.3 lubrication oil & oil filter change tools | 1.1 Receive job order. 1.2 Prepare tools, material and working area. 1.3 Drain out all lubrication oil. 1.4 Remove oil filter. 1.5 Install new oil filter. 1.6 Replace drain plug gasket. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Adhere to workplace safety practises. • Follow safety signage. • Skilful in using tools. <u>SAFETY:</u> <ul style="list-style-type: none"> • Practice integrity in determining workshop housekeeping | 1.1 Job order are obtained, presented and explained. 1.2 Tools, material and working area readied and confirmed. 1.3 Lubrication oil draining process confirmed. 1.4 Oil filter replacement performed. 1.5 Drain plug gasket |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|---|--|--|
| | <ul style="list-style-type: none"> • Special Set Tools • Common Tools • Usage • Function 1.4 Function of lubrication system. 1.5 Fundamental of lubricants <ul style="list-style-type: none"> • Type • Usage • Function • Viscosity • Classification 1.6 Fundamental of oil filter <ul style="list-style-type: none"> • Type • Usage • Function 1.7 Lubrication oil & oil filter change process. | 1.7 Tighten drain plug. 1.8 Fill in new lubrication oil. 1.9 Check oil level. 1.10 Check oil leakage. 1.11 Observe oil pressure level indicator. 1.12 Record/ reset next service interval sticker. | compliances. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Adhere to Environment quality act and regulations. | 1.6 replacement confirmed. Drain plug tightened to specific torque using torque wrench. 1.7 New lubrication oil poured through filler cap. 1.8 Oil level verified. 1.9 Oil leakage checked while engine are running. 1.10 Oil pressure indicator checked accordance to light on/ off. 1.11 Next service interval sticker updated and placed on the vehicle windshield. |
| 2. Change engine drive belt and tensioner. | 2.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 2.2 Tools and equipment: <ul style="list-style-type: none"> • Special set tools • Common tools 2.3 Fundamental of | 2.1 Receive job order. 2.2 Prepare tools, material and working area. 2.3 Change engine drive belt. 2.4 Change tensioner bearing. 2.5 Prepare technical report. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Adhere to workplace safety practises. • Follow safety signage. • Skilful in using tools. <u>SAFETY:</u> <ul style="list-style-type: none"> • Practice integrity in determining workshop housekeeping | 2.1 Job order are obtained, presented and explained. 2.2 Tools, material and working area readied and confirmed. 2.3 Belt condition checked. 2.4 Belt tension checked. 2.5 Tensioner tension checked. 2.6 Tensioner belt bearing checked. 2.7 New engine drive belt replacement confirmed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|---|---|---|
| | <p>engine drive belt</p> <ul style="list-style-type: none"> ● Usage ● Function ● Layout ● Type of defect <p>2.4 Procedures of replacing and tensioning drive belt.</p> <p>2.5 Testing and checking drive belt and tensioner procedure.</p> <p>2.6 Preparing engine drive belt and tensioner replacement technical report procedure.</p> | | <p>compliances.</p> <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> ● Adhere to Environment quality act and regulations. | <p>2.8 Tensioner bearing replacement confirmed.</p> <p>2.9 Engine drive belt and tensioner replacement technical report updated and printed.</p> |
| <p>3. Inspect exhaust system components condition.</p> | <p>3.1 Fundamental of job order</p> <ul style="list-style-type: none"> ● Function ● Types ● Format ● Information <p>3.2 Exhaust system components inspection tools</p> <ul style="list-style-type: none"> ● Special Set Tools ● Common Tools ● Usage ● Function <p>3.3 Fundamental of exhaust system components</p> | <p>3.1 Receive job order</p> <p>3.2 Prepare tools, material and working area.</p> <p>3.3 Check exhaust manifold gasket leakage.</p> <p>3.4 Check resonator (flexible) exhaust pipe.</p> <p>3.5 Check catalytic converter condition.</p> <p>3.6 Check exhaust muffler condition.</p> <p>3.7 Prepare inspection report.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> ● Systematic in organizing work activities. ● Follow safety signage. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> ● Adhere to safety precaution in inspecting exhaust system components condition. <p><u>ENVIRONMENT:</u></p> | <p>3.1 Job order are obtained, presented and explained.</p> <p>3.2 Tools, material and working area readied and confirmed.</p> <p>3.3 Exhaust manifold gasket leakage confirmed and ascertained.</p> <p>3.4 Resonator (flexible) exhaust pipe condition confirmed and ascertained.</p> <p>3.5 Catalytic converter condition confirmed and ascertained.</p> <p>3.6 Exhaust muffler condition confirmed and ascertained.</p> <p>3.7 Exhaust system components inspection report updated and</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|----------------------|--|---|---|---|
| 4 Change air filter. | <ul style="list-style-type: none"> • Type • Usage • Function • Noise, Vibration, Harshness (NVH) 3.4 Exhaust system components inspect procedure. 3.5 Exhaust system components inspection report procedure. | 4.1 Receive job order. 4.2 Prepare tools, material and working area. 4.3 Remove air filter. 4.4 Replace air filter. 4.5 Prepare technical report. | <ul style="list-style-type: none"> • Adhere to Environment Quality Act 1973 and the regulation under the act. | printed. |
| 4 Change air filter. | 4.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 4.2 Fundamental of air filter components <ul style="list-style-type: none"> • Type • Usage • Function • Type of defect 4.3 Air filter components replacement tools <ul style="list-style-type: none"> • Special Set Tools • Common Tools • Usage • Function 4.4 Air filter replacement | 4.1 Receive job order. 4.2 Prepare tools, material and working area. 4.3 Remove air filter. 4.4 Replace air filter. 4.5 Prepare technical report. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organizing work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in carrying out air filter replacement. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reduce, Reuse, Recycle (3R). | 4.1 Job order are obtained, presented and explained. 4.2 Tools, material and working area readied and confirmed. 4.3 Faulty air filter removed from vehicle confirmed and ascertained. 4.4 Air filter condition are ascertained and confirmed. 4.5 Air filter unit cleaned using air duster. 4.6 New air filter replacement confirmed. 4.7 Air filter replacement technical report updated. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|---|---|---|
| 4.5 Air filter replacement technical report procedure. | | | | |
| 5 Change fuel filter. | <p>5.1 Fundamental of job order</p> <ul style="list-style-type: none"> • Function • Types • Format • Information <p>5.2 Fuel filter replacement tools</p> <ul style="list-style-type: none"> • Special Set Tools • Common Tools • Usage • Function <p>5.3 Fundamental of fuel filter</p> <ul style="list-style-type: none"> • Type • Usage • Function • Type of defect <p>5.4 Fuel filter replacement procedure.</p> <p>5.5 Fuel filter replacement technical report procedure.</p> | <p>5.1 Receive job order.</p> <p>5.2 Prepare tools, material and working area.</p> <p>5.3 Remove fuel filter hose.</p> <p>5.4 Replace fuel filter.</p> <p>5.5 Attach fuel filter hose.</p> <p>5.6 Check for fuel filter leakage.</p> <p>5.7 Prepare technical report.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Always use extreme caution when carrying out fuel filter replacement. • Always follow vehicle manufacturers warnings, cautions and service procedures. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Careful when handling flammable liquid. • Avoid working near heat source. • Do not spill fuel the floor. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reduce, Reuse, Recycle (3R). | <p>5.1 Job order are obtained, presented and explained.</p> <p>5.2 Tools, material and working area readied and confirmed.</p> <p>5.3 Faulty fuel filter hose removed from vehicle confirmed.</p> <p>5.4 New fuel filter installed.</p> <p>5.5 Fuel filter hose inserted according to service manual.</p> <p>5.6 Fuel filter leaking condition detected and ascertained.</p> <p>5.7 Fuel filter replacement technical report updated and printed.</p> |
| 6 Change spark plugs. | <p>6.1 Fundamental of job order</p> <ul style="list-style-type: none"> • Function | <p>6.1 Receive job order.</p> <p>6.2 Prepare tools, material and working area.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work | <p>6.1 Job order are obtained, presented and explained.</p> <p>6.2 Tools, material and working</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|---|--|---------------------|
| <ul style="list-style-type: none"> • Types • Format • Information <p>6.2 Spark plugs replacement tools</p> <ul style="list-style-type: none"> • Special set tools • Common tools • Usage • Function <p>6.3 Fundamental of spark plugs</p> <ul style="list-style-type: none"> • Type • Usage • Function • Type of defect <p>6.4 Spark plugs replacement procedure.</p> <p>6.5 Spark plugs replacement technical report procedure.</p> | <p>6.3 Remove ignition system attachments.</p> <p>6.4 Unfasten spark plug from cylinder head.</p> <p>6.5 Clean spark plug seat threads on cylinder head.</p> <p>6.6 Replace spark plug.</p> <p>6.7 Attach ignition system attachments.</p> <p>6.8 Crank vehicle engine.</p> <p>6.9 Prepare technical report.</p> | <p>activities.</p> <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in changing spark plugs replacement. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reduce, Reuse, Recycle(3R). | <p>area readied and confirmed.</p> <p>6.3 Ignition system attachments removing process ascertained and confirmed.</p> <p>6.4 Faulty spark plug removed according to service manual.</p> <p>6.5 Spark plug seat threads on cylinder head cleaned from dirt and grim.</p> <p>6.6 New spark plug installed confirmed.</p> <p>6.7 Ignition system attachments installed to vehicle confirmed.</p> <p>6.8 Spark plugs replacement technical report updated and printed.</p> | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 Tony Candela, Automotive Wiring and Electrical Systems (Workbench Series), Publisher:CarTech (April 2, 2010), ISBN-10: 1932494871, ISBN-13: 978-1932494877
- 2 Tony Candela, Automotive Electrical Performance Projects (S-A Design Projects), August 24, 2011, Publisher:CarTech (August 24, 2011), ISBN-10: 1934709557, ISBN-13: 978-1934709559
- 3 Ed May (2003), Automotive Mechanic Vol 2, 7th Edition, Mc Graw-Hill Australia ISBN: 0074712969
- 4 S Srinivasan (2016), Automotive Engines, Tata McGraw-Hill Education, ISBN 0070402655, 9780070402652
- 5 MS 827:2002. Spark Plugs for Internal Combustion Engines (First Revision).
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15.3. Vehicle Engine Overhauling

| | | |
|-------------------------------|---|-----------------------|
| SECTION | (G) Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452) Maintenance And Repair Of Motor Vehicles | |
| AREA | Passenger Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| COMPETENCY UNIT TITLE | Vehicle Engine Overhauling | |
| LEARNING OUTCOMES | <p>The person who is competent in this CU shall be able to make sure no abnormal knocking sound, no visible and possible leaking from the engine and free from defect to ensure the engine functions in full optimal performance also defect free.</p> <p>Upon completion of this competency unit, trainees shall be able to:</p> <ol style="list-style-type: none"> 1 Conduct engine compression test. 2 Conduct engine cylinder leakages test. 3 Remove engine from vehicle. 4 Perform engine overhaul. 5 Reinstall engine onto vehicle. 6 Conduct engine test. | |
| TRAINING PRE-REQUISITE | N/A | |
| CU CODE | G452-002-2:2018-CU03 | NOSS LEVEL Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-------------------------------------|---|---|---|---|
| 1. Conduct engine compression test. | 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Engine compression test tools <ul style="list-style-type: none"> • Type • Usage | 1.1 Receive job order. 1.2 Prepare tools, material and working area. 1.3 Perform engine compression test. 1.4 Record engine compression test result. 1.5 Perform analysis on test result. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. • Using appropriate tools. • Handle tools with care. | 1.1 Job orders are obtained, presented and explained. 1.2 Tools, material and working area readied and confirmed. 1.3 Engine compression test is completed following the procedure. 1.4 Engine compression test result are recorded and printed. 1.5 Analysis on engine |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|---|--|--|
| | <ul style="list-style-type: none"> Function 1.3 Fundamental of engine compression test Type of engine Engine components Usage Function Type of defect 1.4 Engine compression test procedure. | 1.6 Prepare engine overhaul recommendation checklist. | <u>SAFETY:</u> <ul style="list-style-type: none"> Adhere to safety precaution in conducting engine compression test. Adhere to company safety and policy. Use relevant Personal Protective Equipment (PPE). Occupational safety & health act. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> Practice Reuse, Recycle and Reduce (3R). Environment Quality act. | <p>compression test checklist are identified and confirmed.</p> <p>1.6 Engine overhaul recommendation checklist are prepared and presented.</p> |
| 2. Conduct engine cylinder leakages test. | <p>2.1 Fundamental of job order</p> <ul style="list-style-type: none"> Function Types Format Information <p>2.2 Engine cylinder leakages test tools</p> <ul style="list-style-type: none"> Type Usage Function | <p>2.1 Receive job order.</p> <p>2.2 Prepare tools, material and working area.</p> <p>2.3 Perform engine cylinder leakages test.</p> <p>2.4 Record engine cylinder leakages test result.</p> <p>2.5 Perform analysis on test result.</p> <p>2.6 Prepare engine overhaul</p> | <u>ATTITUDE:</u> <ul style="list-style-type: none"> Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> Adhere to safety precaution in conducting engine cylinder leakage test. Adhere to company safety and policy. | <p>2.1 Job orders are obtained, presented and explained.</p> <p>2.2 Tools, material and working area readied and confirmed.</p> <p>2.3 Engine cylinder leakages test completed following the procedure.</p> <p>2.4 Engine cylinder leakages test result are recorded and printed.</p> <p>2.5 Analysis on engine cylinder leakages test checklist are</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--------------------------------|--|--|---|--|
| | 2.3 Fundamental of engine cylinder leakages test <ul style="list-style-type: none"> • Type of engine • Usage • Function • Type of defect 2.4 Engine cylinder leakages test procedure. | recommendation checklist. | <ul style="list-style-type: none"> • Use relevant Personal Protective Equipment (PPE). • Follow occupational safety & health act. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Environment Quality act. | identified and confirmed. 2.6 Engine overhaul recommendation checklist are prepared and presented. |
| 3. Remove engine from vehicle. | 3.1 Overhaul recommendation checklist <ul style="list-style-type: none"> • Type • Usage 3.2 Engine removal tools <ul style="list-style-type: none"> • Type • Usage • Function 3.3 Fundamental of engine <ul style="list-style-type: none"> • Type of engine • Engine components • Usage • Function 3.4 Engine removal procedure | 3.1 Interpret overhaul recommendation checklist. 3.2 Setup workplace for removing engine. 3.3 Disconnect power cable from battery terminals. 3.4 Drain operation fluids and lubricant. 3.5 Recover refrigerant. 3.6 Detach engine auxiliary components and attachments. 3.7 Lift-out vehicle engine from vehicle. 3.8 Mount engine on engine stand. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in removing engine from vehicle. • Adhere to company safety and policy. • Use relevant Personal Protective Equipment (PPE). • Follow occupational safety & health act. | 3.1 Workplace for removing engine is prepared. 3.2 Power cable from battery terminals is visually disconnected. 3.3 Operation fluids and lubricant are drained empty. 3.4 Used operation fluids and lubricant are disposed into disposable container. 3.5 Refrigerant recovered empty without leakages and dispose into disposable container. 3.6 Engine auxiliary components and attachments visually detached. 3.7 Vehicle engine lift-out safely from vehicle using hoist and safety harness. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|------------------------------------|---|--|---|---|
| <p>4. Perform engine overhaul.</p> | <p>4.1 Engine overhaul tools and materials</p> <ul style="list-style-type: none"> • Type • Usage • Function <p>4.2 Fundamental of engine</p> <ul style="list-style-type: none"> • Petrol • Diesel <p>4.3 Fundamental of engine components</p> <ul style="list-style-type: none"> • Function • Usage • Type of defect <p>4.4 Engine external components such as:</p> <ul style="list-style-type: none"> • Cylinder head cover • Exhaust manifold • Compressor <p>4.5 Engine internal components such as:</p> <ul style="list-style-type: none"> • Engine block • Crankshaft • Camshaft | <p>4.1 Remove engine external components.</p> <p>4.2 Remove internal components.</p> <p>4.3 Strip down the internal components.</p> <p>4.4 Clean engine parts and components.</p> <p>4.5 Inspect engine parts and components.</p> <p>4.6 Measure engine part and components wear and tear condition.</p> <p>4.7 Prepare components for machine shop work.</p> <p>4.8 Check engine parts and components received.</p> <p>4.9 Change worn or damaged parts and components.</p> <p>4.10 Reassemble external and internal engine</p> | <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in performing engine overhaul. • Adhere to company safety and policy. • Use relevant Personal Protective Equipment (PPE). • Follow occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>3.8 Vehicle Engine mounted and secured on engine stand.</p> <p>4.1 Engine external components are visually dismantled.</p> <p>4.2 Engine internal components are visually dismantled.</p> <p>4.3 Engine parts and components are cleaned from grease and grimes.</p> <p>4.4 Engine parts and components are inspected visually.</p> <p>4.5 Engine part and components wear and tear condition are ascertained and confirmed.</p> <p>4.6 Components for machine shop work are readied, delivered and received.</p> <p>4.7 New parts and components are replaced.</p> <p>4.8 External and internal engine components are reassembled in accordance with workshop manual.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------------------------|---|---|--|--|
| | 4.6 Engine schematic diagram. 4.7 Engine parts cleaning procedure. 4.8 Engine part measuring procedures. 4.9 Machine shop working procedure. 4.10 Parts & components changing procedure. 4.11 Engine components reassembling procedure. | components. | | |
| 5. Reinstall engine onto vehicle. | 5.1 Engine reinstalling procedure. 5.2 Attaching auxiliary components procedure. 5.3 Vehicle operation fluids, lubricant and refrigerants <ul style="list-style-type: none"> • Types • Functions 5.4 Recharge refrigerant procedure. 5.5 Recharge vehicle operation fluids and lubricant procedure. 5.6 Reconnecting power electrical power | 5.1 Crane-in the engine onto vehicle. 5.2 Fit engine auxiliary components and attachments. 5.3 Refill vehicle operation fluids and lubricant. 5.4 Recharge refrigerant. 5.5 Reconnect electrical power source. 5.6 Prepare technical report. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in reinstalling engine onto vehicle. • Adhere to company safety and policy. • Follow Occupational safety & health act. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reuse, | 5.1 Engine craned-in onto vehicle are confirmed. 5.2 Engine auxiliary components and attachments are visually fitted. 5.3 Vehicle operation fluids, lubricant full level and refrigerant full level are confirmed. 5.4 Power cable to battery terminals visually reconnected. 5.5 Engine reinstall technical report updated and printed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--------------------------------|--|--|---|--|
| | <p>source procedure. 5.7 Engine reinstall technical report procedure.</p> | | <p>Recycle and Reduce (3R). <ul style="list-style-type: none"> Follow Environment Quality act. </p> | |
| <p>6. Conduct engine test.</p> | <p>6.1 Type of engine malfunctions</p> <ul style="list-style-type: none"> Electrical Mechanical <p>6.2 Type of leakages:</p> <ul style="list-style-type: none"> Source <ul style="list-style-type: none"> Cylinder head Crank case Air-Cond pipes/hoses Cause <ul style="list-style-type: none"> Miss-aligned gasket Fastening manner Incompatible materials <p>6.3 Types of NVH</p> <ul style="list-style-type: none"> Sources <ul style="list-style-type: none"> Miss-aligned cam and crank shaft Engine mounting Causes <ul style="list-style-type: none"> Fastening | <p>6.1 Check leakages of the engine. 6.2 Check noise, vibration and harshness (NVH). 6.3 Carry out OBD (On Board Diagnostic) test. 6.4 Prepare vehicle for test drive. 6.5 Prepare engine test report.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> Adhere to safety precaution in conducting engine test. Adhere to company safety and policy. Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> Practice Reuse, Recycle and Reduce (3R). Follow Environment Quality act. | <p>6.1 Oil leakages, free from grease are confirmed. 6.2 Leakages of the engine are visually checked. 6.3 Engine is free from knocking and screeching sound check list are completed. 6.4 Absent of noise from engine is explained. 6.5 OBD test are performed with diagnostic tools. 6.6 Test drive vehicle performed by driving the vehicle. 6.7 Final control test on the overall vehicle performance checklist are completed. 6.8 Engine test report are produced and presented.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|-------------------------------|---------------------|
| | manner - Incompatible materials • Type of noises - Grinding - Knocking - Humming - Sizzling 6.4 Engine test procedure. 6.5 Preparing engine test report procedure. | | | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 Automotive Mechanics / Willian H. Crouse and Donald L. Anglin 10 th ed. ISBN0-02-800943-6
- 2 Tony Candela, Automotive Wiring and Electrical Systems (Workbench Series), Publisher:CarTech (April 2, 2009), ISBN-10: 1932494871, ISBN-13: 978-1932494877
- 3 Tony Candela, Automotive Electrical Performance Projects (S-A Design Projects), August 24, 2011, Publisher:CarTech (August 24, 2011), ISBN-10: 1934709557, ISBN-13: 978-1934709559
- 4 Ed May (2003), Automotive Mechanic Vol 2, 7th Edition, Mc Graw-Hill Australia ISBN: 0074712969
- 5 S Srinivasan (2001), Automotive Engines, Tata McGraw-Hill Education, ISBN 0070402655, 9780070402652

15.4. Vehicle Brake System Service

| | |
|------------------------|--|
| SECTION | (G) Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles |
| GROUP | (452) Maintenance And Repair Of Motor Vehicles |
| AREA | Passenger Vehicle Maintenance & Service |
| NOSS TITLE | Light Vehicle-Repair Service |
| COMPETENCY UNIT TITLE | Vehicle Brake System Service |
| LEARNING OUTCOMES | The person who is competent in this CU shall be able to make sure the continuous of the brake functions, free of any fluid leakages, and to ensure the safeness of the driver. Upon completion of this competency unit, trainees shall be able to: 1. Inspect Brake System Condition. 2. Change brake system. 3. Change parking brake system components. |
| TRAINING PRE-REQUISITE | N/A |
| CU CODE | G452-002-2:2018-CU04 |
| | NOSS LEVEL |
| | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|------------------------------------|---|--|---|--|
| 1. Inspect brake system condition. | 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Function of hydraulic brake system. 1.3 Hydraulic brake system repair tools <ul style="list-style-type: none"> • Type of tools (such as common tools and special tools) • Functions of tools | 1.1 Receive job order. 1.2 Prepare tools, material and working area. 1.3 Check condition of brake leakages. 1.4 Check water vapour contamination level of the brake fluid. 1.5 Check brake fluid level switch. 1.6 Check brake pedal free-play. 1.7 Update brake system condition inspection | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in inspecting brake system. • Adhere to company safety and policy. • Follow Occupational safety & health act. | 1.1 Job order are obtained, presented and explained. 1.2 Hydraulic brake system tools and equipment are prepared. 1.3 Condition of the brake leakages are visually checked. 1.4 Water vapour contamination level ascertained and confirmed. 1.5 Brake fluid viscosity and discoloration condition visually checked. 1.6 Brake fluid level switch is visually checked. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-------------------------|--|--|---|--|
| | 1.4 Hydraulic brake system layout. 1.5 Hydraulic brake system functionality test procedure. 1.6 Water vapour contamination condition <ul style="list-style-type: none"> • Discoloration • Viscosity 1.7 Brake fluid level switch functionality. 1.8 Free-play checking procedure. | status checklist. | <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | 1.7 Brake pedal free-play are checked and pressed. 1.8 Brake system condition inspection status checklist are completed and printed. |
| 2. Change brake system. | 2.1 Fundamental of Pascal law. 2.2 Type and functions of brake system <ul style="list-style-type: none"> • Disc Brake • Drum Brake • Brake Fluids 2.3 Drum brake system parts <ul style="list-style-type: none"> • Brake booster • Master cylinder • Proportioning valve • Brake line/hoses/pipes • Wheel cylinder • Brake Shoes • Brake Drum | 2.1 Remove brake system parts from vehicle. 2.2 Replace disc brake parts. 2.3 Replace drum brake parts. 2.4 Update brake system replacement status checklist. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. • Handling brake fluid with care. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in changing brake system components service. • Adhere to company safety and policy. • Follow occupational safety & health act • Avoid brake fluid | 2.1 Brake system parts removed and sorted safely from the vehicle. 2.2 New disc brake parts indicated by part numbers replaced in compliance with the workshop manual. 2.3 New drum brake parts indicated by part numbers replaced in compliance with the workshop manual. 2.4 Brake system replacement status checklist are updated and printed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|--|---------------------|
| | <p>2.4 Disc brake system parts</p> <ul style="list-style-type: none"> • Brake Booster master cylinder • Proportioning valve • Brake line/hoses/pipes • brake callipers • Brake pads • Disc Rotor <p>2.5 Brake system replacing procedure.</p> <ul style="list-style-type: none"> • Replace vehicle disc brake pads • Overhaul vehicle brake calliper. • Replace vehicle brake disc • Replace vehicle drum brake shoes. • Overhaul vehicle drum brake wheel cylinder • Overhaul vehicle brake master cylinder. • Replace vehicle brake booster. | | <p>spillage.</p> <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Practice Environment Quality act. | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|--|---|---|--|
| 3. Change parking brake system components. | <p>3.1 Parking brake functionality checking procedure.</p> <p>3.2 Type and functions of parking brake system.</p> <p>3.3 Fundamental of parking brake system such as:-</p> <ul style="list-style-type: none"> • Schematic diagram • Components of parking brake <p>3.4 Parking brake removing and replacing procedure.</p> | <p>3.1 Check parking brake functionality.</p> <p>3.2 Release parking brake cable adjustment.</p> <p>3.3 Remove parking brake cable assembly.</p> <p>3.4 Replace parking brake cable assembly.</p> <p>3.5 Install parking brake cable assembly.</p> <p>3.6 Carryout parking brake final test.</p> <p>3.7 Update Parking Brake system replacement status checklist.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in changing parking brake system components service. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). Environment Quality act. | <p>3.1 Parking brake cable is visually checked.</p> <p>3.2 Condition parking brake cable components confirmed.</p> <p>3.3 Condition Parking brake cable is confirmed.</p> <p>3.4 Releasing parking brake cable adjustment is confirmed.</p> <p>3.5 Parking brake cable assembly is removed from the vehicle.</p> <p>3.6 New parking brake cable indicated by part numbers is replaced in compliance with the workshop manual.</p> <p>3.7 Parking brake cable assembly is installed onto vehicle.</p> <p>3.8 Parking brake stop light and third light indicator check list are performed.</p> <p>3.9 Parking brake system replacement status checklist are completed and printed.</p> |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Ellis Johnson, Tires and Handling, Published by SAE in 1996, ISBN 1-56091-752-0.
- 5 Rudolf Limpert, Brake and Design Safety, Published by SAE in 1999, ISBN 1-56091-915-9.
- 6 MS ISO 6311:2003. Methods Of Test For Automotive Friction Materials (Brake Lining, Disc Pads And Bonded Shoe) : Part 5 : Internal Shear Strength Of Lining Material A– Test Procedure(ISO 6311:1980, IDT).
- 7 MS ISO 3996:2005. Road Vehicles - Brake Hose Assemblies For Hydraulic Braking Systems Used With Non-Petroleum-Base Brake Fluid (ISO 3996:1995, IDT)

15.5. Engine Cooling System Replacement

| | |
|------------------------|--|
| SECTION | (G) Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles |
| GROUP | (452) Maintenance And Repair Of Motor Vehicles |
| AREA | Passenger Vehicle Maintenance & Service |
| NOSS TITLE | Light Vehicle-Repair Service |
| COMPETENCY UNIT TITLE | Engine Cooling System Replacement |
| LEARNING OUTCOMES | The person who is competent in this CU shall be able to provide smooth of the engine cooling functions, free of noise and defects, maintain the temperature of the engine and to ensure efficiency of the cooling system. Upon completion of this competency unit, trainees shall be able to: 1. Conduct cooling system pressure test. 2. Conduct cooling system parts functionality test. 3. Change cooling system parts. |
| TRAINING PRE-REQUISITE | N/A |
| CU CODE | G452-002-2:2018-CU05 |
| | NOSS LEVEL |
| | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|--|---|--|---|
| 1. Conduct cooling system pressure test. | 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Fundamentals of cooling system. 1.3 Procedures of cooling system pressure test. | 1.1 Receive job order. 1.2 Identify tools, equipment and materials. 1.3 Prepare tools, material and working area. 1.4 Carry out cooling system pressure test. 1.5 Update pressure test result status. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Always use extreme caution when conducting cooling system pressure test. • Always follow vehicle manufacturers warnings, cautions and service procedures. • Follow safety signage. <u>SAFETY:</u> | 1.1 Job order are obtained, presented and explained. 1.2 Tools, equipment and materials for conducting cooling system pressure test are acquired and prepared in working place. 1.3 Cooling system pressure test performed. 1.4 Pressure test result status checklist are completed and printed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|--|--|--|
| 2. Conduct cooling system parts functionality test. | 2.1 Types of cooling system. 2.2 Layout of cooling system. 2.3 Procedures of checking cooling system parts. 2.4 Components of cooling system such as: <ul style="list-style-type: none"> • Water pump • Radiator • Belting • Fan blade • Fan motor/ pulley • Thermostat • Radiator cap • Water temperature | 2.1 Identify tools, equipment and materials. 2.2 Prepare tools, material and working area. 2.3 Conduct cooling system components functionality test for Noise, vibration & harshness (NVH). 2.4 Update cooling system components functionality test status checklist. | <ul style="list-style-type: none"> • Follow pressure test safety procedure. • Ensure engine cool before opening radiator cap. • Cautions when opening radiator cap while temperature of the engine is high. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Follow Environment Quality act. <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Always use extreme caution when inspecting engine cooling systems components condition. • Always follow vehicle manufacturers warnings, cautions and service procedures. • Follow safety signage. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Ensure engine is cool before opening radiator cap. | 2.1 Tools, equipment and materials for cooling system components functionality test are acquired and prepared in working place. 2.2 Cooling system components functionality test are identified and confirmed for Noise, vibration & harshness (NVH). 2.3 Cooling system components functionality test status checklist are completed and printed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|--|---|---|---|
| | <p>sender unit</p> <p>2.5 Functions of cooling system components.</p> <p>2.6 NVH Sources:</p> <ul style="list-style-type: none"> • Miss-aligned cam and crank shaft • Engine mounting <p>2.7 Problem and causes NVH:</p> <ul style="list-style-type: none"> • Fastening manner • Incompatible materials <p>2.8 Type of noises created:</p> <ul style="list-style-type: none"> • Grinding • Knocking • Humming • Sizzling | | <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Follow Environment Quality act. | |
| <p>3. Change cooling system parts.</p> | <p>3.1 Removing and replacing cooling system components procedure.</p> <p>3.2 New Cooling system part:</p> <ul style="list-style-type: none"> • part numbers <p>3.3 Types of coolant following OEM.</p> <p>3.4 Types and functions of cooling system parts</p> <ul style="list-style-type: none"> • Pressure cap • radiator | <p>3.1 Identify tools, equipment and materials.</p> <p>3.2 Prepare tools, material and working area.</p> <p>3.3 Replace new cooling system parts.</p> <p>3.4 Conduct cooling system performance test.</p> <p>3.5 Update cooling system rectification checklist.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in changing cooling system components. • Adhere to company safety and policy. • Follow Occupational | <p>3.1 Tools, equipment and materials for cooling system parts replacement are acquired and prepared in working place.</p> <p>3.2 New cooling system parts is installed in compliance with the workshop manual.</p> <p>3.3 Cooling system performance test are performed and ascertained.</p> <p>3.4 Cooling system parts replacement status checklist are completed and printed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|--|---------------------|
| | <ul style="list-style-type: none"> • radiator hoses • radiator fan • water pump • thermostat • cooling system sensors • expansion tank <p>3.5 Cooling system performance such as :</p> <ul style="list-style-type: none"> • Leakages • Temperature rising • Functionality of the components (thermostat, fan, temperature sensor, radiator cap) <p>3.6 Engine cooling system replacement procedure:</p> <ul style="list-style-type: none"> • Replace engine radiator pressure cap. • Replace engine radiator hose. • Replace engine radiator assembly. | | <p>safety & health act</p> <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|-------------------------------|---------------------|
| | <ul style="list-style-type: none"> • Replace engine thermostat. • Replace radiator electrical cooling fan assembly. | | | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Eric Chowanietz, Automobile Electronics, Published by SAE in 1995, ISBN 0-7506-1878-7.
- 5 Tom Denton, Automotive Electric and Electronic system fourth edition, ISBN 978-0-08-096942-8.

15.6. Rear / Front Axle Rectification

| | |
|------------------------|---|
| SECTION | (G)Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles |
| GROUP | (452)Maintenance And Repair Of Motor Vehicles |
| AREA | Passenger Vehicle Maintenance & Service |
| NOSS TITLE | Light Vehicle-Repair Service |
| COMPETENCY UNIT TITLE | Rear / Front Axle Rectification |
| LEARNING OUTCOMES | The person who is competent in this CU shall be able to provide free of leakages, other defects and smooth performance of the rear / front axle. Upon completion of this competency unit, trainees shall be able to: 1. Inspect rear / front axle condition. 2. Dismantle rear / front axle differential unit. 3. Change rear / front axle differential components & parts. |
| TRAINING PRE-REQUISITE | N/A |
| CU CODE | G452-002-2-2018-CU06 |
| | NOSS LEVEL |
| | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|---|---|---|
| 1. Inspect rear / front axle condition. | 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Tools, equipment and parts such as : <ul style="list-style-type: none"> • Machine hand tools set • Common tools • Special tools | 1.1 Receive job order. 1.2 Setup tools, equipment and parts. 1.3 Check rear / front axle leakages. 1.4 Check rear / front axle abnormal noise. 1.5 Check rear / front axle abnormal vibration. 1.6 Prepare rear / front axle condition checklist / report. | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting rear / front axle condition inspection. • Adhere to company safety and policy. | 1.1 Job order are obtained, presented and explained. 1.2 Tools, equipment and parts prepared at working area. 1.3 Rear / front axle leakages ascertained and confirmed. 1.4 Rear / front axle abnormal noise detection performed. 1.5 Rear / front axle abnormal vibration detection performed. 1.6 Rear / front axle condition checklist are completed and printed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|---|---------------------|
| | <ul style="list-style-type: none"> • Workshop manual 1.3 Types and functions of rear and front axle: 1.4 Rear and front axle unit schematic diagram. 1.5 Type of possible leakage: <ul style="list-style-type: none"> • Source (such as differential unit, drain plug gasket, drive shaft boot, oil seal) • Cause (such as wear and tear, misalignment, accident) 1.6 NVH Sources: <ul style="list-style-type: none"> • Bearing damage • Worn out gears 1.7 Problem and causes NVH: <ul style="list-style-type: none"> • Fastening manner • Incompatible materials 1.8 Type of noises created by NVH <ul style="list-style-type: none"> • Grinding • Humming 1.9 Rear / front axle condition inspection procedure. | | <ul style="list-style-type: none"> • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|--|--|--|
| 2. Dismantle rear / front axle differential unit. | <p>2.1 Removing wheel from the front axle procedure.</p> <p>2.2 Drain differential gear oil procedure</p> <p>2.3 Removing front axle components procedure:</p> <ul style="list-style-type: none"> • Drive shaft • CV (Constant Velocity) joint <p>2.4 Removing rear axle components procedure:</p> <ul style="list-style-type: none"> • Propeller shaft • Half shaft <p>2.5 Remove differential unit procedure.</p> | <p>2.1 Remove wheel from the front axle.</p> <p>2.2 Drain-out gear oil.</p> <p>2.3 Remove drive shaft & CV (Constant Velocity) joint for rear axle.</p> <p>2.4 Remove transaxle unit from engine for rear axle.</p> <p>2.5 Remove propeller shaft and half shaft for front axle.</p> <p>2.6 Remove differential unit from transaxle.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting rear / front axle differential unit dismantling. • Adhere to company safety and policy. • Follow Occupational safety & health act <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>2.1 Wheel safely removed from the front axle and safely put onto wheel rack / holder.</p> <p>2.2 Gear oil safely drain-out into disposable container.</p> <p>2.3 Rear axle drive shaft safely removed from vehicle.</p> <p>2.4 Rear axle constant velocity (CV) joint safely removed from vehicle.</p> <p>2.5 Front axle propeller shaft safely removed from vehicle.</p> <p>2.1 Front axle half shaft safely removed from vehicle.</p> <p>2.6 Differential unit safely removed from vehicle.</p> |
| 3. Change rear / front axle differential components & parts. | <p>3.1 Rear / Front Axle differential unit components.</p> <ul style="list-style-type: none"> • Type • Function <p>3.2 Rear axle differential unit dismantle procedure.</p> <p>3.3 Rear axle differential</p> | <p>3.1 Dismantle rear axle differential unit.</p> <p>3.2 Check crown wheel & pinion worn out condition.</p> <p>3.3 Change crown wheel gear set & pinion wheel set.</p> <p>3.4 Change pinion oil</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting axle | <p>3.1 Rear / Front axle differential unit dismantled by components.</p> <p>3.2 Crown wheel & Pinion worn out condition physically and visually checked.</p> <p>3.3 New crown & pinion wheel installed.</p> <p>3.4 Gasket worn out condition</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|---|--|--|
| | <p>unit components replacement and measurement procedures.</p> <p>3.4 Front axle differential unit dismantle procedure.</p> <p>3.5 Front axle differential unit components replacement and measurement procedures.</p> | <p>seal</p> <p>3.5 Replace gasket.</p> <p>3.6 Check bearing worn out condition.</p> <p>3.7 Replace bearing.</p> <p>3.8 Adjust rear axle components parts clearance / free play.</p> <p>3.9 Assemble rear axle differential unit components.</p> <p>3.10 Replace drive shaft oil seal.</p> <p>3.11 Install rear axle differential unit into rear axle.</p> <p>3.12 Install rear wheels.</p> <p>3.13 Carryout Pre-delivery inspection test.</p> | <p>differential unit faulty / worn out components parts replacing.</p> <ul style="list-style-type: none"> • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>physically and visually checked.</p> <p>3.5 New gasket installed.</p> <p>3.6 Bearing worn out condition physically and visually checked.</p> <p>3.7 New bearing installed.</p> <p>3.8 Rear / Front axle components parts clearance / free play adjustment ascertained and confirmed.</p> <p>3.9 Rear / Front axle differential unit components assembly process ascertained and confirmed.</p> <p>3.10 Drive Shaft oil seal worn out condition physically and visually checked.</p> <p>3.11 New drive shaft oil seal installed.</p> <p>3.12 Rear / Front wheels safely installed in compliance with the workshop manual.</p> <p>3.13 Pre-delivery inspection test are performed in compliance with the workshop manual.</p> |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Published by SAE in 1999, ISBN 1-56091-199-9.

15.7. Exhaust System Rectification

| | | |
|------------------------|--|------------|
| SECTION | (G)Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452)Maintenance And Repair Of Motor Vehicles | |
| AREA | Passenger Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| COMPETENCY UNIT TITLE | Exhaust System Rectification | |
| LEARNING OUTCOMES | <p>The person who is competent in this CU shall be able to provide free of leakages, noise & vibration, good cosmetic value & performance of engine exhaust system and also to make sure safer environment.</p> <p>Upon completion of this competency unit, trainees shall be able to:</p> <ol style="list-style-type: none"> 1. Inspect exhaust system components condition. 2. Change exhaust system components. 3. Conduct exhaust system components performance test. | |
| TRAINING PRE-REQUISITE | N/A | |
| CU CODE | G452-002-2:2018-CU07 | NOSS LEVEL |
| | | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|--|--|--|
| 1. Inspect exhaust system components condition. | 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Emission specification 1.3 Tools, equipment, parts and materials: <ul style="list-style-type: none"> • Emission tester • Power tool • Special tool • Testing equipment | 1.1 Received job order. 1.2 Prepare tools, material and working area. 1.3 Check exhaust silencer worn out condition. 1.4 Check manifold and gasket leakages. 1.5 Check resonator condition. 1.6 Check exhaust pipe condition. 1.7 Update inspection result checklist. 1.8 Prepare replacement | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting exhaust systems components usability condition inspection. • Adhere to company safety and policy. | 1.1 Job Order received and explained and understood. 1.2 Tools, equipment and parts setup at the working area. 1.3 Exhaust silencer worn out condition confirmed. 1.4 Manifold gasket leakages condition confirmed. 1.5 Abnormal vibration of resonator condition confirmed. 1.6 Exhaust pipe corrosion and worn out condition confirmed. 1.7 Oxygen sensors measurement recorded. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--------------------------------------|--|---|---|--|
| | <ul style="list-style-type: none"> Exhaust components 1.4 Exhaust system schematic diagram. 1.5 Exhaust system components such as : <ul style="list-style-type: none"> Types Functions 1.6 Types of Exhaust Components defect : <ul style="list-style-type: none"> Leakages Corrosion Noise, vibration & harshness (NVH) 1.7 Exhaust system inspection procedure. | checklist. | <ul style="list-style-type: none"> Follow Occupational safety & health act. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> Practice Reuse, Recycle and Reduce (3R). Follow Environment Quality act. | 1.8 Catalytic convertor worn out and corroded condition checked. 1.9 Inspection result and replacement checklist are printed and presented. |
| 2. Change exhaust system components. | 2.1 Type and functions of exhaust system components. 2.2 Exhaust silencer changing procedure. 2.3 Gasket changing procedure. 2.4 Resonator changing procedure. 2.5 Tail pipe changing procedure. 2.6 Exhaust pipe changing procedure. 2.7 Mounting rubber changing procedure. | 2.1 Replace defect exhaust manifold unit and gasket. 2.2 Change defect catalytic convertor and gasket. 2.3 Change defect flexible joint. 2.4 Change defect exhaust pipe and gasket. 2.5 Change defect oxygen sensors. 2.6 Change defect exhaust silencer. 2.7 Change defect | <u>ATTITUDE:</u> <ul style="list-style-type: none"> Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> Adhere to safety precaution in conducting exhaust system components replacing. Adhere to company safety and policy. Occupational safety & health act. | 2.1 New exhaust silencer installed in compliance with the workshop manual. 2.2 New gasket installed in compliance with the workshop manual. 2.3 New tail pipe installed in compliance with the workshop manual. 2.4 New exhaust pipe installed in compliance with the workshop manual. 2.5 New catalytic convertor installed in compliance with the workshop manual. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|--|--|--|
| | 2.8 Oxygen sensors changing procedure. 2.9 Catalytic convertor changing procedure. 2.10 Flexible joint changing procedure. | mounting rubber. 2.8 Prepare technical report. | <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | 2.6 Tail pipe, exhaust pipe and catalytic convertor firmly connected together. 2.7 New mounting rubber installed in compliance with the workshop manual. 2.8 New oxygen sensors installed in compliance with the workshop manual. 2.9 New flexible joint installed in compliance with the workshop manual. |
| 3. Conduct exhaust system components performance test. | 3.1 Exhaust silencer performance test procedure. 3.2 Resonator performance test procedure. 3.3 Tail pipe, exhaust pipe and catalytic convertor connecting & fitting procedure. 3.4 Complete combustion procedure. 3.5 Flexible joint vibration procedure. | 3.1 Start engine in idle mode. 3.2 Carry out exhaust gas leakages test. 3.3 Carry out NVH test. 3.4 Carry out emission test. 3.5 Prepare technical report. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting exhaust system performance test. • Adhere to company safety and policy. • Follow Occupational safety & health act. | 3.1 Engine start up confirmed. 3.2 Exhaust silencer free of abnormal noise are confirmed. 3.3 Resonator free of abnormal vibration confirmed. 3.4 Tail pipe, exhaust pipe and catalytic convertor cosmetically fitted. 3.5 Flexible joint vibration check list completed. 3.6 Physically check for exhaust gas leakages. 3.7 Exhaust system are confirmed free of noise, vibration & harshness (NVH). 3.8 Exhaust system performance checklist are printed and presented. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|-------------------|----------------|---|---------------------|
| | | | <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> Practice Reuse, Recycle and Reduce (3R). Follow Environment Quality act. | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Lenz, Cozzarini, Emissions and Air Quality, Published by SAE in 1999, ISBN 0-7680-0248-6.
- 5 Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Published by SAE in 1999, ISBN 1-56091-199-9.
- 6 Michael Plint, Anthony Martyr, Engine Testing Theory and Practice, Published by SAE in 1999, ISBN 0-7680-0314-8

15.8. Vehicle Electrical & Electronic System Service

| | | |
|------------------------|--|------------|
| SECTION | (G)Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452)Maintenance And Repair Of Motor Vehicles | |
| AREA | Passenger Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| COMPETENCY UNIT TITLE | Vehicle Electrical & Electronic System Service | |
| LEARNING OUTCOMES | <p>The person who is competent in this CU shall be able to provide clear engine ignition, combustion of the engine and a smooth fuel injection operation and chassis.</p> <p>Upon completion of this competency unit, trainees shall be able to:</p> <ol style="list-style-type: none"> 1. Inspect electrical & electronic system parts & components functionality. 2. Change electrical & electronic system parts & components. 3. Inspect chassis electrical system. 4. Change chassis electrical system components. | |
| TRAINING PRE-REQUISITE | N/A | |
| CU CODE | G452-002-2:2018-CU08 | NOSS LEVEL |
| | | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|---|---|---|
| 1. Inspect electrical & electronic system parts & components functionality. | <p>1.1 Fundamental of job order</p> <ul style="list-style-type: none"> • Function • Types • Format • Information <p>1.2 Fundamentals of common tools & special tools for inspection</p> | <p>1.1 Received job order.</p> <p>1.2 Prepare parts, tools, equipment and materials in working area.</p> <p>1.3 Inspect vehicle battery condition.</p> <p>1.4 Inspect fuses, relays and wiring harness functionality.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Ensure components according to manufacturer specification. • Handle tools and equipment with care. • Ensure safe workplace. | <p>1.1 Job order are obtained, presented and explained.</p> <p>1.2 Part, tools, equipment and materials are obtained and readied in working area.</p> <p>1.3 Vehicle battery condition confirmed and ascertained.</p> <p>1.4 Fuses, relays and wiring harness functionality tested and condition confirmed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|--|---|---------------------|
| <ul style="list-style-type: none"> • Function • Usage • Type <p>1.3 Introduction to basic circuit theory.</p> <p>1.4 Fundamental of vehicle battery</p> <ul style="list-style-type: none"> • Type • Function • Usage • Inspection procedure • Safety • Handling • Type of defect • Dispose process <p>1.5 Fundamentals of starting system</p> <ul style="list-style-type: none"> • Type • Function • Usage • Inspection procedure • Safety • Type of defect • Handling | <p>1.5 Inspect electrical & electronic components.</p> <p>1.6 Inspect body electrical system functionality.</p> <p>1.7 Prepare inspection technical report.</p> | <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Safety work procedure. • Wear appropriate PPE. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reduce, Reuse, Recycle (3R). | <p>1.5 Electrical & electronic components functionality condition confirmed and ascertained.</p> <p>1.6 Body electrical system functionality condition confirmed and ascertained.</p> <p>1.7 Inspection technical report printed and presented.</p> | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|-------------------------------|---------------------|
| | <ul style="list-style-type: none"> • Dispose process <p>1.6 Fundamentals of charging system</p> <ul style="list-style-type: none"> • Type • Function • Usage • Inspection procedure • Safety • Type of defect <p>1.7 Fundamentals of body electrical system</p> <ul style="list-style-type: none"> • Type • Function • Usage • Inspection procedure • Safety • Type of defect <p>1.8 Fundamentals of instrument panel system</p> <ul style="list-style-type: none"> • Type • Function • Usage • Inspection | | | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|---|---|---|
| | procedure <ul style="list-style-type: none"> • Safety • Type of defect 1.9 Fundamentals of fuses, relays and wiring harness system <ul style="list-style-type: none"> • Type • Function • Usage • Inspection procedure • Safety • Type of defect 1.10 Technical report <ul style="list-style-type: none"> • Type • Function • Method of writing report | | | |
| 2. Change electrical & electronic system parts & components. | 2.1 Fundamentals of tools, equipment and materials for system parts & components replacement <ul style="list-style-type: none"> • Type • Function • Usage | 2.1 Receive technical report. 2.2 Prepare parts, tools, equipment and materials in working area. 2.3 Replace vehicle battery. 2.4 Replace fuses, relays and wiring harness | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Handle equipment with care. • Ensure safe workplace. • Comply standard workshop manual. <u>SAFETY:</u> <ul style="list-style-type: none"> • Safety work | 2.1 Inspection technical report interpreted and understood. 2.2 Parts, tools, equipment and materials for system parts & components replacement are acquired and prepared in working place. 2.3 New battery installed onto vehicle. 2.4 New fuses, relays and wiring |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|---|---|---|
| | <p>2.2 Electrical & electronic system parts & components replacement procedure</p> <ul style="list-style-type: none"> • Starting system • Charging system • Body electrical system • Instrument panel system • Battery system • Fuses, relays and wiring harness system • Fuel injection system • Vehicle battery • Vehicle alternator <p>2.3 Electrical & electronic system parts & components performance test procedure.</p> <p>2.4 Electrical & electronic system parts & components replacement report</p> | <p>system.</p> <p>2.5 Replace starting system parts & components.</p> <p>2.6 Replace charging system parts & components.</p> <p>2.7 Replace body electrical system parts & components.</p> <p>2.8 Replace instrument panel system parts & components.</p> <p>2.9 Replace fuel injection system parts & components.</p> <p>2.10 Conduct performance test</p> <p>2.11 Prepare technical report.</p> | <p>procedure</p> <ul style="list-style-type: none"> • Wear appropriate PPE. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reduce, Reuse, Recycle (3R). | <p>harness are replaced and installed onto the vehicle.</p> <p>2.5 New starting system parts & components are replaced and installed onto vehicle.</p> <p>2.6 New charging system parts & components are replaced and installed onto vehicle.</p> <p>2.7 New body electrical system parts & components are replaced and installed onto vehicle.</p> <p>2.8 New instrument panel system parts & components are replaced and installed onto vehicle.</p> <p>2.9 New fuel injection system parts & components are replaced and installed onto vehicle.</p> <p>2.10 Electrical & electronic system parts & components performance test are conducted and confirmed.</p> <p>2.11 Electrical & electronic system parts & components replacement technical report are printed and presented.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|--|---|--|
| <p>3. Inspect chassis electrical system.</p> | <p>writing :</p> <ul style="list-style-type: none"> • Type of report • Content / information • Submission procedure <p>3.1 Fundamental of job order</p> <ul style="list-style-type: none"> • Function • Types • Format • Information <p>3.2 Tools, equipment, materials and parts:</p> <ul style="list-style-type: none"> • Usage • Functions • Types <p>3.3 Fundamentals of chassis electrical system:</p> <ul style="list-style-type: none"> • Vehicle electrical circuit guideline <p>3.4 Vehicle chassis electrical system inspection procedure.</p> <p>3.5 Inspection report writing:</p> <ul style="list-style-type: none"> • Format such as computerised or manual | <p>3.1 Received job order.</p> <p>3.2 Prepare parts, tools, equipment and materials in working area in working area.</p> <p>3.3 Check vehicle instrumentation panel.</p> <p>3.4 Check vehicle chassis electrical system fuses and relay functionality.</p> <p>3.5 Inspect vehicles lighting system components functionality.</p> <p>3.6 Check vehicle horn functionality.</p> <p>3.7 Check wiper motor functionality.</p> <p>3.8 Check motor operated rear view window functionality.</p> <p>3.9 Prepare technical report.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting vehicle chassis electrical system inspection. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment | <p>3.1 Job order are obtained, presented and explained.</p> <p>3.2 Customer complaints based on the initial report by inspecting the systems physical condition verified and understood.</p> <p>3.3 Suitable work space, common and special tools set up.</p> <p>3.4 Vehicle instrumentation panel tell-tale condition confirmed.</p> <p>3.5 Vehicles chassis electrical system fuses and relay functionality confirmed.</p> <p>3.6 Vehicles lighting system components functionality confirmed.</p> <p>3.7 Vehicles horn functionality condition confirmed.</p> <p>3.8 Wiper motor functionality condition confirmed.</p> <p>3.9 Motor operated rear view window functionality condition confirmed.</p> <p>3.10 Inspection report produced and presented.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|--|---|---|
| <p>4. Change chassis electrical system components.</p> | <ul style="list-style-type: none"> • Content / information • Submission procedure <p>4.1 Fundamentals of chassis electrical system:</p> <ul style="list-style-type: none"> • Vehicle electrical circuit guideline <p>4.2 Vehicle chassis electrical system components replacement procedure.</p> <p>4.3 Replacement report writing:</p> <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information • Submission procedure | <p>4.1 Replace vehicle chassis electrical system fuses and relay.</p> <p>4.2 Replace vehicle lighting system components.</p> <p>4.3 Replace vehicle horn.</p> <p>4.4 Replace wiper motor.</p> <p>4.5 Replace motor operated rear view window.</p> <p>4.6 Prepare technical report.</p> | <p>quality act.</p> <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting vehicles chassis electrical system components replacement. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment quality act. | <p>4.1 New vehicle chassis electrical system fuses and relay installed.</p> <p>4.2 New vehicle lighting system components installed.</p> <p>4.3 New vehicle horn installed.</p> <p>4.4 New wiper motor installed.</p> <p>4.5 New motor operated rear view window installed.</p> <p>4.6 Vehicle chassis electrical system components performance test are conducted and confirmed.</p> <p>4.7 Vehicle chassis electrical system components replacement report updated and presented.</p> |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Eric Chowanietz, Automobile Electronics, Published by SAE in 1995, ISBN 0-7506-1878-7.
- 5 Tom Denton, Automotive Electric and Electronic system fourth edition, ISBN 978-0-08-096942-8.
- 6 Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Published by SAE in 1999, ISBN 1-56091-199-9.
- 7 MS 1827: PART 2:2005. Road Vehicles - Ignition Systems: Part 2: Electrical Performance And Function Test Methods (ISO 6518-2:1995 And Its Technical Corrigendum 1:1997, MOD).
- 8 MS ISO 8092-1:2005. Road Vehicles - Connections For On-Board Electrical Wiring Harnesses - Part 1: Tabs For Single-Pole Connections - Dimensions And Specific Requirements (ISO 8092-1:1996, IDT).
- 9 MS ISO 8092-4:2009. Road Vehicles - Connections For On-Board Electrical Wiring Harnesses - Part 4: Pins For Single- And Multi-Pole Connections - Dimensions And Specific Requirements (ISO 8092-4:1997, IDT).

15.9. Vehicle Steering, Suspension and Wheel System Service

| | | |
|------------------------|---|------------|
| SECTION | (G)Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452)Maintenance And Repair Of Motor Vehicles | |
| AREA | Passenger Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| COMPETENCY UNIT TITLE | Vehicle Steering, Suspension and Wheel System Service | |
| LEARNING OUTCOMES | <p>The person who is competent in this cu shall be able to provide free leakages, vibration and stiff defect, smooth performance and operational of vehicle steering and wheels, free stiff, noise defect and safety ensure for suspension.</p> <p>Upon completion of this competency unit, trainees shall be able to:</p> <ol style="list-style-type: none"> 1. Inspect steering, suspension and wheel system functionality. 2. Change steering system parts. 3. Change suspension system parts. 4. Change vehicle tyres and rims. | |
| TRAINING PRE-REQUISITE | N/A | |
| CU CODE | G452-002-2:2018-CU09 | NOSS LEVEL |
| | | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|--|--|--|
| 1. Inspect steering, suspension and wheel system functionality. | <p>1.1 Fundamental of job order</p> <ul style="list-style-type: none"> • Function • Types • Format • Information <p>1.2 Fundamentals of tools, equipment and materials for steering & suspension system functionality inspection:</p> | <p>1.1 Received job order.</p> <p>1.2 Prepare parts, tools, equipment and materials in working area.</p> <p>1.3 Inspect steering & suspension abnormal noises.</p> <p>1.4 Inspect steering & suspension stiffness condition.</p> <p>1.5 Check suspension</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting steering & suspension system functionality | <p>1.1 Job order are obtained, presented and explained.</p> <p>1.2 Part, tools, equipment and materials for functionality inspection are obtained and readied in working area.</p> <p>1.3 Steering & suspension abnormal noises sources identified and confirmed.</p> <p>1.4 Steering & suspension stiffness condition sources identified.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|---|---|--|
| | <ul style="list-style-type: none"> • Function • Usage • Type <p>1.3 Steering system abnormalities such as:</p> <ul style="list-style-type: none"> • Noises • Leakages • Stiffness • Other defects <p>1.4 E-power steering (EPS) system abnormalities such as:</p> <ul style="list-style-type: none"> • Noises • Stiffness • Other defects <p>1.5 Suspension system abnormalities such as:</p> <ul style="list-style-type: none"> • Noises • Leakages • Stiffness • Other defect <p>1.6 Steering wheel free play procedure.</p> <p>1.7 Steering & suspension system functionality inspection report writing :</p> <ul style="list-style-type: none"> • Type of report • Content / information | <p>system leakages.</p> <p>1.6 Check steering wheel free play condition.</p> <p>1.7 Check steering & suspension abnormal vibration.</p> <p>1.8 Prepare steering & suspension system functionality technical report.</p> | <p>inspections.</p> <ul style="list-style-type: none"> • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>1.5 Suspension system leakages sources identified.</p> <p>1.6 Steering wheel free play condition performed and confirmed.</p> <p>1.7 Steering & suspension abnormal vibration sources identified.</p> <p>1.8 Steering & suspension system functionality technical report updated and printed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|---|---|---|
| <p>2. Change steering system parts.</p> | <ul style="list-style-type: none"> • Submission procedure <p>2.1 Fundamentals of tools, equipment and materials for steering parts replacement :</p> <ul style="list-style-type: none"> • Function • Usage • Type <p>2.2 Fundamentals of steering such as :</p> <ul style="list-style-type: none"> • System schematic diagram • Principle of operation • System electric diagram <p>2.3 Steering parts and components:</p> <ul style="list-style-type: none"> • Type • Function • Usage • Code number <p>2.4 Steering system disassembling procedure.</p> <p>2.5 Steering system parts and components checking functionality procedure.</p> | <p>2.1 Prepare parts, tools, equipment and materials in working area.</p> <p>2.2 Disassemble steering system parts.</p> <p>2.3 Replace defect steering wheel.</p> <p>2.4 Replace defect steering column.</p> <p>2.5 Replace defect steering rack.</p> <p>2.6 Reassemble steering system parts & components.</p> <p>2.7 Reinstall steering system into vehicle.</p> <p>2.8 Prepare steering system parts replacement technical report.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting steering system service. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>2.1 Part, tools, equipment and materials for steering parts replacement are obtained and readied in working area.</p> <p>2.2 Steering parts and components disassembled and safely organised.</p> <p>2.3 New steering wheel installed and secured onto the vehicle.</p> <p>2.4 New steering column installed and secured onto the vehicle.</p> <p>2.5 New steering rack installed and secured onto the vehicle.</p> <p>2.6 Steering system parts & components reassembled following the workshop manual.</p> <p>2.7 Steering system reinstalled to vehicle.</p> <p>2.8 Steering system parts replacement technical report updated and printed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------------------------|--|---|--|---|
| | 2.6 Steering system components replacing procedure. 2.7 Steering system reassembling procedure. 2.8 Steering system reinstalling procedure. 2.9 Steering system parts replacement report writing : <ul style="list-style-type: none"> • Type of report • Content / information • Submission procedure | | | |
| 3. Change suspension system parts | 3.1 Fundamentals of tools, equipment and materials for steering parts replacement : <ul style="list-style-type: none"> • Function • Usage • Type 3.2 Fundamentals of suspension such as : <ul style="list-style-type: none"> • System schematic diagram • Principle of operation • System electric | 3.1 Prepare parts, tools, equipment and materials in working area. 3.2 Disassemble suspension parts. 3.3 Replace defect suspension wheel. 3.4 Replace defect suspension column. 3.5 Replace defect suspension rack. 3.6 Reassemble suspension system parts & components. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting suspension system service. • Adhere to company safety and policy. • Follow | 3.1 Part, tools, equipment and materials for suspension parts replacement are obtained and readied in working area. 3.2 Suspension parts and components disassembled and safely organised. 3.3 New suspension wheel installed and secured onto the vehicle. 3.4 New suspension column installed and secured onto the vehicle. 3.5 New suspension rack |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|---|---|--|
| | <p>3.3 Suspension parts and diagram components:</p> <ul style="list-style-type: none"> • Type • Function • Usage • Code number <p>3.4 Suspension system disassembling procedure.</p> <p>3.5 Suspension system parts and components checking functionality procedure.</p> <p>3.6 Suspension system components replacing procedure.</p> <p>3.7 Suspension system reassembling procedure.</p> <p>3.8 Suspension system reinstalling procedure.</p> <p>3.9 Suspension system parts replacement report writing :</p> <ul style="list-style-type: none"> • Type of report • Content / information • Submission procedure | <p>3.7 Reinstall suspension system into vehicle.</p> <p>3.8 Prepare suspension system parts replacement technical report.</p> | <p>Occupational safety & health act.</p> <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>installed and secured onto the vehicle.</p> <p>3.6 Suspension system parts & components reassembled following the workshop manual.</p> <p>3.7 Suspension system reinstalled to vehicle.</p> <p>3.9 Steering system parts & components replacement technical report updated and printed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|----------------------------------|---|--|--|--|
| 4. Change vehicle tyres and rims | <p>4.1 Fundamentals of tools, equipment and materials for steering parts replacement :</p> <ul style="list-style-type: none"> • Function • Usage • Type <p>4.2 Fundamentals of tyre:</p> <ul style="list-style-type: none"> • Function • Usage • Type • Size • Production date • Material • Speed index • Tyre rating • Load index • Leakages <p>4.3 Wheel removing from vehicle procedure.</p> <p>4.4 Tyre removing from rim procedure.</p> <p>4.5 Tyre valve installing procedure.</p> <p>4.6 Tyre installing on the rim procedure.</p> <p>4.7 Rim changing procedure.</p> <p>4.8 Vehicle tyres and rims</p> | <p>4.1 Select tools, equipment and parts.</p> <p>4.2 Remove the vehicle wheel.</p> <p>4.3 Replace vehicle tyres.</p> <p>4.4 Replace vehicle rim.</p> <p>4.5 Carry out wheel balancing.</p> <p>4.6 Install the wheel.</p> <p>4.7 Carry out wheel alignment.</p> <p>4.8 Prepare vehicle for road test.</p> <p>4.9 Prepare vehicle tyres and rims parts replacement technical report.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting inspect tyres and rims condition inspections. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>4.1 Part, tools, equipment and materials for suspension parts replacement are obtained and readied in working area.</p> <p>4.2 Wheel dismounted from vehicle with air pressure released.</p> <p>4.3 Tyres and rim are separated.</p> <p>4.4 Tyre direction indication are confirmed.</p> <p>4.5 New tyre, tube, rim and valve are fitted onto wheels.</p> <p>4.6 Tyre are inflated and air pressure confirmed.</p> <p>4.7 Air leakage ascertained thru water submerging process.</p> <p>4.8 Wheel balancing indicator specification are confirmed.</p> <p>4.9 Wheel mounted to vehicle.</p> <p>4.10 Wheel alignment result are confirmed.</p> <p>4.11 Vehicle are readied in the testing area.</p> <p>4.12 Vehicles wheel replacement technical report updated and printed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|-------------------------------|---------------------|
| | parts replacement report writing : <ul style="list-style-type: none"> • Type of report • Content / information • Submission procedure | | | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Published by SAE in 1999, ISBN 1-56091-199-9.
- 5 Ellis Johnson, Tires and Handling, Published by SAE in 1996, ISBN 1-56091-752-0.
- 6 Rudolf Limpert, Brake and Design Safety, Published by SAE in 1999, ISBN 1-56091-915-9.

15.10. Vehicle Heated Ventilation Air Conditioning (HVAC) System Rectification

| | | |
|------------------------|---|-----------------------|
| SECTION | (G)Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452)Maintenance And Repair Of Motor Vehicles | |
| AREA | Passenger Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| COMPETENCY UNIT TITLE | Vehicle Heated Ventilation Air Conditioning (HVAC) System Rectification | |
| LEARNING OUTCOMES | <p>The person who is competent in this CU shall be able to ensure free leakages, free defect and temperature accuracy for cooling effect.</p> <p>Upon completion of this competency unit, trainees shall be able to:</p> <ol style="list-style-type: none"> 1. Inspect heated ventilation air conditioning (HVAC) system condition. 2. Change heated ventilation air conditioning (HVAC) system parts and components. 3. Conduct heated ventilation air conditioning (HVAC) system performance test. | |
| TRAINING PRE-REQUISITE | N/A | |
| CU CODE | G452-002-2:2018-CU10 | NOSS LEVEL Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|---|---|---|
| 1. Inspect heated ventilation air conditioning (HVAC) system condition. | 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Fundamentals of tools, equipment and materials for heated ventilation air conditioning (HVAC) system condition: <ul style="list-style-type: none"> • Function • Usage | 1.1 Received job order. 1.2 Prepare parts, tools, equipment and materials in working area. 1.3 Check leakage. 1.4 Check cooling effect of the heated ventilation air conditioning (HVAC) system. 1.5 Check abnormal noise. 1.6 Check air-condition | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting heated ventilation air conditioning (HVAC) system inspection. • Adhere to company safety and policy. | 1.1 Job order obtained from superior are interpreted and understand. 1.2 Part, tools, equipment and materials for functionality inspection are obtained and readied in working area. 1.3 Heated Ventilation Air Conditioning (HVAC) system leakage are confirmed and ascertained. 1.4 Cooling effect of heated ventilation air conditioning (HVAC) system physically |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|---|---|---|
| | <ul style="list-style-type: none"> • Type <p>1.3 Fundamentals of heated ventilation air conditioning (HVAC) system such as :</p> <ul style="list-style-type: none"> • Functionality • Usability • Schematic diagram • Parts & components • Flange related parts (attachments) <p>1.4 Heated ventilation air conditioning (HVAC) system condition check procedure:</p> <ul style="list-style-type: none"> • Leakage • Cooling effect • Noise <p>1.5 Check usability components condition procedure such as:</p> <ul style="list-style-type: none"> • Micro filter element • Condensers fan unit • Blower motor | <p>condensers fan unit functionality.</p> <p>1.7 Check refrigerant gas adequacy.</p> <p>1.8 Check blower motor functionality.</p> <p>1.9 Check blower motor switch functionality.</p> <p>1.10 Check blower motor control resistor.</p> <p>1.11 Prepare heated ventilation air conditioning (HVAC) system condition inspection technical report.</p> | <ul style="list-style-type: none"> • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>1.5 confirmed and ascertained. Heated ventilation air conditioning (HVAC) abnormal noise and harshness confirmed and ascertained.</p> <p>1.6 Heated ventilation air conditioning (HVAC) condenser fan unit functionality condition confirmed and ascertained.</p> <p>1.7 Refrigerant Gas adequacy condition confirmed and ascertained.</p> <p>1.8 Blower motor functionality condition confirmed and ascertained.</p> <p>1.9 Blower motor switch turn on and off functionality performed, confirmed and ascertained.</p> <p>1.10 Blower motor control resistor functionality performed, confirmed and ascertained.</p> <p>1.11 Heated ventilation air conditioning (HVAC) inspection technical report updated and printed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|--|--|---|--|
| | <ul style="list-style-type: none"> • Switch & resistor <p>1.6 Check refrigerant gas adequacy procedure.</p> <p>1.7 Inspection report writing:</p> <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information • Submission procedure | | | |
| <p>2. Change heated ventilation air conditioning (HVAC) system parts and components.</p> | <p>2.1 Fundamentals of heated ventilation air conditioning (HVAC) system parts and components</p> <ul style="list-style-type: none"> • Micro filter element blockage / air filter • Condenser fan • Blower motor unit • Blower motor switch & control resistor unit <p>2.2 HVAC parts operation such as:</p> <ul style="list-style-type: none"> • Compressor • Condenser • Receiver <p>2.3 Micro filter element</p> | <p>2.1 Prepare parts, tools, equipment and materials in working area.</p> <p>2.2 Perform defect air filter replacement.</p> <p>2.3 Perform defect condenser fan unit replacement</p> <p>2.4 Recharge heated ventilation air conditioning (HVAC) refrigerant.</p> <p>2.5 Perform defect blower motor replacement.</p> <p>2.6 Perform defect blower motor switch & control resistor replacement.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting heated ventilation air conditioning (HVAC) system inspection. • Adhere to company safety and policy. • Follow Occupational safety & health act. | <p>2.1 Part, tools, equipment and materials for heated ventilation air conditioning (HVAC) system parts and components replacements are obtained and readied in working area.</p> <p>2.2 New heated ventilation air conditioning (HVAC) air filter replacement completed.</p> <p>2.3 New heated ventilation air conditioning (HVAC) condenser fan unit replacement completed.</p> <p>2.4 Refrigerant fully recharge and adequacy confirmed and completed.</p> <p>2.5 New heated ventilation air conditioning (HVAC) blower</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|---|---|---|
| | removal procedure. 2.4 Condenser fan unit removal procedure. 2.5 Refrigerant measuring procedure. 2.6 Heated ventilation air conditioning (HVAC) recovery & flushing procedure. 2.7 Air-condition refrigerant recharge procedure. 2.8 Blower motor unit removal procedure. 2.9 Blower motor switch & control resistor removal procedure. 2.10 Replacements report writing: <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information • Submission procedure | 2.7 Prepare heated ventilation air conditioning (HVAC) system parts and components replacements technical report. | <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | motor replacement completed. 2.6 New heated ventilation air conditioning (HVAC) blower motor switch & control resistor replacement completed. 2.7 Heated ventilation air conditioning (HVAC) system parts and components replacements technical report updated and printed. |
| 3. Conduct heated ventilation air conditioning (HVAC) | 3.1 Heated ventilation air conditioning (HVAC) temperature performance test. 3.2 Abnormal defects | 3.1 Switch on heated ventilation air conditioning (HVAC) system. 3.2 Check abnormal | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. | 3.1 Air-Conditioner switch turned on. 3.2 Leakages, noise, vibration and harshness inspection completed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---------------------------------|--|---|---|--|
| <p>system performance test.</p> | <ul style="list-style-type: none"> • Leakage • Cooling effect • Noise • Not function • Noise, Vibration and Harshness (NVH) condition <p>3.3 Heated ventilation air conditioning (HVAC) system performance test report writing :</p> <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information • Submission procedure | <p>defect.</p> <p>3.3 Carry out heated ventilation air conditioning (HVAC) system performance test.</p> <p>3.4 Prepare heated ventilation air conditioning (HVAC) system performance test technical report.</p> | <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting heated ventilation air conditioning (HVAC) system performance test. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>3.3 Noise, vibration and harshness checklist are updated.</p> <p>3.4 Abnormal defect checklist completed.</p> <p>3.5 Heated ventilation air conditioning (HVAC) system performance test technical report updated and printed.</p> |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

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- 2 Graham Stoakes (Author). Principles of Light Vehicle Air Conditioning. ISBN-10: 0992949246.
- 3 Anon (Author). Air Conditioning Manual. ISBN-10: 1785213598. J H Haynes & Co Ltd (June 27, 2016).
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15.11. Automatic Transmission / Transaxle Unit Overhauling

| | | | |
|---|---|---|---|
| SECTION GROUP | (G) Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | | |
| AREA | (452) Maintenance And Repair Of Motor Vehicles | | |
| NOSS TITLE | Passenger Vehicle Maintenance & Service | | |
| COMPETENCY UNIT TITLE | Light Vehicle-Repair Service | | |
| LEARNING OUTCOMES | Automatic Transmission / Transaxle Unit Overhauling The person who is competent in this CU shall be able to ensure the smoothness of the transmission / transaxle unit shifting time, the quality of the shifting and free defect and malfunctions in accordance with OEM specifications. Upon completion of this competency unit, trainees shall be able to: 1. Conduct automatic transmission / transaxle unit functional test. 2. Remove automatic transmission / transaxle from vehicle. 3. Perform automatic transmission / transaxle overhauling. 4. Install automatic transmission / transaxle into vehicle. | | |
| TRAINING PRE-REQUISITE | N/A | | |
| CU CODE | G452-002-2:2018-CU11 | NOSS LEVEL | Two (2) |
| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT |
| 1. Conduct automatic transmission / transaxle unit functional test. | 1.1 Fundamental of job order • Function • Types • Format • Information 1.2 Fundamental of Automatic Transmission / Transaxle such as: • Functions | 1.1 Received job order. 1.2 Carry out vehicle test drive. 1.3 Carry out automatic transmission / transaxle functionality condition test. 1.4 Prepare functional test technical report. | <u>ATTITUDE:</u> • Systematic in organising work activities. <u>SAFETY:</u> • Adhere to safety precaution in conducting manual transmission / transaxle unit |
| | | | ASSESSMENT CRITERIA |
| | | | 1.1 Job order are obtained, presented and explained. 1.2 Vehicle automatic transmission / transaxle shifting condition by performing vehicle test identified and ascertained. 1.3 Automatic transmission / transaxle functionality condition checklist completed. 1.4 Functional test technical report |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|--|---|--|
| | <ul style="list-style-type: none"> • Parts & components • schematic diagram • usability conditions <p>1.3 Automatic Transmission / transaxle functionality condition test procedure</p> <p>1.4 Functional test technical report writing:</p> <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information • Submission procedure | | <p>functional test.</p> <ul style="list-style-type: none"> • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>updated and printed.</p> |
| <p>2. Remove automatic transmission / transaxle from vehicle.</p> | <p>2.1 Fundamentals of tools, equipment and materials for automatic transmission / transaxle overhaul:</p> <ul style="list-style-type: none"> • Function • Usage • Type <p>2.2 Drain ATF (automatic transmission fluid) procedure.</p> | <p>2.1 Prepare parts, tools, equipment and materials in working area.</p> <p>2.2 Drain out automatic transmission / transaxle fluid (ATF).</p> <p>2.3 Detach automatic transmission / Transaxle attachments.</p> <p>2.4 Remove torque converter.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting remove automatic transmission/ transaxle | <p>2.1 Part, tools, equipment and materials for functionality inspection are obtained and readied in working area.</p> <p>2.2 Automatic transaxle/transmission fluid (ATF) draining process performed and confirmed.</p> <p>2.3 Used automatic transmission / transaxle fluid (ATF) fully drain out into disposable container.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|--|--|---|
| | <p>2.3 Type of automatic transmission attachment such as:</p> <ul style="list-style-type: none"> • Cables • Propeller shaft • U-joint • Bracket & mounting <p>2.4 Automatic transmission attachment detaching procedure such as:</p> <ul style="list-style-type: none"> • Linkage cable disconnected • Indicator switch harness disconnected <p>2.5 Fundamental of torque converter such as :</p> <ul style="list-style-type: none"> • Functions • Parts and components • Schematic diagrams <p>2.6 Torque converter removing procedure</p> <p>2.7 Automatic transmission / transaxle mount on the overhaul stand procedure.</p> | <p>2.5 Mount automatic transmission / Transaxle on the overhaul stand.</p> | <p>from vehicle.</p> <ul style="list-style-type: none"> • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>2.4 Automatic transmission / transaxle attachments safely detached.</p> <p>2.5 Torque converter is removed from the vehicle.</p> <p>2.6 Automatic transmission / transaxle secured on the overhaul stand using hoist and safety harness.</p> |
| <p>3. Perform automatic transmission / transaxle overhauling.</p> | <p>3.1 Internal components dismantling procedure.</p> <p>3.2 Automatic transmission/ Transaxle components usability condition</p> | <p>3.1 Dismantle automatic transmission / transaxle internal components.</p> <p>3.2 Determine automatic transmission /</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. | <p>3.1 All automatic transmission / transaxle internal components dismantling process performed and confirmed.</p> <p>3.2 Automatic transmission / transaxle components parts</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|--|---|--|
| | <p>such as:</p> <ul style="list-style-type: none"> • Worn out components • Defective & damaged components • Leakages <p>3.3 Components changing procedure.</p> <p>3.4 Automatic transmission / Transaxle unit reassembling procedure.</p> | <p>transaxle components parts condition.</p> <p>3.3 Replace defect automatic / transaxle transmission components parts.</p> <p>3.4 Reassemble automatic / transaxle transmission unit.</p> | <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting automatic transmission/ transaxle overhauling. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>condition checklist performed.</p> <p>3.3 New automatic transmission / transaxle components parts replacement performed and confirmed.</p> <p>3.4 Automatic transmission / transaxle unit reassembling process performed and confirmed.</p> |
| <p>4. Install automatic transmission / transaxle into vehicle.</p> | <p>4.1 Install attachments to the automatic transmission / transaxle unit procedure.</p> <p>4.2 Torque converter installing procedure.</p> <p>4.3 Automatic transmission / transaxle unit installing procedure.</p> <p>4.4 Refill Automatic Transmission Fluid (ATF) procedure.</p> <p>4.5 Automatic transmission /</p> | <p>4.1 Reattach automatic transmission / transaxle attachments.</p> <p>4.2 Detach automatic transmission / transaxle unit from the overhaul stand.</p> <p>4.3 Install torque converter to the automatic transmission / transaxle unit.</p> <p>4.4 Install automatic transmission / transaxle unit onto the engine.</p> <p>4.5 Refill automatic</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting install automatic transmission/ transaxle into vehicle. • Adhere to company safety and policy. | <p>4.1 Automatic transmission / transaxle attachments reattached to engine confirmed.</p> <p>4.2 Automatic transmission / transaxle unit lifted from the overhaul stand by safety hoist and harness.</p> <p>4.3 Torque converter installation to automatic transmission / transaxle unit performed and confirmed.</p> <p>4.4 Automatic transmission / transaxle unit installation onto engine performed and confirmed.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|--|--|--|
| | transaxle functionality test procedure. 4.6 Automatic transmission / transaxle unit overhauling technical report writing : <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information • Submission procedure | transmission/transaxle fluid (ATF). 4.6 Test Automatic transmission / transaxle functionality. 4.7 Prepare automatic transmission / transaxle unit overhauling technical report. | <ul style="list-style-type: none"> • Follow Occupational safety & health act. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | 4.5 Automatic Transmission / Transaxle Fluid (ATF) refilled fully. 4.6 Automatic transmission / transaxle functionality checklist are updated and confirmed. 4.7 Automatic transmission / transaxle unit overhauling technical report updated and printed. |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

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- 5 Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Published by SAE in 1999, ISBN 1-56091-199-9.
- 6 Michael Plint, Anthony Martyr, Engine Testing Theory and Practice, Published by SAE in 1999, ISBN 0-7680-0314-8

15.12. Manual Transmission / Transaxle Unit Overhauling

| | | |
|------------------------|--|------------|
| SECTION | (G) Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452) Maintenance And Repair Of Motor Vehicles | |
| AREA | Passenger Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| COMPETENCY UNIT TITLE | Manual Transmission / Transaxle Unit Overhauling | |
| LEARNING OUTCOMES | <p>The person who is competent in this CU shall be able to ensure the smoothness of the transmission unit shifting time, the quality of the shifting and free defect and malfunctions in accordance with OEM specifications.</p> <p>Upon completion of this competency unit, trainees shall be able to:</p> <ol style="list-style-type: none"> 1. Conduct manual transmission / transaxle unit functional test. 2. Remove manual transmission / transaxle from vehicle. 3. Perform clutch system overhaul. 4. Perform manual transmission / transaxle overhauling. 5. Install manual transmission / transaxle into vehicle. | |
| TRAINING PRE-REQUISITE | N/A | |
| CU CODE | G452-002-2:2018-CUI2 | NOSS LEVEL |
| | | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|---|--|---|
| 1. Conduct manual transmission / transaxle unit functional test. | <ol style="list-style-type: none"> 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Fundamental of Manual Transmission / transaxle such as: <ul style="list-style-type: none"> • Functions • Parts & | <ol style="list-style-type: none"> 1.1 Received job order. 1.2 Carry out manual transmission / transaxle functionality condition test. 1.3 Prepare functional test report. | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting manual transmission / transaxle unit | <ol style="list-style-type: none"> 1.1 Job order are obtained, presented and explained. 1.2 Manual transmission / transaxle functionality condition checklist completed. 1.3 Functional test technical report updated and printed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|---|---|---|
| | components <ul style="list-style-type: none"> • schematic diagram • usability conditions 1.3 Manual Transmission / transaxle functionality condition test procedure. 1.4 Functional test report writing: <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information • Submission procedure | | functional test. <ul style="list-style-type: none"> • Adhere to company safety and policy. • Follow Occupational safety & health act. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | |
| 2. Remove manual transmission / transaxle from vehicle. | 2.1 Fundamentals of tools, equipment and materials for manual transmission / transaxle overhaul: <ul style="list-style-type: none"> • Function • Usage • Type 2.2 Drain Manual Transmission / transaxle Fluid (MTF) procedure. 2.3 Type of manual transmission / transaxle attachment | 2.1 Prepare parts, tools, equipment and materials in working area. 2.2 Drain out manual transmission / transaxle fluid (MTF). 2.3 Detach Manual transmission attachments. 2.4 Mount Manual Transmission / transaxle on the overhaul stand. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting remove manual transmission/transaxle from vehicle. • Adhere to company safety and policy. • Follow Occupational | 2.1 Part, tools, equipment and materials for functionality inspection are obtained and readied in working area. 2.2 Manual transmission / transaxle fluid (MTF) draining process performed and confirmed. 2.3 Used manual transmission / transaxle fluid (MTF) are disposed into disposable container. 2.4 Manual transmission / transaxle attachments detached. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|---|--|--|
| <p>3. Perform clutch system overhaul.</p> | <p>such as:</p> <ul style="list-style-type: none"> • Cables • Propeller shaft • U-joint • Bracket & mounting <p>2.4 Manual transmission / transaxle attachment detaching procedure such as:</p> <ul style="list-style-type: none"> • Linkage cable disconnected • Indicator switch harness disconnected <p>2.5 Manual transmission mount on the overhaul stand procedure.</p> | | <p>safety & health act.</p> <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>2.5 Manual transmission / transaxle safely lift-out from vehicle using hoist and safety harness.</p> <p>2.6 Manual transmission / transaxle secured on the overhaul stand using hoist and safety harness.</p> |
| <p>3. Perform clutch system overhaul.</p> | <p>3.1 Fundamentals of tools, equipment and materials for clutch system overhaul:</p> <ul style="list-style-type: none"> • Function • Usage • Type <p>3.2 Fundamentals of clutch system</p> <ul style="list-style-type: none"> • Schematic diagram • Functions • Types of linking system (hydraulic | <p>3.1 Prepare parts, tools, equipment and materials in working area.</p> <p>3.2 Perform clutch system inspection-</p> <p>3.3 Disassemble clutch system assembly.</p> <p>3.4 Replace defect clutch system parts & components.</p> <p>3.5 Assemble clutch system assembly.</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting clutch system overhaul. • Adhere to company safety and policy. • Follow Occupational | <p>3.1 Part, tools, equipment and materials for clutch system overhaul are obtained and readied in working area.</p> <p>3.2 Clutch system inspection checklist are updated and confirmed.</p> <p>3.3 Clutch system assembly are dissembled and organised following workshop manual.</p> <p>3.4 New clutch system parts & components replacement performed and confirmed.</p> <p>3.5 Clutch system assembly</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|---|--|---|--|
| 4. Perform manual transmission / transaxle overhauling. | <ul style="list-style-type: none"> • and cable) • Type of possible leakage • Clutch external parts & components • Clutch external parts & components • Clutch bleeding procedure • Transmission / transaxle mating casing inspection and replacement procedure. | | <p>safety & health act.</p> <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | <p>assembling process performed and confirmed.</p> |
| 4. Perform manual transmission / transaxle overhauling. | <ul style="list-style-type: none"> 4.1 Internal components dismantling procedure 4.2 Manual transmission / transaxle components usability condition such as: <ul style="list-style-type: none"> • Worn out • Defective & damaged components • Leakages 4.3 Components changing procedure according to OEM requirement 4.4 Manual transmission / transaxle unit reassembling procedure | <ul style="list-style-type: none"> 4.1 Dismantle manual transmission / transaxle internal components. 4.2 Determine manual transmission / transaxle components parts condition. 4.3 Replace manual transmission / transaxle components parts. 4.4 Reassemble manual transmission / transaxle unit. | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting manual transmission / transaxle overhauling. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> | <ul style="list-style-type: none"> 4.1 All manual transmission / transaxle internal components dismantling process performed and confirmed. 4.2 Manual transmission / transaxle components parts condition checklist performed. 4.3 New Manual transmission / transaxle components parts replacement performed and confirmed. 4.4 Manual transmission / transaxle unit reassembling process confirmed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|--|--|---|--|
| 5. Install manual transmission / transaxle into vehicle. | 5.1 Install attachments to the manual transmission / transaxle unit procedure. 5.2 Manual transmission / transaxle detach from the overhaul stand procedure. 5.3 Torque converter installing to the manual transmission / transaxle unit procedure. 5.4 Manual transmission / transaxle unit installing onto the engine procedure. 5.5 Refill manual transmission / transaxle fluid (MTF) procedure. 5.6 Manual transmission / transaxle functionality test procedure. 5.7 Manual transmission / transaxle unit overhauling report writing : | 5.1 Reattach manual transmission / transaxle attachments. 5.2 Detach manual transmission / transaxle unit from the overhaul stand. 5.3 Install manual transmission / transaxle unit onto the engine. 5.4 Refill manual transmission / transaxle fluid (MFT) fluid. 5.5 Test manual transmission / transaxle functionality. 5.6 Prepare manual transmission / transaxle unit overhauling report. | <ul style="list-style-type: none"> Practice Reuse, Recycle and Reduce (3R). Follow Environment Quality act. <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> Adhere to safety precaution in conducting manual transmission into vehicle installation. Adhere to company safety and policy. Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> Practice Reuse, Recycle and Reduce (3R). Follow Environment Quality act. | 5.1 Manual transmission / transaxle attachments reattached to engine confirmed. 5.2 Manual transmission / transaxle unit lifted from the overhaul stand by safety hoist and harness. 5.3 Manual transmission / transaxle unit installation onto engine performed and confirmed. 5.4 Manual Transmission / Transaxle Fluid (ATF) refilled fully. 5.5 Manual transmission / transaxle functionality checklist are updated and confirmed. 5.6 Manual transmission / transaxle unit overhauling technical report updated and printed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|-------------------------------|---------------------|
| | <ul style="list-style-type: none"> Format such as computerised or manual Content / information | | | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Eric Chowanietz, Automobile Electronics, Published by SAE in 1995, ISBN 0-7506-1878-7.
- 5 Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Published by SAE in 1999, ISBN 1-56091-199-9.
- 6 Michael Plint, Anthony Martyr, Engine Testing Theory and Practice, Published by SAE in 1999, ISBN 0-7680-0314-8

15.13. Transfer Case Overhauling

| | | |
|------------------------|--|------------|
| SECTION | (G)Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles | |
| GROUP | (452)Maintenance And Repair Of Motor Vehicles | |
| AREA | Passenger Vehicle Maintenance & Service | |
| NOSS TITLE | Light Vehicle-Repair Service | |
| COMPETENCY UNIT TITLE | Transfer Case Overhauling | |
| LEARNING OUTCOMES | <p>The person who is competent in this CU shall be to ensure the smoothness of the gear engage, the quality of the shifting and free defect and malfunctions in accordance with OEM specifications.</p> <p>Upon completion of this competency unit, trainees shall be able to:</p> <ol style="list-style-type: none"> 1. Conduct transfer case unit functional test. 2. Remove transfer case unit from vehicle. 3. Perform transfer case unit overhauling. 4. Install transfer case unit into vehicle. | |
| TRAINING PRE-REQUISITE | N/A | |
| CU CODE | G452-002-2:2018-EU01 | NOSS LEVEL |
| | | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|---|--|--|
| 1. Conduct transfer case unit functional test. | <ol style="list-style-type: none"> 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Fundamental of transfer case such as: <ul style="list-style-type: none"> • Functions • Parts & components • Schematic diagram | <ol style="list-style-type: none"> 1.1 Received job order. 1.2 Carry out transfer case functionality condition test. 1.3 Prepare functional test report. | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting manual transmission / transaxle unit functional test. • Adhere to company | <ol style="list-style-type: none"> 1.1 Job order obtained and interpreted and understand. 1.2 Transfer case functionality condition checklist completed. 1.3 Functional test report produced and presented. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---|--|--|---|--|
| <p>2. Remove transfer case unit from vehicle.</p> | <ul style="list-style-type: none"> • Usability conditions <p>1.3 Transfer case functionality condition test procedure</p> <p>1.4 Functional test report writing:</p> <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information • Submission procedure <p>2.1 Fundamentals of tools, equipment and materials for transfer case unit overhaul:</p> <ul style="list-style-type: none"> • Function • Usage • Type <p>2.2 Drain gear oil procedure</p> <p>2.3 Type of transfer case unit attachment such as:</p> <ul style="list-style-type: none"> • Cables • Propeller shaft • U-joint • Bracket & mounting | <p>2.1 Prepare parts, tools, equipment and materials in working area.</p> <p>2.2 Drain out gear oil.</p> <p>2.3 Detach manual transmission attachments.</p> <p>2.4 Mount transfer case unit on the overhaul stand.</p> | <p>safety and policy.</p> <ul style="list-style-type: none"> • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting remove transfer case unit from vehicle. • Adhere to company safety and policy. • Follow Occupational safety & health act. | <p>2.1 Part, tools, equipment and materials for functionality inspection obtained and readied in working area.</p> <p>2.2 Gear oil fully drain out into disposable container.</p> <p>2.3 Transfer case cables, propeller shaft, u-joint, bracket and mounting detached checklist are updated.</p> <p>2.4 Transfer case mount on the overhaul stand using hoist and safety harness.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|--|---|---|---|
| | 2.4 Transfer case unit attachment detaching procedure such as: <ul style="list-style-type: none"> • Linkage cable disconnected • Indicator switch harness disconnected 2.5 Transfer case unit on the overhaul stand procedure. | | <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice reuse, recycle and reduce (3R). • Follow Environment quality act. | |
| 3. Perform transfer case unit overhauling. | 3.1 Internal components dismantling procedure. 3.2 Transfer case components usability condition such as: <ul style="list-style-type: none"> • Worn out • Defective & damaged components • Leakages 3.3 Transfer case components changing procedure. 3.4 Transfer case unit reassembling procedure. 3.5 Refill gear oil procedure. 3.6 Transfer case | 3.1 Dismantle transfer case internal components. 3.2 Determine transfer case components parts worn, defective and damaged condition. 3.3 Replace transfer case components parts. 3.4 Reassemble transfer case components. 3.5 Refill gear oil. 3.6 Test transfer case functionality. 3.7 Transfer case unit overhauling report. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting transfer case overhauling. • Adhere to company safety and policy. • Follow Occupational safety & health act. <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). | 3.1 Transfer case internal components dismantled accordingly one by one. 3.2 Transfer case components parts condition checklist performed. 3.3 Transfer case components parts replace checklist performed. 3.4 Transfer case unit safely reassembled. 3.5 Gear oil fully replenished 3.6 Transfer case unit functionality test checklist are updated and confirmed. 3.7 Transfer case unit overhauling report produced and presented. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|--|--|--|--|
| <p>4. Install transfer case unit into vehicle.</p> | <p>functionality test procedure</p> <p>3.7 Transfer case unit overhauling report writing :</p> <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information <p>4.1 Transfer case unit detach from the overhaul stand procedure.</p> <p>4.2 Transfer case unit installing to the manual transmission / transaxle unit procedure.</p> <p>4.3 Transfer case unit installing onto the engine procedure.</p> <p>4.4 Refill gear oil procedure.</p> <p>4.5 Transfer case unit functionality test procedure.</p> <p>4.6 Transfer case unit overhauling report writing :</p> <ul style="list-style-type: none"> • Format such as computerised or manual | <p>4.1 Reattach transfer case unit attachments.</p> <p>4.2 Detach transfer case unit from the overhaul stand.</p> <p>4.3 Install transfer case unit onto the engine.</p> <p>4.4 Refill gear oil.</p> <p>4.5 Test transfer case unit.</p> <p>4.6 Prepare transfer case unit overhauling report.</p> | <ul style="list-style-type: none"> • Follow Environment quality act. <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting manual transmission into vehicle installation. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). | <p>4.1 Transfer Case unit attachments reattach checklist performed.</p> <p>4.2 Transfer Case unit lifted from the overhaul stand by safety hoist and harness.</p> <p>4.3 Transfer Case unit installed onto the engine and safely secured.</p> <p>4.4 Transfer Case unit gear oil replenished</p> <p>4.5 Transfer Case unit functionality checklist are updated and confirmed.</p> <p>4.6 Transfer Case unit overhauling report prepared and presented.</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|---|----------------|---|---------------------|
| | <ul style="list-style-type: none"> Content / information | | <ul style="list-style-type: none"> Follow Environment Quality act. | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Published by SAE in 1999, ISBN 1-56091-199-9.
- 5 Michael Plint, Anthony Martyr, Engine Testing Theory and Practice, Published by SAE in 1999, ISBN 0-7680-0314-8
- 6 Rudolf Limpert, Brake and Design Safety, Published by SAE in 1999, ISBN 1-56091-915-9.

15.14. Vehicle Carburettor Service

| | |
|------------------------|--|
| SECTION | (G) Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles |
| GROUP | (452) Maintenance And Repair Of Motor Vehicles |
| AREA | Passenger Vehicle Maintenance & Service |
| NOSS TITLE | Light Vehicle-Repair Service |
| COMPETENCY UNIT TITLE | Vehicle Carburettor Service |
| LEARNING OUTCOMES | The person who is competent in this CU shall be able to ensure the smoothness of the engine, optimum performance and free defect and malfunctions in accordance with OEM specifications. Upon completion of this competency unit, trainees shall be able to: 1. Inspect carburettor functionality. 2. Overhaul carburettor. 3. Perform carburettor tuning. |
| TRAINING PRE-REQUISITE | N/A |
| CU CODE | G452-002-2:2018-EU02 |
| | NOSS LEVEL |
| | Two (2) |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|---------------------------------------|--|--|---|---|
| 1. Inspect carburettor functionality. | 1.1 Fundamental of job order <ul style="list-style-type: none"> • Function • Types • Format • Information 1.2 Fundamentals of tools, equipment and materials for carburettor functionality inspection: <ul style="list-style-type: none"> • Function • Usage | 1.1 Received job order. 1.2 Prepare parts, tools, equipment and materials in working area. 1.3 Check carburettor leakages condition. 1.4 Check carburettor idling speed. 1.5 Check carburettor acceleration performance. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting carburettor functionality inspection. • Adhere to company safety | 1.1 Job order are obtained, presented and explained. 1.2 Part, tools, equipment and materials for functionality inspection are obtained and readied in working area. 1.3 Carburettor leakages condition visually checked. 1.4 Carburettor idling speed characteristic determined. 1.5 Carburettor acceleration performance checklist performed. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|--|----------------|--|---------------------|
| | <p>1.3 Type Fundamentals of carburettor such as :-</p> <ul style="list-style-type: none"> • Functionality • Usability • 7 stage of carburettor • Schematic Diagram • Parts & components • Flange related parts (attachments) <p>1.4 Type of possible leakage</p> <ul style="list-style-type: none"> • Source (such as petrol part, oil ring, gasket) • cause (such as wear and tear, misalignment, accident) <p>1.5 Carburettor idling speed checking procedure such as :-</p> <ul style="list-style-type: none"> • Components checking (fuel hose, fuel pump assembly, gasket) • Functions (auto choke, air-conditioner) | | <p>and policy.</p> <ul style="list-style-type: none"> • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment Quality act. | |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--|---|--|---|--|
| 1.6 Carburettor acceleration performance checking procedure. | actuator, vacuum hose) | | | |
| 2. Overhaul carburettor. | <p>2.1 Fundamentals of tools, equipment and materials for carburettor service:</p> <ul style="list-style-type: none"> • Function • Usage <p>2.1 Carburettor attachment dismantling procedure.</p> <p>2.2 Carburettor removing from the intake manifold procedure.</p> <p>2.3 Carburettor components dismantling procedure.</p> <p>2.4 Carburettor components usability condition such as:</p> <ul style="list-style-type: none"> • Worn out • Defective & damaged components • Leakages <p>2.5 Carburettor components cleaning procedure.</p> <p>2.6 Carburettor</p> | <p>2.1 Prepare parts, tools, equipment and materials in working area.</p> <p>2.2 Remove carburettor attachments.</p> <p>2.3 Remove carburettor from the intake manifold.</p> <p>2.4 Dismantle carburettor components.</p> <p>2.5 Determine carburettor components worn out or damage conditions</p> <p>2.6 Clean carburettor components.</p> <p>2.7 Change carburettor components.</p> <p>2.8 Reassemble carburettor components.</p> <p>2.9 Mount carburettor to intake manifold.</p> <p>2.10 Reassemble carburettor</p> | <p><u>ATTITUDE:</u></p> <ul style="list-style-type: none"> • Systematic in organising work activities. <p><u>SAFETY:</u></p> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting carburettor overhaul. • Adhere to company safety and policy. • Follow Occupational safety & health act. <p><u>ENVIRONMENT:</u></p> <ul style="list-style-type: none"> • Practice Reuse, Recycle and Reduce (3R). • Follow Environment | <p>2.1 Part, tools, equipment and materials for functionality inspection obtained and readied in working area.</p> <p>2.2 Carburettor cables, brackets and mounting removed.</p> <p>2.3 Carburettor is removed from intake manifold and put on overhaul stand.</p> <p>2.4 Carburettor components dismantled following OEM manual.</p> <p>2.5 Carburettor components worn out or damage conditions characteristic determined.</p> <p>2.6 Carburettor components cleaned from grime and dirt.</p> <p>2.7 Carburettor components changing checklist performed.</p> <p>2.8 Carburettor components replacing checklist performed.</p> <p>2.9 Carburettor hoist into intake manifold and secured.</p> <p>2.10 Carburettor attachments reassembling checklist</p> |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|--------------------------------|---|---|---|--|
| | components changing procedure. 2.7 Carburettor components reassembling procedure. 2.8 Mount carburettor to the intake manifold. 2.9 Carburettor attachment reassembling procedure. | attachments. | Quality act. | performed. |
| 3. Perform carburettor tuning. | 3.1 Carburettor fundamental test procedure such: <ul style="list-style-type: none"> • Idling test • Tuning test 3.2 Acceleration testing procedure. 3.3 Choke testing procedure. 3.4 Data Technical Inspection (DTI) preparing procedure. 3.5 Transfer case functionality test procedure. 3.6 Vehicle carburettor service report writing : <ul style="list-style-type: none"> • Format such as computerised or manual • Content / information | 3.1 Carry out Carburettor idling tuning testing. 3.2 Carry out Carburettor acceleration tuning test. 3.3 Carry out Carburettor choke tuning test. 3.4 Prepare Data Technical Inspection (DTI) sheet. 3.5 Test transfer case functionality. 3.6 Vehicle carburettor service report. | <u>ATTITUDE:</u> <ul style="list-style-type: none"> • Systematic in organising work activities. <u>SAFETY:</u> <ul style="list-style-type: none"> • Adhere to safety precaution in conducting carburettor overhaul. • Adhere to company safety and policy. • Follow Occupational safety & health act. | 3.1 Carburettor idling tuning testing checklist performed. 3.2 Carburettor acceleration tuning test checklist performed. 3.3 Carburettor choke tuning test checklist performed. 3.4 Data technical inspection (DTI) sheet checklist completed. 3.5 Vehicle carburettor functionality test checklist are updated and confirmed. 3.6 Vehicle carburettor service report produced and presented. |

| WORK ACTIVITIES | RELATED KNOWLEDGE | RELATED SKILLS | ATTITUDE/ SAFETY/ ENVIRONMENT | ASSESSMENT CRITERIA |
|-----------------|-------------------|----------------|---|---------------------|
| | | | <u>ENVIRONMENT:</u> <ul style="list-style-type: none"> Practice Reuse, Recycle and Reduce (3R). Follow Environment Quality act. | |

Employability Skills

Core Abilities

- Please refer NCS- Core Abilities latest edition.

Social Values & Social Skills

- Please refer Handbook on Social Skills and Social Values in Technical Education and Vocational Training.

References for Learning Material Development

- 1 BOSCH, Automotive Terminology, Published by SAE in 1998, ISBN 0-7680-0338-5.
- 2 Jose Luis Leyva, Learn Automotive Terminology in 2015, ISBN 9-781503-225725.
- 3 BOSCH, Automotive Handbook, Published by Bosch in 1996, ISBN 1-56091-918-3.
- 4 Thomas D. Gillespie, Fundamentals of Vehicle Dynamics, Published by SAE in 1999, ISBN 1-56091-199-9.
- 5 Michael Plint, Anthony Martyr, Engine Testing Theory and Practice, Published by SAE in 1999, ISBN 0-7680-0314-8
- 6 Rudolf Limpert, Brake and Design Safety, Published by SAE in 1999, ISBN 1-56091-915-9.

16. Delivery Mode

The following are the **recommended** training delivery modes:-

| KNOWLEDGE | SKILL |
|---|---|
| <ul style="list-style-type: none">• Lecture• Group discussion• E-learning, self-paced• E-learning, facilitate• Case study or Problem based learning (PBL)• Self-paced learning, non-electronic• One-on-one tutorial• Shop talk• Seminar | <ul style="list-style-type: none">• Demonstration• Simulation• Project• Scenario based training (SBT)• Role play• Coaching• Observation• Mentoring |

Skills training and skills assessment of trainees should be implemented in accordance with TEM requirements and actual situation.

17. Tools, Equipment and Materials (TEM)

LIGHT VEHICLE-REPAIR SERVICE

LEVEL 2

| CU No. | CU CODE | COMPETENCY UNIT TITLE |
|--------|----------------------|---|
| CU1 | G452-002-2:2018-CU01 | Vehicle Workshop Housekeeping |
| CU2 | G452-002-2:2018-CU02 | Vehicle Engine Service |
| CU3 | G452-002-2:2018-CU03 | Vehicle Engine Overhauling |
| CU4 | G452-002-2:2018-CU04 | Vehicle Brake System Service |
| CU5 | G452-002-2:2018-CU05 | Engine Cooling System Replacement |
| CU6 | G452-002-2:2018-CU06 | Rear / Front Axle Rectification |
| CU7 | G452-002-2:2018-CU07 | Exhaust System Rectification |
| CU8 | G452-002-2:2018-CU08 | Vehicle Electrical & Electronic System Service |
| CU9 | G452-002-2:2018-CU09 | Vehicle Steering, Suspension and Wheel System Service |
| CU10 | G452-002-2:2018-CU10 | Vehicle Heated Ventilation Air Conditioning (HVAC) System Rectification |
| CU11 | G452-002-2:2018-CU11 | Automatic Transmission / Transaxle Unit Overhauling |
| CU12 | G452-002-2:2018-CU12 | Manual Transmission / Transaxle Unit Overhauling |
| E01 | G452-002-2:2018-EU01 | Transfer Case Overhauling |
| E02 | G452-002-2:2018-EU02 | Vehicle Carburettor Service |