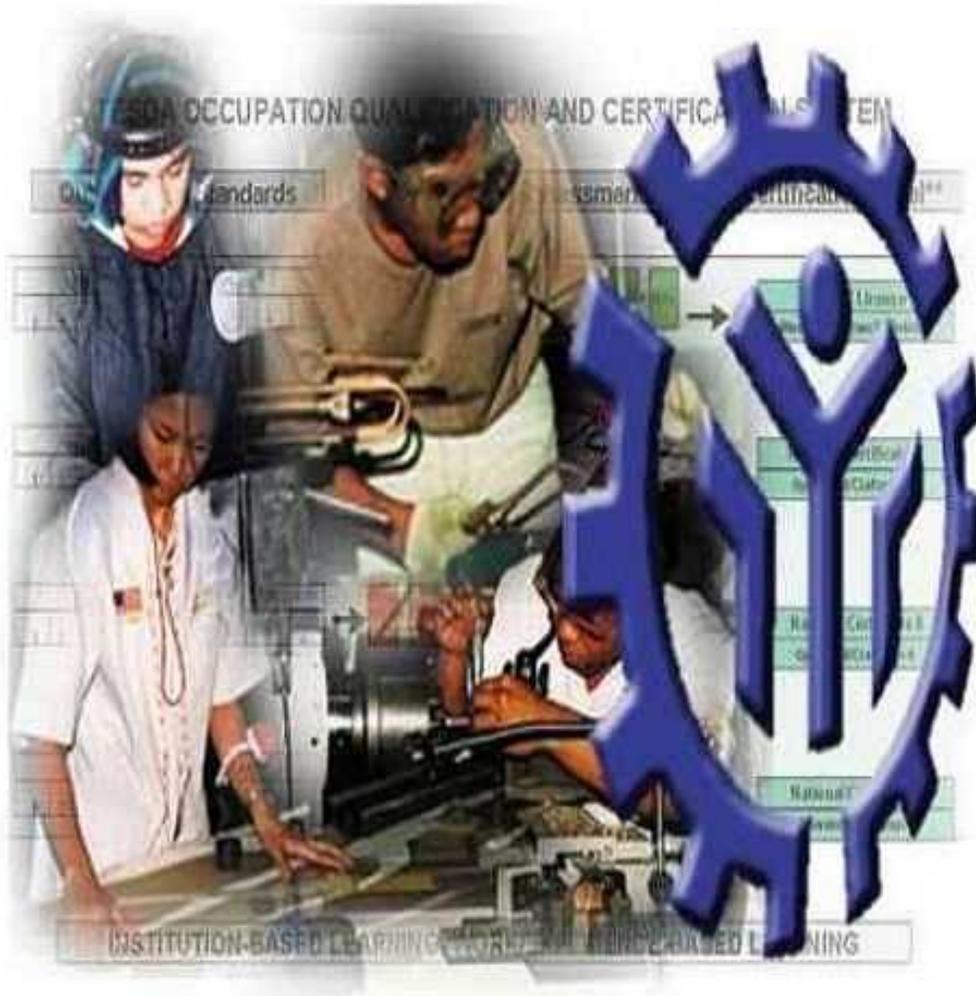


TRAINING REGULATIONS



AUTOMOTIVE SERVICING NC II

**AUTOMOTIVE/
LAND TRANSPORT SECTOR**

TECHNICAL EDUCATION AND SKILLS DEVELOPMENT AUTHORITY

East Service Road, South Superhighway, Taguig City, Metro Manila

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**TRAINING REGULATIONS FOR
AUTOMOTIVE SERVICING NC II**

SECTION 1 AUTOMOTIVE SERVICING NC II QUALIFICATION

The AUTOMOTIVE SERVICING NC II Qualification consists of competencies that a person must achieve to inspect, clean and repair mechanical or electrical parts, components, assemblies and sub-assemblies of light and heavy-duty automotive vehicle with diesel or gas engine in accordance with manufacturer's specification. It also covers servicing of engine mechanical components such as cooling and lubricating system; performing power train and underchassis servicing and repair.

This Qualification is packaged from the competency map of the Automotive Industry (Service sector) as shown in Annex A.

The Units of Competency comprising this Qualification include the following

CODE NO.	BASIC COMPETENCIES
500311105	Participate in Workplace Communication
500311106	Work in Team Environment
500311107	Practice Career Professionalism
500311108	Practice Occupational Health and Safety Procedures

CODE NO.	COMMON COMPETENCIES
ALT723201	Apply appropriate sealant/adhesive
ALT723202	Move and position vehicle
ALT311202	Perform mensuration and calculation
ALT723203	Read, interpret and apply specifications and manuals
ALT723204	Use and apply lubricants/coolants
ALT723205	Perform shop maintenance
ALT311204	Perform job estimates
ALT311205	Interpret/ draw technical drawing
ALT723206	Practice health, safety and environment procedures
ALT311207	Inspect technical quality of work
ALT311208	Maintain quality systems
ALT311209	Provide work skill instructions
ALT723210	Identify and select original automotive parts and products

CODE NO.	CORE COMPETENCIES
ALT723303	Service Automotive Battery
ALT723304	Service Ignition System
ALT723305	Test and Repair Wiring/Lighting System
ALT723307	Service Starting System
ALT723308	Service Charging System
ALT723309	Service Engine Mechanical System
ALT723310	Service Clutch System
ALT723311	Service Differential and Front Axle
ALT723312	Service Steering System
ALT723314	Service Brake System
ALT723315	Service Suspension System
ALT723306	Perform Underchassis Preventive Maintenance
ALT723313	Overhaul Manual Transmission

A person who has achieved this Qualification is competent to be:

- Automotive Mechanic
- Automotive Service Technician

SECTION 2 COMPETENCY STANDARDS

This section gives the details of the contents of the basic, common and core units of competency required in AUTOMOTIVE SERVICING NC II.

BASIC COMPETENCIES

UNIT OF COMPETENCY : PARTICIPATE IN WORKPLACE COMMUNICATION

UNIT CODE : 500311105

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to gather, interpret and convey information in response to workplace requirements.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Obtain and convey workplace information	1.1 Specific and relevant information is accessed from appropriate sources 1.2 Effective questioning , active listening and speaking skills are used to gather and convey information 1.3 Appropriate medium is used to transfer information and ideas 1.4 Appropriate non- verbal communication is used 1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed 1.6 Defined workplace procedures for the location and storage of information are used 1.7 Personal interaction is carried out clearly and concisely
2. Participate in workplace meetings and discussions	2.1 Team meetings are attended on time 2.2 Own opinions are clearly expressed and those of others are listened to without interruption 2.3 Meeting inputs are consistent with the meeting purpose and established protocols 2.4 Workplace interactions are conducted in a courteous manner 2.5 Questions about simple routine workplace procedures and matters concerning working conditions of employment are asked and responded to 2.6 Meetings outcomes are interpreted and implemented
3. Complete relevant work related documents	3.1 Range of forms relating to conditions of employment are completed accurately and legibly 3.2 Workplace data is recorded on standard workplace forms and documents 3.3 Basic mathematical processes are used for routine calculations 3.4 Errors in recording information on forms/ documents are identified and properly acted upon 3.5 Reporting requirements to supervisor are completed according to organizational guidelines

RANGE OF VARIABLES

VARIABLE	RANGE
1. Appropriate sources	1.1. Team members 1.2. Suppliers 1.3. Trade personnel 1.4. Local government 1.5. Industry bodies
2. Medium	2.1. Memorandum 2.2. Circular 2.3. Notice 2.4. Information discussion 2.5. Follow-up or verbal instructions 2.6. Face to face communication
3. Storage	3.1. Manual filing system 3.2. Computer-based filing system
4. Forms	4.1. Personnel forms, telephone message forms, safety reports
5. Workplace interactions	5.1. Face to face 5.2. Telephone 5.3. Electronic and two way radio 5.4. Written including electronic, memos, instruction and forms, non-verbal including gestures, signals, signs and diagrams
6. Protocols	6.1. Observing meeting 6.2. Compliance with meeting decisions 6.3. Obeying meeting instructions

EVIDENCE GUIDE

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1. Prepared written communication following standard format of the organization 1.2. Accessed information using communication equipment 1.3. Made use of relevant terms as an aid to transfer information effectively 1.4. Conveyed information effectively adopting the formal or informal communication
<p>2. Underpinning Knowledge and attitude</p>	<ul style="list-style-type: none"> 2.1. Effective communication 2.2. Different modes of communication 2.3. Written communication 2.4. Organizational policies 2.5. Communication procedures and systems 2.6. Technology relevant to the enterprise and the individual's work responsibilities
<p>3. Underpinning Skills</p>	<ul style="list-style-type: none"> 3.1. Follow simple spoken language 3.2. Perform routine workplace duties following simple written notices 3.3. Participate in workplace meetings and discussions 3.4. Complete work related documents 3.5. Estimate, calculate and record routine workplace measures 3.6. Basic mathematical processes of addition, subtraction, division and multiplication 3.7. Ability to relate to people of social range in the workplace 3.8. Gather and provide information in response to workplace Requirements
<p>4. Resource Implications</p>	<ul style="list-style-type: none"> 4.1. Fax machine 4.2. Telephone 4.3. Writing materials 4.4. Internet
<p>5. Methods of Assessment</p>	<ul style="list-style-type: none"> 5.1. Direct Observation 5.2. Oral interview and written test
<p>6. Context for Assessment</p>	<ul style="list-style-type: none"> 6.1. Competency may be assessed individually in the actual workplace or through accredited institution

UNIT OF COMPETENCY: WORK IN TEAM ENVIRONMENT

UNIT CODE : 500311106

UNIT DESCRIPTOR : This unit covers the skills, knowledge and attitudes to identify role and responsibility as a member of a team.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Describe team role and scope	1.1. The role and objective of the team is identified from available sources of information 1.2. Team parameters, reporting relationships and responsibilities are identified from team discussions and appropriate external sources
2. Identify own role and responsibility within team	2.1. Individual role and responsibilities within the team environment are identified 2.2. Roles and responsibility of other team members are identified and recognized 2.3. Reporting relationships within team and external to team are identified
3. Work as a team member	3.1. Effective and appropriate forms of communications used and interactions undertaken with team members who contribute to known team activities and objectives 3.2. Effective and appropriate contributions made to complement team activities and objectives, based on individual skills and competencies and workplace context 3.3. Observed protocols in reporting using standard operating procedures 3.4. Contribute to the development of team work plans based on an understanding of team's role and objectives and individual competencies of the members.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Role and objective of team	1.1. Work activities in a team environment with enterprise or specific sector 1.2. Limited discretion, initiative and judgement maybe demonstrated on the job, either individually or in a team environment
2. Sources of information	2.1. Standard operating and/or other workplace procedures 2.2. Job procedures 2.3. Machine/equipment manufacturer's specifications and instructions 2.4. Organizational or external personnel 2.5. Client/supplier instructions 2.6. Quality standards 2.7. OHS and environmental standards
3. Workplace context	3.1. Work procedures and practices 3.2. Conditions of work environments 3.3. Legislation and industrial agreements 3.4. Standard work practice including the storage, safe handling and disposal of chemicals 3.5. Safety, environmental, housekeeping and quality guidelines

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1. Operated in a team to complete workplace activity 1.2. Worked effectively with others 1.3. Conveyed information in written or oral form 1.4. Selected and used appropriate workplace language 1.5. Followed designated work plan for the job 1.6. Reported outcomes
<p>2. Underpinning Knowledge and attitude</p>	<ul style="list-style-type: none"> 2.1. Communication process 2.2. Team structure 2.3. Team roles 2.4. Group planning and decision making
<p>3. Underpinning Skills</p>	<ul style="list-style-type: none"> 3.1. Communicate appropriately, consistent with the culture of the workplace
<p>4. Resource Implications</p>	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 4.1. Access to relevant workplace or appropriately simulated environment where assessment can take place 4.2. Materials relevant to the proposed activity or tasks
<p>5. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> 5.1. Observation of the individual member in relation to the work activities of the group 5.2. Observation of simulation and or role play involving the participation of individual member to the attainment of organizational goal 5.3. Case studies and scenarios as a basis for discussion of issues and strategies in teamwork
<p>6. Context for Assessment</p>	<ul style="list-style-type: none"> 6.1. Competency may be assessed in workplace or in a simulated workplace setting 6.2. Assessment shall be observed while task are being undertaken whether individually or in group

UNIT OF COMPETENCY: PRACTICE CAREER PROFESSIONALISM

UNIT CODE : 500311107

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes in promoting career growth and advancement.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Integrate personal objectives with organizational goals	1.1 Personal growth and work plans are pursued towards improving the qualifications set for the profession 1.2 Intra- and interpersonal relationships is are maintained in the course of managing oneself based on performance evaluation 1.3 Commitment to the organization and its goal is demonstrated in the performance of duties
2. Set and meet work priorities	2.1 Competing demands are prioritized to achieve personal, team and organizational goals and objectives. 2.2 Resources are utilized efficiently and effectively to manage work priorities and commitments 2.3 Practices along economic use and maintenance of equipment and facilities are followed as per established procedures
3. Maintain professional growth and development	3.1 Trainings and career opportunities are identified and availed of based on job requirements 3.2 Recognitions are -sought/received and demonstrated as proof of career advancement 3.3 Licenses and/or certifications relevant to job and career are obtained and renewed

RANGE OF VARIABLES

VARIABLE	RANGE
1. Evaluation	1.1 Performance Appraisal 1.2 Psychological Profile 1.3 Aptitude Tests
2. Resources	2.1 Human 2.2 Financial 2.3 Technology 2.3.1 Hardware 2.3.2 Software
3. Trainings and career opportunities	3.1 Participation in training programs 3.1.1 Technical 3.1.2 Supervisory 3.1.3 Managerial 3.1.4 Continuing Education 3.2 Serving as Resource Persons in conferences and workshops
4. Recognitions	4.1 Recommendations 4.2 Citations 4.3 Certificate of Appreciations 4.4 Commendations 4.5 Awards 4.6 Tangible and Intangible Rewards
5. Licenses and/or certifications	5.1 National Certificates 5.2 Certificate of Competency 5.3 Support Level Licenses 5.4 Professional Licenses

EVIDENCE GUIDE

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Attained job targets within key result areas (KRAs) 1.2 Maintained intra - and interpersonal relationship in the course of managing oneself based on performance evaluation 1.3 Completed trainings and career opportunities which are based on the requirements of the industries 1.4 Acquired and maintained licenses and/or certifications according to the requirement of the qualification
<p>2. Underpinning Knowledge and attitude</p>	<ul style="list-style-type: none"> 2.1 Work values and ethics (Code of Conduct, Code of Ethics, etc.) 2.2 Company policies 2.3 Company-operations, procedures and standards 2.4 Fundamental rights at work including gender sensitivity 2.5 Personal hygiene practices
<p>3. Underpinning Skills</p>	<ul style="list-style-type: none"> 3.1 Appropriate practice of personal hygiene 3.2 Intra and Interpersonal skills 3.3 Communication skills
<p>4. Resource Implications</p>	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace or assessment location 4.2 Case studies/scenarios
<p>5. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Portfolio Assessment 5.2 Interview 5.3 Simulation/Role-plays 5.4 Observation 5.5 Third Party Reports 5.6 Exams and Tests
<p>6. Context for Assessment</p>	<ul style="list-style-type: none"> 6.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY : PRACTICE OCCUPATIONAL HEALTH AND SAFETY PROCEDURES

UNIT CODE : 500311108

UNIT DESCRIPTOR : This unit covers the outcomes required to comply with regulatory and organizational requirements for occupational health and safety.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Identify hazards and risks	1.1 Safety regulations and workplace safety and hazard control practices and procedures are clarified and explained based on organization procedures 1.2 Hazards/risks in the workplace and their corresponding indicators are identified to minimize or eliminate risk to co-workers, workplace and environment in accordance with organization procedures 1.3 Contingency measures during workplace accidents, fire and other emergencies are recognized and established in accordance with organization procedures
2. Evaluate hazards and risks	2.1 Terms of maximum tolerable limits which when exceeded will result in harm or damage are identified based on threshold limit values (TLV) 2.2 Effects of the hazards are determined 2.3 OHS issues and/or concerns and identified safety hazards are reported to designated personnel in accordance with workplace requirements and relevant workplace OHS legislation
3. Control hazards and risks	3.1 Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace are consistently followed 3.2 Procedures for dealing with workplace accidents, fire and emergencies are followed in accordance with organization OHS policies 3.3 Personal protective equipment (PPE) is correctly used in accordance with organization OHS procedures and practices 3.4 Appropriate assistance is provided in the event of a workplace emergency in accordance with established organization protocol
4. Maintain OHS awareness	4.1 Emergency-related drills and trainings are participated in as per established organization guidelines and procedures 4.2 OHS personal records are completed and updated in accordance with workplace requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Safety regulations	May include but are not limited to: 1.1 Clean Air Act 1.2 Building code 1.3 National Electrical and Fire Safety Codes 1.4 Waste management statutes and rules 1.5 Philippine Occupational Safety and Health Standards 1.6 DOLE regulations on safety legal requirements 1.7 ECC regulations
2. Hazards/Risks	May include but are not limited to: 2.1 Physical hazards – impact, illumination, pressure, noise, vibration, temperature, radiation 2.2 Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects 2.3 Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors 2.4 Ergonomics <ul style="list-style-type: none"> • Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, varying metabolic cycles • Physiological factors – monotony, personal relationship, work out cycle
3. Contingency measures	May include but are not limited to: 3.1 Evacuation 3.2 Isolation 3.3 Decontamination 3.4 (Calling designed) emergency personnel
4. PPE	May include but are not limited to: 4.1 Mask 4.2 Gloves 4.3 Goggles 4.4 Hair Net/cap/bonnet 4.5 Face mask/shield 4.6 Ear muffs 4.7 Apron/Gown/coverall/jump suit 4.8 Anti-static suits
5. Emergency-related drills and training	5.1 Fire drill 5.2 Earthquake drill 5.3 Basic life support/CPR 5.4 First aid 5.5 Spillage control 5.6 Decontamination of chemical and toxic 5.7 Disaster preparedness/management
6. OHS personal records	6.1 Medical/Health records 6.2 Incident reports 6.3 Accident reports 6.4 OHS-related training completed

EVIDENCE GUIDE

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Explained clearly established workplace safety and hazard control practices and procedures 1.2 Identified hazards/risks in the workplace and its corresponding indicators in accordance with company procedures 1.3 Recognized contingency measures during workplace accidents, fire and other emergencies 1.4 Identified terms of maximum tolerable limits based on threshold limit value- TLV. 1.5 Followed Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace 1.6 Used Personal Protective Equipment (PPE) in accordance with company OHS procedures and practices 1.7 Completed and updated OHS personal records in accordance with workplace requirements
<p>2. Underpinning knowledge and attitude</p>	<ul style="list-style-type: none"> 2.1 OHS procedures and practices and regulations 2.2 PPE types and uses 2.3 Personal hygiene practices 2.4 Hazards/risks identification and control 2.5 Threshold Limit Value –TLV 2.6 OHS indicators 2.7 Organization safety and health protocol 2.8 Safety consciousness 2.9 Health consciousness
<p>3. Underpinning Skills</p>	<ul style="list-style-type: none"> 3.1 Practice of personal hygiene 3.2 Hazards/risks identification and control skills 3.3 Interpersonal skills 3.4 Communication skills
<p>4. Resource Implications</p>	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace or assessment location 4.2 OHS personal records 4.3 PPE 4.4 Health records
<p>5. Methods of Assessment</p>	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> 5.1 Portfolio Assessment 5.2 Interview 5.3 Case Study/Situation
<p>6. Context for Assessment</p>	<p>6.1 Competency may be assessed in the work place or in a simulated work place setting</p>

COMMON COMPETENCIES

UNIT OF COMPETENCY: APPLY APPROPRIATE SEALANT/ADHESIVE

UNIT CODE: ALT723201

UNIT DESCRIPTOR: This competency unit covers the knowledge, skills and attitude required in the selection and application of sealant/adhesives.

ELEMENT	PERFORMANCE CRITERIA
	<i>Italicized terms</i> are elaborated in the Range of Variables
1. Identify appropriate Sealant/adhesive	1.1 Sealant/adhesive are selected in line with job requirements and manufacturer's specification 1.1 Sealant/adhesive checking is performed to ensure that the product is fit for use.
2. Prepare surface for Sealant/adhesive	2.1 Surface materials are identified as per construction 2.2 Surface is cleaned and free of moisture, dust and other foreign matters to ensure maximum adhesion or seal.
3. Apply sealant/adhesive evenly	3.1 Sealant/adhesive is applied evenly on the surface in line with manufacturer's specification 3.2 Excess sealant/adhesive is removed by sanding or scrapping 3.3 Tools and equipment used to apply sealant/adhesive are appropriate to job requirements 3.4 Safety are observed and PPE are worn in accordance with industry SOP 3.5 Hazards associated with the use of sealant and adhesives are identified.
4. Store/Dispose of sealant/adhesive	4.1 Sealant/adhesive are stored as per prescribed procedure 4.2 Waste are disposed as per workshop standard operating procedures

RANGE OF VARIABLES

VARIABLE	RANGE
1. Sealant/Adhesive	May include: 1.1 Form in Place Gasket (FIPG) 1.2 Ribbon Sealer 1.3 Hametite 1.4 Silicon Body sealer 1.5 Prestite for Auto and Auto Aircon
2. Tools and equipment	May include: 2.1 Putty knife 2.2 Scraper 2.3 Compressor 2.4 Steel brush 2.5 Paint brush 2.6 Rubber hammer 2.7 Hand tools Personal protective equipment include: 2.8 Gloves 2.9 Apron 2.10 Safety shoes 2.11 Goggles 2.12 Gas mask
3. Safety	May include: 3.1 Ventilation 3.2 Handling of Flammable/Irritating substances 3.3 Use of Personal Protective Equipment
4. Hazards	May include: 4.1 Fumes 4.2 Skin irritation 4.3 Burns
5. Adhesive/Sealant checking	May include: 5.1 Expiry date 5.2 Free of contamination 5.1 Cap/Covers 5.2 Tightly closed 5.3 Concentration

EVIDENCE GUIDE

1. Critical aspect of competency	Assessment requires evidence that the candidate: 1.1 Identified appropriate sealant/adhesives 1.2 Prepared surface for sealant/adhesive 1.3 Applied sealant/adhesive 1.4 Stored unused or dispose of used sealant/adhesive
2. Required knowledge	2.1 OH & S regulations 2.2 Safe handling of sealant/adhesive 2.3 Industry code of practice 2.2 Procedures in sealant/adhesive application 2.3 Procedures in interpreting manuals
3. Required skills	3.1 Handling sealant/adhesive 3.2 Applying sealant/adhesive 3.3 Sanding the surface 3.4 Use of tools, equipment 3.5 Mixing of body filler and epoxy base and hardener
4. Resource implication	The following resources should be provided: 4.1 Materials relevant to the activity 4.2 Appropriate tools and equipment 4.3 Real or simulated workplace
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Observation with questioning 5.2 Interview related to: <ul style="list-style-type: none"> • Safe and correct use of tools and equipment • Application of adhesive/sealant
6. Context of assessment	6.1 Competency elements must be assessed in a safe working environment 6.2 Assessment may be done in a workplace or simulated environment

UNIT OF COMPETENCY: MOVE AND POSITION VEHICLE

UNIT CODE: ALT723202

UNIT DESCRIPTOR: This unit covers the knowledge, skills and attitude needed to move and position vehicle in a workshop.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Prepare vehicle for driving	1.2 Correct check-up procedures performed based on vehicle manufacturer's standard
2. Move and position vehicle	2.1 Select vehicle to be moved or re-position. 2.2 Drive the vehicle to appropriate location 2.3 Park vehicle following parking safety techniques and procedure
3. Check the vehicle	3.1 Vehicle position is checked as per requirement 3.2 Vehicle is checked for external damages

RANGE OF VARIABLE

VARIABLE	RANGE
1. Check up procedure	May include: 1.1 Oil level 1.2 Brake fluid 1.3 Clutch fluid 1.4 Coolant level 1.5 Battery (electrolyte) 1.6 Tire pressure 1.7 Position of driving gear 1.8 Lighting and warning devices
2. Vehicles	May include: 2.1 Vehicles with automatic transmission 2.2 Vehicles with manual transmission
3. Parking safety techniques	May include: 3.1 Engaging of Park brake 3.2 Vehicle parking position 3.3 Front wheel position

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Prepared vehicle for driving. 1.2 Moved and positioned vehicle 1.3 Checked the vehicle.
2. Required Knowledge	<ul style="list-style-type: none"> 2.1 Driver's Code of conduct 2.2 Workshop signs and symbols 2.3 Driving skills 2.4 Vehicle accessories for safe driving and parking
3. Required skills	<ul style="list-style-type: none"> 3.1 Ability to handle/maneuver vehicle the easiest way 3.2 Immediate response to accident 3.3 Preparing vehicle for driving 3.4 Parking Downhill, Uphill, Parallel 3.5 Shifting Gears 3.6 Maneuvering
4. Resource implication	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Driving range/area 4.2 Appropriate vehicle for driving 4.3 Vehicle accessories
5. Method of assessment	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Observation with questioning 5.2 Written or oral examination
6. Context of assessment	<ul style="list-style-type: none"> 6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines 6.2 Assessment of practical skills must be done in a workplace or simulated environment.

UNIT OF COMPETENCY: PERFORM MENSURATION AND CALCULATION
UNIT CODE: ALT311202

UNIT DESCRIPTOR: This unit covers the knowledge, skills and attitudes in identifying, caring, handling and using of measuring instrument.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Select measuring instruments	1.1 Object or component to be measured is identified 1.2 Correct specifications are obtained from relevant source 1.3 Appropriate measuring instrument is selected according to job requirements
2. Carry out measurements and calculation	2.1 Measuring tools are selected in line with job requirements 2.2 Accurate measurements are obtained in accordance with the job requirements 2.3 Calculation needed to complete work tasks are performed using the four fundamental operations of addition (+), subtraction (-), multiplication (x) and division (/). 2.4 Calculations involving fractions, percentages and mixed numbers are used to complete workplace tasks. 2.5 Numerical computation is self-checked and corrected for accuracy 2.6 Instruments are read to the limit of accuracy of the tool.
3. Maintain measuring instruments	3.1 Measuring instruments are kept free from corrosion 3.2 Measuring instruments are not dropped to avoid damage 3.3 Measuring instruments are cleaned before and after using.

RANGE OF VARIABLES

VARIABLE	RANGE	
1. Measuring instruments	May include: 1.1 Multitester 1.2 Micrometer (In-out, depth) 1.3 Vernier caliper (Out, inside) 1.4 Dial Gauge with Mag. Std. 1.5 Plastigauge 1.6 Straight Edge 1.7 Thickness gauge	1.8 Torque Gauge 1.9 Small Hole gauge 1.10 Telescopic Gauge 1.11 Try square 1.12 Protractor 1.13 Combination gauge 1.14 Steel rule
2. Calculation	May include: 2.1 Volume 2.2 Area 2.3 Displacement 2.4 Inside diameter 2.5 Circumference 2.6 Length 2.7 Thickness 2.8 Outside diameter 2.9 Taper 2.10 Out of roundness 2.11 Oil clearance 2.12 End play/thrust clearance	

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Selected measuring instruments 1.2 Carried out measurements and calculations. 1.3 Maintained measuring instruments
2. Required Knowledge	2.1 Types of Measuring instruments and their uses 2.2 Safe handling procedures in using measuring instruments 2.3 Four fundamental operation of mathematics 2.4 Formula for Volume, Area, Perimeter and other geometric figures
3. Required skills	3.1 Caring and Handling measuring instruments 3.2 Calibrating and using measuring instruments 3.3 Performing calculation by Addition, Subtraction, Multiplication and Division 3.4 Visualizing objects and shapes 3.5 Interpreting formula for volume, area, perimeter and other geometric figures
4. Resource implication	The following resources should be provided: 4.1 Workplace location 4.2 Measuring instrument appropriate to servicing processes 4.3 Instructional materials relevant to the propose activity
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Observation with questioning 5.2 Written or oral examination 5.3 Interview 5.4 Demonstration with questioning
6. Context of assessment	6.1 Competency elements must be assessed in a safe working environment 6.2 Assessment may be conducted in a workplace or simulated environment

UNIT TITLE: READ, INTERPRET AND APPLY SPECIFICATION AND MANUALS.

UNIT CODE: ALT723203

UNIT DESCRIPTOR: This unit deals with identifying, interpreting and applying service specification manuals, maintenance procedure manuals and periodic maintenance manual.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Identify and access manual/ specification	1.1 Appropriate manuals are identified and accessed as per job requirements. 1.2 Version and date of manual are checked to ensure correct specification and procedure are identified.
2. Interpret manuals	2.1 Relevant sections, chapters of manuals/specifications are located in relation to the work to be conducted 2.2 Information and procedure in the manual are interpreted in accordance with industry practices
3. Apply information in manual	3.1 Manual is interpreted according to job requirements 3.2 Work steps are correctly identified in accordance with manufacturer specification 3.3 Manual data are applied according to the given task 3.4 All correct sequencing and adjustments are interpreted in accordance with information contained on the manual or specifications
4. Store manuals	4.1 Manual or specification are stored appropriately to ensure prevention of damage, ready access and updating of information when required in accordance with company requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Manuals	May include: 1.1 Manufacturer's specification manual 1.2 Repair manual 1.3 Maintenance Procedure Manual 1.4 Periodic Maintenance Manual

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Identified and accessed manual/specification 1.2 Interpreted manuals 1.3 Applied information in manuals 1.4 Stored manuals
2. Required Knowledge	2.1 Types of manuals used in automotive industry 2.2 Identification of symbols used in the manuals 3.1 Identification of units of measurements 3.2 Unit conversion
3. Required skills	3.1 Reading and comprehension skills required to identify and interpret automotive manuals and specifications 3.2 Accessing information and data
4. Resource implication	The following resources should be provided: 4.1 All manuals/catalogues relative to Automotive 4.2 Job order, requisitions 4.3 Actual vehicle or simulator
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Observation with questioning 5.2 Interview
6. Context of assessment	6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines 6.2 Assessment may be conducted in the workplace or a simulated environment.

UNIT OF COMPETENCY: USE AND APPLY LUBRICANTS/COOLANTS

UNIT CODE: ALT723204

UNIT DESCRIPTOR: This unit covers the knowledge, skills and attitudes required in selecting and applying different types of lubricants.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Identify types of lubricants/coolants	1.1 Correct information on <i>lubrication schedule</i> is accessed and interpreted from appropriate manufacturers specifications <i>manuals</i> 1.2 Type and quantity of <i>lubricants/coolants</i> are identified as per job requirements
2. Use and apply lubricants/coolant	2.1 Correct procedure for change of lubricant is identified following manufacturer's specification or manual 2.2 Correct tools and equipment are selected and used in line with job requirements 2.3 Existing lubricants are removed and replaced with specified types and quantity of new materials in line with manufacturer's specification 2.4 Safe procedure and use of <i>PPE</i> are observed when removing or replacing lubricant 2.5 Used lubricants are disposed in accordance with environmental guidelines 2.6 Work is checked in line with company SOP.
3. Perform housekeeping activities	3.1 <i>Tools, equipment</i> and materials are properly stored as per company SOP 3.2 Workplace is free from waste materials

RANGE OF VARIABLES

VARIABLE	RANGE	
1. Manuals	May include: 1.1 Manufacturer's specification manual 1.2 Periodic Maintenance manual 1.3 Service Manual	
2. Lubricants/ Coolant	May include: 2.1 Engine oil: <ul style="list-style-type: none"> • Diesel engine oil • Gasoline engine oil 2.2 Automatic Transmission Fluid <ul style="list-style-type: none"> • Destro II • T4 2.3 Gear oil lubricants: <ul style="list-style-type: none"> • Oil #90 • Oil #140 • Oil #30 • Oil #40 2.4 Grease <ul style="list-style-type: none"> • Special (velocity joint) Molybdenum disulfate) • Ordinary • Multi-purpose oil • Contact point lubricant (grease) 	2.5 Brake/Clutch System <ul style="list-style-type: none"> • Brake fluid • DOT3 2.6 Power Steering Fluid <ul style="list-style-type: none"> • Hydraulic Fluid 2.7 Radiator Coolant <ul style="list-style-type: none"> • Long last coolant 2.8 A/C Compressor Oil <ul style="list-style-type: none"> • Pag oil
3. Lubricant Schedule	May include: 3.1 Kilometers traveled used 3.2 No. of Hours used 3.3 Monthly	
4. Tool and equipment	May include: 4.1 Hand tools 4.2 Oiler 4.3 Oil Dispenser 4.4 Grease gun	
5. Personal Protective Equipment (PPE)	May include: 5.1 Apron 5.2 Gloves 5.3 Goggles 5.4 Safety shoes	

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Identified types of lubricants and lubrication schedule. 1.2 Used and applied lubricants. 1.3 Performed housekeeping
2. Required Knowledge	2.1 Types/Classification of Lubricants 2.2 Identifying lubrication schedule 2.3 Cause and Effects of Gear Oil Dilution 2.4 Purpose of Lubrication (Problem and effects) 2.5 Hazard associated with lubrication
3. Required skills	3.1 Handling of oils (Gear, oil, engine oil) 3.2 Familiarization/Classification of Lubricants 3.3 Lubrication Procedure
4. Resource implication	The following resources should be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate tools and equipment 4.3 Materials relevant to activity
5. Method of assessment	Competency in this unit may be assessed through 5.1 Demonstration with questioning 5.2 Written/Oral examination
6. Context of assessment	6.1 Competency elements must be assessed in a safe working environment 6.2 Assessment must be undertaken in accordance with the endorsed industry assessment guidelines 6.2 Assessment of Underpinning Knowledge and attitude and skills may be assessed on or off- the- job

UNIT OF COMPETENCY: PERFORM SHOP MAINTENANCE

UNIT CODE: ALT723307

UNIT DESCRIPTOR: This unit deals with inspecting and cleaning of work area including tools, equipment and facilities. Storage of tools and equipment and disposal of used materials are also incorporated in this competency

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Inspect/clean tools and work area	1.1 Cleaning solvent used as per workshop/tools cleaning requirement 1.2 Work area is checked and cleaned 1.3 Wet surface/spot in work area is wiped and dried
2. Store/arrange tools and shop equipment	2.1 Tools/equipment are checked and stored in their respective shelves/location 2.2 Corresponding labels are posted and visible 2.3 Tools are safely secured and logged in the records
3. Dispose wastes/used lubricants	3.1 Containers for used lubricants are visibly labeled 3.2 Wastes/used lubricants are disposed as per workshop SOP
4. Report damaged tools/equipment	4.1 Complete inventory of tools/equipment is maintained 4.2 Damaged tools/equipment/facilities are identified and repair recommendation is given 4.3 Reports prepared have no error/discrepancy

RANGE OF VARIABLES

VARIABLE	RANGE
1. Work Area	May include: 1.1 Workshop areas for servicing/repairing light and/or heavy vehicle and/or plant transmissions and/or outdoor power equipment 1.2 Open workshop/garage and enclosed, ventilated office area 1.3 Other variables may include workshop with: <ul style="list-style-type: none"> • Mess hall • Wash room • Comfort room
2. Cleaning requirement	May include: 2.1 Cleaning solvent 2.2 Inventory of supplies, tools, equipment, facilities 2.3 List of mechanics/technicians 2.4 Rags 2.5 Broom 2.6 Map 2.7 Pail 2.8 Used oil container 2.9 Oiler 2.10 Dust/waste bin
3. Manuals	May include: 3.1 Vehicle/plant manufacturer specifications 3.2 Company operating procedures 3.3 Industry/Workplace Codes of Practice 3.4 Product manufacturer specifications 3.5 Customer requirements 3.6 Industry Occupational Health & Safety
4. Company standard operating procedure	May include: 4.1 Gloves 4.2 Apron 4.3 Goggles 4.4 Safety shoes

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Cleaned workshop tools/facilities 1.2 Maintained equipment, tools and facilities 1.3 Disposed wastes and used lubricants/fluid as per required procedure
2. Required Knowledge	2.1 5S or TQM 2.2 Service procedures 2.3 Relevant technical information 2.4 Safe handling of Equipment and tools 2.5 Vehicle safety requirements 2.6 Workshop policies 2.7 Personal safety procedures 2.8 Fire Extinguishers and prevention 2.9 Storage/Disposal of Hazardous/flammable materials 2.10 Positive Work Values (Perseverance, Honesty, Patience, Attention to Details)
3. Required skills	3.1 Handling/Storing of tools/equipment/supplies and material 3.2 Cleaning grease/lubricants 3.3 Disposing of wastes and fluid 3.4 Preparing inventory of s/m and tools and equipment 3.5 Monitoring of s/m and tools/equipment
4. Resource implications	The following resources should be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Written/Oral Questioning 5.2 Demonstration
6. Context of assessment	6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: PREPARE JOB ESTIMATE/COSTING

CODE: ALT311204

UNIT DESCRIPTOR: This competency unit covers the knowledge, skills and attitude in estimating/costing automotive repair.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Identify nature/scope of work	1.1 Effective communication skills are applied to determine the nature and scope of work to be undertaken 1.2 Extent of service to be rendered is determined and documented in line with standard operating procedures (SOP)
2. Prepare and present estimate	2.1 Type and quantity of supplies, materials and labor required to perform work are identified in line with job requirements 2.2 Cost of supplies, materials are obtained from suppliers 2.3 Total cost of required services is calculated in line with SOP 2.4 Estimate is presented to customer in line with SOP.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Communication	May include: 1.1 Listening to customer 1.2 Speaking with suppliers, customers and co-workers 1.3 Questioning
2. Suppliers	May include: 2.2 Distributors 2.3 Managers 2.4 Proprietors
3. Cost	May include: 3.1 Materials 3.2 Labor 3.3 Overhead

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate</p> <p>1.1 Identified nature/scope of work</p> <p>1.2 Prepared and presented estimate</p>
2. Required Knowledge	<p>2.1 Consumer mathematics</p> <p>2.2 Replaceable/Fabricated Materials or Spare parts in a vehicle</p> <p>2.3 Automotive Repair Procedures and Techniques</p> <p>2.4 Job estimates</p> <p>2.5 Honesty, Perseverance, Patience, Attention to Details</p>
3. Required skills	<p>3.1 Computing using the Four Mathematical Operations</p> <p>3.2 Estimating repair works and activities</p>
4. Resource implications	<p>The following resources should be provided:</p> <p>4.1 Appropriate tools such as calculator, paper, pen, and other measuring instruments relevant to activity</p>
5. Method of assessment	<p>Competency in this unit may be assessed through:</p> <p>5.1 Observation with questioning</p> <p>5.2 Presentation of Finished drawing</p>
6. Context of assessment	<p>6.1 Competency must be assessed in a room or any simulated places</p> <p>6.2 Assessment must be given according to industry standard</p>

UNIT OF COMPETENCY: INTERPRET/DRAW TECHNICAL DRAWING

CODE: ALT311205

UNIT DESCRIPTOR: This unit identifies the competencies required to draw/interpret basic trade drawing

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Interpret technical drawing	1.1 Components, assemblies or objects are recognized as required 1.2 Dimensions are identified as appropriate to the field of employment 1.3 Instructions are identified and followed as required 1.4 Material and other consumable requirements are identified as required 1.5 Symbols are recognized as appropriate in drawing
2. Select correct technical drawing	2.1 Drawing is checked and validated against job requirements or equipment 2.2 Drawing version is checked and validated according to the Manual
3. Apply freehand sketching	3.1 Correct freehand sketching is produced using the necessary tools and materials

RANGE OF VARIABLES

VARIABLE	RANGE
1. Drawing	May include: 1.1 Drawing symbols 1.2 Alphabet of lines 1.3 Orthographic views 1.3.1 Front view 1.3.2 Right side view/left side view 1.3.3 Top view 1.3.4 Pictorial 1.4 Schematic diagram
2. Manual	May include: 2.1 technical drawing manual 2.2 manufacturers schematic diagram
3. Consumables	May include: 3.1 drawing plate 3.2 pencil and eraser 3.3 scotch tape
4. Tools and materials	May include: 4.1 compass 4.2 divider 4.3 rulers 4.4 triangles 4.5 drawing tables 4.6 computer

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Interpreted technical drawing 1.2 Selected correct technical drawing 1.3 Applied freehand sketching
2. Required Knowledge	2.1 Drawing standard symbols 2.2 Safe handling of tools and consumables 2.3 Identification of types of drawing 2.4 Patience, Perseverance, Attention to Details
3. Required skills	3.1 Draw/interpret orthographic drawing 3.2 Handling of drawing instruments
4. Resource implications	The following resources should be provided: 4.1 Drawing room 4.2 Appropriate tools 4.3 Materials relevant to activity
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Observation with questioning 5.2 Written/Oral examination 5.3 Presentation of Finished drawing
6. Context of assessment	6.1 Must be assessed in a drawing room or in any simulated places 6.2 Assessment must be given according to industry standard

UNIT OF MPETENCY: PRACTICE HEALTH, SAFETY AND ENVIRONMENT PROCEDURES

UNIT CODE : ALT723206

UNIT DESCRIPTOR : This unit of competency incorporates the work safe regional guidelines and encompasses competencies necessary to apply basic safety and emergency procedures to maintain a safe workplace for staff, customers and others.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Apply basic safety procedures	1.1. Policies and procedures to achieve a safe working environment are followed and maintained in line with occupational health and safety (OHS) procedures and according to worksite policy 1.2. All unsafe situations are recognized and reported according to worksite policy 1.3. All breakdowns in relation to machinery and equipment are reported to supervisor or nominated persons 1.4. Fire and safety hazards are identified and precautions are taken or reported according to worksite policy and procedures 1.5. Dangerous goods and substances are identified, handled and stored according to worksite policy and procedures and OHS requirements 1.6. Worksite policy regarding manual handling practice is followed 1.7. Participation in consultative arrangements established by company for OHS is exercised
2. Apply emergency procedures	2.1. Worksite policies and emergency procedures regarding illness or accidents are identified and applied 2.2. Safety alarms are identified 2.3. Qualified persons are contacted in the event of accident or sickness of customers or staff and accident details are documented according to worksite accident/ injury procedures 2.4. Worksite evacuation procedures are identified and applied

RANGE OF VARIABLES

VARIABLE	RANGE
1. Policies and procedures	May include: 1.1. Hazard policies and procedures 1.2. Emergency, fire and accident procedures 1.3. Personal safety procedures 1.4. Procedures for the use of personal protective clothing and equipment 1.5. Use of motor vehicles 1.6. Resolution procedures 1.7. Job procedures 1.8. Work instructions
2. OHS procedures	May include: 2.1. Safe manual handling and lifting customers, staff, equipment/tooling, premises and stock
3. Hazards	May include: 3.1. Sharp cutting tooling and instruments 3.2. Electricity and water 3.3. Toxic substances 3.4. Damaged packing material or containers 3.5. Broken or damaged equipment 3.6. Flammable materials and fire hazards 3.7. Lifting practices 3.8. Spillages, waste and debris especially on floors, ladders, trolleys and glue guns/burns
4. Emergency procedures	May include: 4.1. Sickness 4.2. Accident 4.3. Fire or store evacuation involving staff or customers

EVIDENCE GUIDE

1. Critical Aspects of Competency	<p>Assessment requires evidence that the candidate has:</p> <ul style="list-style-type: none"> 1.1 Communicated effectively with others involved in or affected by the work 1.2 Identified and assessed hazardous situations and rectified, or reported to the relevant persons 1.3 Operated fire-fighting equipment 1.4 Handled safely and stored dangerous and/or hazardous goods and substances 1.5 Applied safe manual handling practices 1.6 Operated safely and effectively equipment and utilized materials over the full range of functions 1.7 Followed worksite evacuation procedures.
2. Required knowledge	<p>General knowledge of:</p> <ul style="list-style-type: none"> 2.1 The implications of OHS on efficiency, morale and customer relations 2.2 Common automotive terminology 2.3 OHS regulations/requirements, equipment, material and personal safety requirements 2.4 Safe manual handling theories and practices 2.5 The selection and application of fire-fighting equipment 2.6 Dangerous goods and hazardous chemicals handling processes 2.7 Worksite reporting procedures
3. Required Skills	<ul style="list-style-type: none"> 3.1. Collect, organize and understand information related to recognizing and reporting situations 3.2. Communicate ideas and information to reporting procedures (verbal and written) 3.3. Plan and organize activities which implement and follow standard procedures 3.4. Work with others and in a team by assisting and cooperating with team members 3.5. Use mathematical ideas and techniques to document and report numbers for emergency procedures 3.6. Establish diagnostic processes which recommend improvements for OHS issues 3.7. Use workplace technology related to the use of technology to assist with safe work practices
4. Resource Implications	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1. A workplace or simulated workplace 4.2. Situations requiring safe working practices 4.3. Worksite or equivalent instructions on safe working practice 4.4. Hazardous chemicals and/or dangerous goods information 4.5. Materials, tooling and equipment 4.6. Firefighting appliances and fire test facilities
5. Methods of Assessment	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Portfolio Assessment 5.2 Interview 5.3 Case Study/Situation
6. Context for Assessment	<ul style="list-style-type: none"> 6.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY: INSPECT TECHNICAL QUALITY OF WORK

UNIT CODE : ALT311207

UNIT DESCRIPTOR : . This unit covers the competence to inspect work done by

other staff, apply quality standards to work, and protect customer property and interests.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Gather information to carry out inspection	1.1 OH&S requirements , including company regulatory requirements and personal protection needs are observed throughout the work 1.2 Pertinent information are sourced 1.3 Different methods are analyzed and those most appropriate to the circumstances are selected and prepared 1.4 Technical and/or calibration requirements for inspection are sourced and needed equipment is identified and prepared
2. Inspect and apply quality standards to work	2.1 Work is identified and confirmed for inspection in accordance with company quality procedures 2.2 Quality Inspections are conducted throughout the course of the work to ensure quality standards are maintained 2.3 Quality standards are applied during work completion to ensure the treatment of customer property meets industry and / or company standards 2.4 Activities are coordinated throughout the workplace in accordance with company procedures 2.5 Documents of work quality are maintained according to company requirements
3. Achieve quality work outcomes	3.1 Damage to customer property is avoided through ensuring staff adherence to quality procedures and use of protective materials at all stages of the repair or service 3.2 Communication pertaining to quality improvements and recommendations are to be done in accordance with company requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. OH&S Requirements	May include: 1.1 Safety equipment 1.2 Personal protective equipment and clothing 1.3 First aid equipment 1.4 Hazard and risk control 1.5 Elimination of hazardous materials and substances manual handling, including shifting, lifting and carrying 1.6 Emergency procedures 1.4 Road rules and safe driving policy
2. Information	May include: 2.1 Manufacturer / component supplier specifications 2.2 Company operating procedures 2.3 Supplier directories 2.4 Parts catalogues 2.5 Customer orders 2.6 Service manual 2.7 Material safety data sheets
3. Quality Procedures	May include: 3.1 Worksite quality system documentation 3.2 Work instructions 3.3 Safe work procedures 3.4 Product specifications 3.5 Equipment maintenance schedules 3.6 Technical procedures 3.7 Adopted or specifically prepared standards
4. Quality Inspections	May include: 4.1 Periodic inspection during the job or observation at completion of the job to ensure all ordered parts have been fitted, components used meet manufacturer / component supplier specifications, invoicing complies with service / repair / parts order and contains sufficient details of labor and / or components used 4.2 Reported and diagnosed problems have been confirmed as rectified thru test procedures and presentation of the vehicle or equipment after service / repair meets manufacturer and Company standards
5. Communication	May include: 5.1 Verbal 5.2 Written 5.3 Telephone or Electronic means

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Observed safety procedures and requirements 1.2 Communicated effectively with others involved in or affected by the work 1.3 Applied OH&S policies and procedures 1.4 Identified quality procedures 1.5 Inspected work undertaken by others 1.5 Applied quality standards to work
2. Required knowledge	<p>A working knowledge of:</p> <ul style="list-style-type: none"> 2.1 Quality systems in a workplace 2.2 Common automotive terminology 2.3 Vehicle safety requirements 2.4 Work planning processes 2.5 OH&S regulations/requirements, equipment, material and personal safety requirements 2.6 Company quality systems and procedures 2.7 Worksite environmental control measures 2.8 Worksite reporting procedures
3. Required skills	<ul style="list-style-type: none"> 3.1 Communicating ideas and information 3.2 Collecting, analyzing and organizing information 3.3 Planning and organizing activities 3.4 Working with others and in a team 3.5 Using mathematical ideas and techniques 3.6 Solving problems 3.7 Using technology
4. Resource implications	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 A workplace or simulated workplace 4.2 Situations requiring inspections of technical quality 4.3 Computer hardware and software, access to electronic communication
5. Method of assessment	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Direct Observation 5.2 Oral interview 5.3 Written Evaluation 5.4 Third Party Report
6. Context of assessment	<ul style="list-style-type: none"> 6.1 Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions

UNIT OF COMPETENCY: MAINTAIN QUALITY SYSTEMS

UNIT CODE : ALT311208

UNIT DESCRIPTOR : This unit of competency covers the competence to conduct the final quality check on completed work or orders, report on the quality of processes and work outcomes, and implement improvements to work processes.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Conduct final quality check on completed work / orders	1.1. Completed work / orders are checked for compliance with supplier, company or customer specifications 1.2. Level of inspection conducted is appropriate to the size and importance of the job 1.3. Documentation is authorized in accordance with company requirements 1.4. Feedback is provided to staff on the quality of their work with equal emphasis on strengths and weaknesses and opportunities for development
2. Report on the quality of processes and work outcomes	2.1. Documents are kept according to company quality procedures on outcomes of quality checks 2.2. Quality problems are identified according to company performance indicators 2.3. Information relating to the quality of processes and work outcomes is provided to appropriate persons on a regular basis
3. Implement improvements to work processes	3.1. Staff input is encouraged to generate possible solutions to quality problems 3.2. Options for solving quality problems are generated and the costs and benefits of each option are evaluated 3.3. Recommended solutions to quality problems are discussed with management 3.4. Improvements to work processes are implemented according to company policies and procedures

RANGE OF VARIABLES

VARIABLE	RANGE
1. Quality procedures	May include: <ol style="list-style-type: none"> 1.1 Company quality system documentation 1.2 Work instructions 1.3 Safe work procedures 1.4 Product specifications 1.5 Equipment maintenance schedules 1.6 Technical procedures and adopted or specifically prepared standards
2. Performance indicators	May include: <ul style="list-style-type: none"> • account for issues of time, quantity, quality and cost factors and may include establishing time targets for own work, identifying reasonable criteria for evaluating own work outcomes, identifying measures to avoid wastage, identifying reasonable criteria to judge internal and/or external customer satisfaction
3. Quality problems	May include: <ol style="list-style-type: none"> 3.1 Misdiagnosed faults 3.2 Jobs requiring rework 3.3 Jobs which do not meet customer requirements 3.4 Repairs which do not fix the problem within the allocated timeframe
4. Communication	May include: <ol style="list-style-type: none"> 4.1 Verbal 4.2 Written 4.3 Telephone or other means
5. Information/documents	May include: <ol style="list-style-type: none"> 5.1 Vehicle manufacturer practices 5.2 Company operating procedures 5.3 Supplier directories 5.4 Parts catalogues 5.5 Customer orders and industry/workplace codes of practice 5.6 Material safety data sheets (MSDS)

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ol style="list-style-type: none"> 1.1 Communicated effectively with others involved in or affected by the work 1.2 Identified quality system procedures and needs 1.3 Identified performance indicators 1.4 Conducted final quality checks on completed work orders 1.5 Reported on the quality of processes and work outcomes 1.6 Monitored and adjusted performance indicators to meet changing circumstances 1.7 Processed and implemented recommendations for change
<p>2. Required knowledge</p>	<p>Knowledge of:</p> <ul style="list-style-type: none"> • quality systems and application techniques in a work environment • typical loss and damage control systems • work planning and organization processes • occupational health and safety (OHS) regulations/requirements, equipment, material and personal safety requirements at the worksite • enterprise quality systems and procedures • worksite information management systems
<p>3. Required skills</p>	<ol style="list-style-type: none"> 3.1 Research and interpretive skills to locate, interpret and apply quality audit policies and procedures 3.2 Investigative and analytical skills required for identification and analysis of quality breaches, incidents or risks, and identification of quality related training needs 3.3 English literacy and communication skills in relation to dealing with customers and team members on worksite quality audit issues 3.4 Questioning and active listening skills 3.5 Written communication skills sufficient to prepare reports, document investigations and maintain worksite quality documents 3.6 Plan and organize activities for leadership skills required in organizing, implementing and promoting worksite quality systems and measures 3.7 Work with others and in a team by seeking advice and assistance from team members 3.8 Use mathematical ideas and techniques to document quantities and company sampling procedures 3.9 Establish diagnostic processes which analyze problems and recommend solutions 3.10 Use the workplace technology related to document and analyze quality problems

4. Resource implications	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 A workplace or simulated workplace 4.2 Situations requiring worksite quality systems maintenance 4.3 Worksite quality policies and procedures 4.4 Worksite quality documents system 4.5 Materials, tooling and equipment
5. Method of assessment	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Direct Observation 5.2 Oral interview 5.3 Written Evaluation 5.4 Third Party Report
6. Context of assessment	<ul style="list-style-type: none"> 6.1 Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions

UNIT OF COMPETENCY: PROVIDE WORK SKILL INSTRUCTIONS
UNIT CODE : ALT311209
UNIT DESCRIPTOR :

This unit describes the performance outcomes, skills and knowledge required to conduct individual and group instruction and demonstrate work skills, using existing learning resources in a safe and comfortable learning environment. The unit also covers the skills and knowledge required to determine the success of both the training provided and one's own personal training performance. It emphasizes the training as being driven by the work process and context.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Organize instruction and demonstration	1.1 Gather information about learner characteristics and learning needs 1.2 Confirm a safe learning environment 1.3 Gather and check instruction and demonstration objectives and seek assistance if required 1.4 Access and review relevant learning resources and learning materials for suitability and relevance, and seek assistance to interpret the contextual application 1.5 Organize access to necessary equipment or physical resources required for instruction and demonstration 1.6. Notify learners of details regarding the implementation of the learning program and/or delivery plan
2. Conduct instruction and demonstration	2.1 Use interpersonal skills with learners to establish a safe and comfortable learning environment 2.2 Follow the learning program and/or delivery plan to cover all learning objectives 2.3 Brief learners on any OHS procedures and requirements prior to and during training 2.4 Use delivery techniques to structure, pace and enhance learning 2.5 Apply coaching techniques to assist learning 2.6 Use communication skills to provide information, instruct learners and demonstrate relevant work skills 2.7 Provide opportunities for practice during instruction and through work activities 2.8 Provide and discuss feedback on learner performance to support learning
3. Check training performance	3.1 Use measures to ensure learners are acquiring and can use new technical and generic skills and knowledge 3.2 Monitor learner progress and outcomes in consultation with learner 3.3 Review relationship between the trainer/coach and the learner and adjust to suit learner needs
4. Review personal training performance and finalize documentation	4.1 Reflect upon personal performance in providing instruction and demonstration, and document strategies for improvement 4.2 Maintain, store and secure learner records according to organizational and legal requirements

RANGE OF VARIABLES

VARIABLE	RANGE
1. Learner Characteristics	May include: 1.1 Language, literacy and numeracy levels 1.2 Learning styles 1.3 Past learning and work experiences 1.4 Specific needs 1.5 Workplace culture
2. Safe Learning Environment	May include: 2.1 Exit requirements 2.2 Personal protective equipment 2.3 Safe access 2.4 Safe use of equipment
3. Instruction and demonstration objectives	May include: 3.1 Competencies to be achieved 3.2 Generic and technical skills, which may be provided by the organization, developed by a colleague and individual or group objectives 3.3 Learning outcomes.
4. Learning resources	May include: 4.1 Learner and user guides 4.2 Trainer and Facilitator guides 4.3 Example training programs 4.4 Specific case studies 4.5 Professional development materials 4.6 Assessment materials 4.7 A variety of formats produced locally or acquired from other sources
5. Learning materials	May include: 5.1 Handouts for learners 5.2 Materials sourced from the workplace, like workplace documentation, operating procedures, and specifications
6. Details	May include: 6.1 Location and time 6.2 Outcomes of instruction or demonstration 6.3 Reason for instruction or demonstration 6.4 Who will be attending instruction session

7. OHS procedures	<p>May include:</p> <ul style="list-style-type: none"> 7.1 Emergency procedures 7.2 Hazards and their means of control 7.3 Incident reporting 7.4 Use of personal protective equipment 7.5 Safe work practices 7.6 Safety briefings 7.7 Site-specific safety rules
8. Delivery techniques	<p>May include:</p> <ul style="list-style-type: none"> 8.1 Coaching 8.2 Demonstration 8.3 Explanation 8.4 Group or pair work providing opportunities to practice skills and solve problems 8.5 Questions and answers
9. Coaching	<p>May include:</p> <ul style="list-style-type: none"> 9.1 Learning arrangements requiring immediate interaction and feedback 9.2 On-the-job instruction and 'buddy' systems 9.3 Relationships targeting enhanced performance 9.4 Short-term learning arrangements 9.5 Working on a one-to-one basis.
10. Measures	<p>May include:</p> <ul style="list-style-type: none"> 10.1 Informal review or discussion 10.2 Learner survey 10.3 On-the-job observation 10.4 Review of peer coaching arrangements.

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>1.1 Carried out a minimum of three training sessions, involving demonstrating and instructing particular work skills for different groups; with each session addressing:</p> <p>1.1.1 Different learning objectives</p> <p>1.1.2 A range of techniques and effective communication skills appropriate to the audience</p>
<p>2. Required knowledge</p>	<p>2.1 Learner characteristics and needs</p> <p>2.2 Content and requirements of the relevant learning program and/or delivery plan</p> <p>2.3 Sources and availability of relevant learning resources and learning materials</p> <p>2.4 Content of learning resources and learning materials</p> <p>2.5 Training techniques that enhance learning and when to use them</p> <p>2.6 Introductory knowledge of learning principles and learning styles</p> <p>2.7 Key OHS issues in the learning environment, including:</p> <ul style="list-style-type: none"> • roles and responsibilities of key personnel • responsibilities of learners • relevant policies and procedures, including hazard identification, risk assessment, reporting requirements, safe use of equipment and emergency procedures • risk controls for the specific learning environment
<p>3. Required skills</p>	<p>3.1 Non-verbal communication techniques, such as:</p> <ul style="list-style-type: none"> • asking relevant and appropriate questions • providing explanations • demonstrating • using listening skills • providing information clearly <p>3.2 Safety skills to implement OHS requirements, by acting and responding safely in order to:</p> <ul style="list-style-type: none"> • identify hazards • conduct prestart-up checks if required • observe and interpret learner behaviour that may put people at risk <p>3.3 Time-management, skills to:</p> <ul style="list-style-type: none"> • ensure all learning objectives are covered • pace learning <p>3.4 Reflection skills in order to:</p> <ul style="list-style-type: none"> • identify areas for improvement • maintain personal skill development <p>3.5 Literacy skills to:</p> <ul style="list-style-type: none"> • complete and maintain documentation • read and follow learning programs and plans • read and analyze learner information

	<p>3.6 Technology skills to operate audio-visual and technical equipment</p> <p>3.7 Interpersonal skills to:</p> <ul style="list-style-type: none"> • engage, motivate and connect with learners • provide constructive feedback • maintain appropriate relationships • establish trust • use appropriate body language • maintain humor • demonstrate tolerance • manage a group • recognize and be sensitive to individual difference and diversity <p>3.8 Observation skills to:</p> <ul style="list-style-type: none"> • monitor learner acquisition of new skills, knowledge and competency requirements • assess learner communication and skills in interacting with others • identify learner concerns • recognize learner readiness to take on new skills and tasks
4. Resource implications	<p>The following resources should be provide: Evidence must be gathered in the workplace wherever possible. Where no workplace is available, a simulated workplace must be provided</p>
5. Method of assessment	<p>Competency in this unit may be assessed through:</p> <p>5.1 Direct Observation</p> <p>5.2 Oral interview</p> <p>5.3 Written Evaluation</p> <p>5.4 Third Party Report</p>
6. Context of assessment	<p>6.1 Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions</p>

UNIT OF COMPETENCY: IDENTIFY AND SELECT ORIGINAL AUTOMOTIVE PARTS AND PRODUCTS

UNIT CODE : ALT723210

UNIT DESCRIPTOR : This unit of competency covers the competence required to identify original automotive parts and products based on evidence from customers and/or other sources which may include catalogue numbers or samples of parts/products or their purpose.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Identify the part/product and its end use	1.1 Available part/product information is gathered, documented and confirmed with customer 1.2 Information gathering techniques is established for proper identification of part/product 1.3 End user or host for the part/product, i.e. vehicle/unit assembly or vehicle/unit assembly options, is established from an analysis of available information
2. Identify details of the part/product	2.1 The parts/product cataloguing system is identified and accessed 2.2 Part/product is matched accurately with cataloguing information by accessing and using the catalogue system 2.3 Details of identity of the part/product are documented and processed
3. Part/product is supplied or ordered for customer	3.1 Customer accepts process used 3.2 Part/product is supplied or ordered if not available 3.3 Customer records are updated

RANGE OF VARIABLES

VARIABLE	RANGE
1. Part/product information	May include: 1.1 Manufacturer/component supplier specifications and technical documentation 1.2 Company procedures and documentation 1.3 Company or industry specifications, diagrams, sketches 1.4 Verbal descriptions and physical and visual evidence
2. Information gathering techniques	May include: 2.1 Common vehicle/unit model 2.2 Date of manufacture 2.3 Purpose and appearance of product and other tracking information
3. Parts/products cataloguing systems	May include: 3.1 Hard-copy (book-fast, loose-leaf) 3.2 Stand-alone computer or networked/online computer-supported services

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Elicited sufficient information from the customer and/or other sources to enable a confirmed identification of vehicle or unit the part/product intended 1.2 Accessed the parts/products catalogue systems associated with required vehicle/unit 1.3 Used both manual and computer-based parts/products catalogues and equivalent documentation to trace and identify common specific brand parts/products 1.4 Communicated effectively with others involved in or affected by the work.
<p>2. Required knowledge</p>	<p>Competency includes sufficient knowledge to:</p> <ul style="list-style-type: none"> 2.1 Structural of computer workstations 2.2 Common automotive terminology 2.3 Main automotive systems and assemblies and their functions 2.4 Parts/product catalogue systems, both brand-specific and general options 2.5 Legal issues associated with the supply and use of non-conforming parts/components/accessories 2.6 Company quality system 2.7 Work organization and planning processes
<p>3. Required skills</p>	<p>Required skills include the ability to:</p> <ul style="list-style-type: none"> 3.1 Apply research and interpretive skills sufficient to locate, interpret and apply manufacturer/component supplier procedures, workplace policies and procedures 3.2 Apply analytical skills required for identification and analysis of technical information 3.3 Apply plain English literacy and communication skills in relation to dealing with customer and team members 3.4 Apply questioning and active listening skills 3.5 Apply oral communication skills sufficient to convey information and concepts to customers 3.6 Apply planning and organizing skills to own work activities, including making good use of time and resources, sorting out priorities and monitoring own performance 3.7 Use mathematical ideas and techniques to correctly calculate material requirements, estimate and calculate costs and establish quality checks 3.8 Use workplace technology related to customer services, including use of measuring equipment, computerized technology, use of communication devices and reporting/ documenting of results

<p>4 Resource implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace location or simulated workplace 4.2 Information and material identifying and selecting automotive parts and products 4.3 Equipment identifying and selecting automotive parts and products 4.4 Activities covering task requirements 4.5 Specifications and work instructions.
<p>5 Method of assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.2 Direct Observation 5.3 Oral interview 5.4 Written Evaluation 5.5 Third Party Report
<p>6 Context of assessment</p>	<p>6.1 Competency may be assessed individually in the actual workplace or simulation environment in TESDA accredited institutions</p>

CORE COMPETENCIES

UNIT OF COMPETENCY : SERVICE AUTOMOTIVE BATTERY

UNIT CODE: ALT723303

UNIT DESCRIPTOR: This unit identifies the competence required to: service, remove, replace, test and charge automotive batteries. The competency is applicable to batteries fitted to

ELEMENT	PERFORMANCE CRITERIA
	<i>Italicized</i> terms are elaborated in the Range of Variables (Note: All standard of performance for Service Automotive Battery is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools, equipment and consumables.)
1. Test automotive battery	1.1 Battery is tested without causing damage to any workplace property or vehicle. 1.2 Correct information is accessed and interpreted based on manufacturer specifications. 1.3 Appropriate test equipment is selected. 1.4 Tests are performed and results analyzed 1.5 Findings is reported to direct supervisor
2. Remove and replace batteries.	2.1 Battery is removed and replaced without causing damage to any workplace property or vehicle. 2.2 Appropriate tools and equipment are selected and used. 2.3 Action is taken to prevent loss of vehicles electronic memory if applicable.
3. Service and charge batteries.	3.1 Battery is charged using the appropriate battery charger. 3.2 Electrolyte levels are checked and topped up 3.3 Battery and its terminals are cleaned. 3.4 Multiple connectors are repaired and replaced to restore integrity of the involved circuit 3.5 Leads are connected/disconnected in sequence as per polarity
4. Jump-start vehicle.	4.1 Vehicle is jump started without causing damage to any workplace property or vehicle. 4.2 Jumper leads are selected and used ensuring spike protection is employed when necessary. 4.3 Leads are connected/disconnected in correct according to sequence and polarity.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Battery	May include: 1.1 Maintenance Free type 1.2 Dry cell Type 1.3 Or by size
2. Manual	May include: 2.1 Manufacturer Specification Manual 2.2 Maintenance Procedure Manual 2.3 Periodic Maintenance Data 2.4 Service Manual 2.5 Parts Checklist
3. Company Standard Operating Procedure	May include: 3.1 Job Order 3.2 Requisition slip 3.3 Wearing of Personal Protective Equipment such as <ul style="list-style-type: none"> • Goggles • Hand gloves • Apron • Safety shoes
4. Consumables	May include: 4.1 Distilled Water 4.2 Battery solution/electrolyte
5. Tools and equipment	May include: 5.1 Hand tools and Special tools for removal/adjustment 5.2 Load tester, hydrometer, multimeter or voltmeter, battery charger, cell tester
6. Test	May include: 6.1 Load tests 6.2 Specific gravity tests 6.3 Cell voltage test

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Removed/replaced battery 1.2 Serviced and charged batteries 1.3 Conducted battery tests
2. Required knowledge	<ul style="list-style-type: none"> 2.1 OH&S legislation 2.2 Safe handling of battery electrolyte and acids 2.3 Industry codes of practice 2.4 Statutory legislation in relation to disposal of batteries and acids 2.5 Testing procedures of both, load and specific gravity 2.6 Identification of battery types 2.7 Servicing procedures 2.8 Jump starting procedures 2.9 Battery charging procedures 2.10 Positive Work Values (Perseverance, Honesty, Attention to Details) 2.11 Quality procedures, e.g., 5S 2.12 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3. Required skills	<ul style="list-style-type: none"> 3.1 Handling battery 3.2 Handling of battery electrolyte 3.3 Use of multitester, Hydrometer, voltmeter, load tester, volt-ammeter, cell tester 3.4 Use of tools for removing battery 3.5 Preventing loss of vehicle electronic memory
4. Resource implications	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Battery to be tested can be separated or to be taken from vehicle 4.2 Appropriate tools and equipment 4.3 Materials relevant to the activity 4.4 Manufacturer's manual and related reference materials
5. Method of assessment	<p>Competency in this unit may be assessed through</p> <ul style="list-style-type: none"> 5.1 Direct observation while the tasks are being performed 5.2 Questions/Interview
6. Context for assessment	<ul style="list-style-type: none"> 6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: SERVICE IGNITION SYSTEM

UNIT CODE: ALT723304

UNIT DESCRIPTOR: This competency unit includes checking and conducting test to ignition components. It also includes repairing the ignition system and components.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (Note: All standard of performance for Service Ignition System is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools and equipment)
1. Check Ignition System	1.1 Spark plug, contact points, rotor, distributor cap, ignition switch are cleaned
2. Perform spark test	2.1 Engine is started as per standard operating procedures. 2.2 Spark test is conducted
3. Check ignition coil resistance	3.1 Coil terminal of ignition coil is disconnected 3.2 Ignition coil resistance is checked
4. Check ballast resistor	4.1 Ballast resistor is checked
5. Adjust contact point clearance (if any)	5.1 Position contact point fully opened 5.2 Contact point is adjusted
6. Perform ignition wiring installation	6.1 Parts condition is checked 6.2 Wiring installation is performed
7. Perform ignition timing	7.1 Ignition timing is adjusted
8. Repair non-electronic ignition system and/or components	8.1 Ignition system/components are repaired without causing damage to any other vehicle parts

RANGE OF VARIABLES

VARIABLE	RANGE
1. Ignition System	May include: 1.1 Spark plug 1.2 Contact Point 1.3 Rotor 1.4 Distributor Cap 1.5 Ignition switch 1.6 Conventional ignition system. 1.7 Magneto system (not including system associated with electronics engine management) Other variables may include: 1.8 Single and dual points, single and multiple distributors, ballast and non-ballast primary circuits, suppressed and non-suppressed high tension leads 1.9 Advanced mechanism (both mechanical and vacuum operated) 1.10 CDI and magnetic pulse
2. Company Standard Operating Procedure	May include: 2.1 Job Order 2.2 Requisition slip 2.3 Wearing of Personal Protective Equipment such as <ul style="list-style-type: none"> • Safety goggles • Safety gloves • Safety shoes • Apron
3. Manual	May include: 3.1 Manufacturer Specification Manual 3.2 Maintenance Procedure Manual 3.3 Periodic Maintenance Data 3.4 Service Manual 3.5 Parts Checklist
4. Tools and equipment	May include: 4.1 Handtools and Power tools, air tools, 4.2 Testing equipment including: <ul style="list-style-type: none"> • Multimeter • Ohmmeter • Voltmeter • Tachometer • timing light • spark plug cleaner/tester • tunesopes • engine analyzer • distributor test bench 4.3 Distributor assembly, ignition coil and condenser 4.4 Actual vehicle equipped with conventional ignition System 4.5 Fender cover

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Checked and Serviced Ignition System 1.2 Tested ignition system/components 1.3 Repaired ignition system/components
2. Required knowledge	2.1 Ignition system construction and operation appropriate to Application 2.2 Measuring and testing procedures 2.3 Vehicles, equipment and personal safety requirements 2.4 Ignition scope pattern 2.5 Positive Work Values (Perseverance , Honesty, Attention to Details, Patience) 2.6 Quality procedures, e.g., 5S 2.7 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3. Required skills	3.1 Using tools when testing and repairing ignition system 3.2 Using ignition system test instrument and equipment 3.3 Observing proper procedures
4. Resource implications	The following resources should be provided: 4.1 Work place location 4.2 Tools and equipment appropriate to servicing processes 4.3 Materials relevant to the proposed activity 4.4 Drawings and specifications relevant to the task
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Direct observation 5.2 Written/Oral questions
6. Context for assessment	6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: TEST AND REPAIR WIRING/LIGHTING SYSTEMS

UNIT CODE: ALT723305

UNIT DESCRIPTOR: This unit identifies the competence required to:
Carry out testing and repair. This standard only applies to
12/24 voltage systems.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (Note: All standard of performance for Test and Repair Wiring/Lighting System is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools and equipment)
1. Test electrical systems	1.1 Tests are completed without causing damage to any workplace property or vehicle. 1.2 Correct information is accessed and interpreted from appropriate manufacturer specifications. 1.3 Tests are carried out to determine faults using appropriate tools and techniques. 1.4 Faults are identified and preferred repair action determined.
2. Repair electrical systems	2.1 Electrical systems are repaired without causing damage to any workplace property or vehicle. 2.2 Correct information is accessed and interpreted from appropriate manufacturer specifications. 2.3 Necessary repairs are carried out using appropriate tools, techniques and materials.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Wiring/Lighting System	May include: 1.1 Fuses 1.2 Bulbs 1.3 Flasher units 1.4 Terminals 1.5 Wiring connections
2. Company Standard Operating Procedure	May include: 2.1 Job Order 2.2 Requisition slip 2.3 Wearing of Personal Protective Equipment such as <ul style="list-style-type: none"> • Apron • Goggles • Gloves
3. Manual	May include: 3.1 Manufacturer Specification Manual 3.2 Maintenance Procedure Manual 3.3 Periodic Maintenance Data 3.4 Service Manual 3.5 Parts Checklist
4. Tools and Equipment	May include: 4.1 Hand tools, 4.2 Power tools, air tools, special tools for removal/adjustment 4.3 Testing equipment including; <ul style="list-style-type: none"> • Multimeter • Test lamps
5. Tests	May include: 5.1 Open circuit test 5.2 Short circuit test

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Tested electrical system 1.2 Repaired electrical system
2. Required knowledge	2.1 Procedures in installing electrical devices 2.2 Operation of electrical system and components relevant to application 2.3 Electrical principles and their application to wiring/lighting 2.4 Procedures for repairing electrical systems 2.5 Testing and fault finding procedures 2.6 Personal safety requirements 2.7 Positive Work Values (Perseverance, Honesty, Attention to Details, Patience) 2.8 Quality procedures, e.g., 5S 2.9 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3. Required skills	3.1 Identifying wire gauge or sizes 3.2 Wiring procedure 3.3 Operating electrical system 3.4 Testing and faultfinding 3.5 Reading and Interpretation of diagrams and circuit
4. Resource implications	The following resources should be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity 4.4 Wiring diagram
5. Method of assessment	Competency in this unit may be assessed through: 5.1 direct observation of application of task 5.2 Written/Oral questioning
6. Context for assessment	6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: SERVICE STARTING SYSTEM

UNIT CODE: ALT723307

UNIT DESCRIPTOR: This unit identifies the competence required to:
Test and repair starting systems.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (Note: All standard of performance for Service Starting Systems is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools and equipment)
1. Test system/ components and identify faults	1.1. Work is completed without causing damage to any workplace property or vehicle. 1.2 Information is accessed and interpreted from appropriate manufacturer specifications. 1.3 Tests are carried out to determine faults using appropriate tools and techniques. 1.4 Faults are identified and preferred repair action determined.
2. Repair starting systems associated components	2.1 Starting systems are repaired without causing damage to any workplace property or vehicle. 2.2 Information is accessed and interpreted from appropriate manufacturer specifications. 2.3 Repairs, component replacement and adjustments are carried out using appropriate tools, techniques and materials.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Starting systems	May include: 1.1 Dynastart, inertia, pre-engaged, axial, coaxial, fixed and remote solenoid, direct drive, gear reduction, protection lockout, inhibitor switch, series-parallel switching, battery isolation switch, single/multiple battery system 1.2 Solar systems may include: single and ganged panels, internal and external regulation, battery sensed and non-battery sensed 12V and 24V operation, solid state controlled 1.3 Direct current motors
2. Manuals	May include: 2.1 Maintenance Procedure Manual 2.2 Periodic Maintenance Data 2.3 Service Manual 2.4 Parts Checklist
3. Company standard operating procedure	May include: 3.1 Job Order 3.2 Requisition slip 3.3 Wearing of Personal Protective Equipment such as <ul style="list-style-type: none"> • Goggles • Hand gloves • Apron • Safety shoes
4. Tools and equipment	May include: 4.1 Hand tools 4.2 Testing equipment including: <ul style="list-style-type: none"> • Multimeters, voltmeters, ammeters 4.3 Power tools, air tools, electrical loading equipment, test benches, soldering equipment, induction , test light (12V and 24V)
5. Tests	May include: 5.1 Open circuit test 5.2 Short circuit test

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate</p> <ul style="list-style-type: none"> 1.1 Serviced and charged batteries 1.2 Tested/jump started the battery/vehicles 1.3 Repaired the starting system
<p>2. Required knowledge</p>	<ul style="list-style-type: none"> 2.1 Starting system components 2.2 Electrical principles 2.3 Repair procedures 2.4 Electrical measuring and testing procedures 2.5 Vehicle safety requirements 2.6 Positive Work Values (Patience, Honesty, Perseverance, Attention to details) 2.7 Quality procedures, e.g., 5S 2.8 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
<p>3. Required skills</p>	<ul style="list-style-type: none"> 3.1 Handling batteries and tools 3.2 Operating testing equipment 3.3 Repairing Starting system 3.4 Using Mathematical Ideas and Techniques 3.5 Solving Problems
<p>4. Resource implications</p>	<p>The following resources shouldt be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity 4.4 Wiring diagram 4.5 Manufacturer's repair manual
<p>5. Method of assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Direct observation while the tasks are being performed 5.2 Questions/Interview related to the underpinning knowledge/skills 5.3 Assessment of underpinning and practical skills may be combined.
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> 6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: SERVICE CHARGING SYSTEMS

UNIT CODE: ALT723308

UNIT DESCRIPTOR: This unit identifies the competence required to:
Test and repair charging systems.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (Note: All standard of performance for Service Charging Systems is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools and equipment)
1. Test system/ components and identify faults	1.1. Work is completed without causing damage to any workplace property or vehicle. 1.2 Information is accessed and interpreted from appropriate manufacturer specifications. 1.3 Tests are carried out to determine faults using appropriate tools and techniques. 1.4 Faults are identified and preferred repair action determined.
2. Repair charging system associated components	2.1 Charging systems are repaired without causing damage to any workplace property or vehicle. 2.2 Information is accessed and interpreted from appropriate manufacturer specifications. 2.3 Repairs, component replacement and adjustments are carried out using appropriate tools, techniques and materials.

RANGE OF VARIABLES

VARIABLE	RANGE
1.Charging systems	May include: 1.1 alternator, generator,(IC-type) internal/external regulation, battery sensed and non-battery sensed regulation, 6V,12V and 24V operation, dynastart, solid state and mechanical regulation, belt and/or direct drive, single/multiple belt drive, adjustable tensioning devices 1.2 Solar systems may include: single and ganged panels, internal and external regulation, battery sensed and non-battery sensed 12V and 24V operation, solid state controlled 1.3 Direct current motors
2. Manuals	May include: 2.1 Maintenance Procedure Manual 2.2 Periodic Maintenance Data 2.3 Service Manual 2.4 Parts Checklist
3. Company standard operating procedure	May include: 3.1 Job Order 3.2 Requisition slip 3.3 Wearing of Personal Protective Equipment such as <ul style="list-style-type: none"> • Goggles • Hand gloves • Apron • Safety shoes
4. Tools and equipment	May include: 4.1 Hand tools 4.2 Testing equipment including: <ul style="list-style-type: none"> • Multimeters, voltmeters, ammeters 4.3 Power tools, air tools, electrical loading equipment, test benches, soldering equipment, induction , test light (12V and 240V)
5. Tests	May include: 5.1 Open circuit test 5.2 Short circuit test

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate 1.1 Serviced and charged batteries 1.2 Tested started the battery/vehicles 1.3 Repaired the charging system
2. Required knowledge	2.1 Electrical principles 2.2 Charging system components and functions 2.3 Repair procedures 2.4 Electrical measuring and testing procedures 2.5 Vehicle safety requirements 2.6 Positive Work Values (Patience, Honesty, Perseverance Attention to details) 2.7 Quality procedures, e.g., 5S 2.8 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3.Required skills	3.1 Handling batteries and tools 3.2 Operating testing equipment 3.3 Repairing Charging system 3.4 Using Mathematical Ideas and Techniques 3.5 Solving Problems
4.Resource implications	The following resources should be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment Materials relevant to the activity
5.Method of assessment	Competency in this unit may be assessed through: 5.1 Direct observation 5.2 Questions/Interview
6.Context for assessment	6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: SERVICE ENGINE MECHANICAL SYSTEM

UNIT CODE: ALT723309

UNIT DESCRIPTOR: This unit identifies the competence required in: servicing cooling, lubricating, fuel systems, diesel fuel injector.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Service cooling system	1.1 Servicing of engine mechanical system such as cooling system is performed as per manufacturer's manual using specified tools and equipment 1.2 Safety is observed as per company standard operating procedures
2. Service lubricating system	2.1 Oil pressure is checked as per manual instruction 2.2 Oil level and condition is checked as per manual instruction 2.3 Oil flashing is performed as per manual instruction
3. Service fuel system	For CARBURETOR TYPE: 3.1 Carburetor is serviced/repared according to manufacturer's repair manual 3.2 Fuel pump is inspected according to service repair manual 3.3 Exhaust Gas analyzer is set-up in accordance with manufacturer's manual 3.4 Exhaust gas emission inspected and necessary adjustment is performed in accordance with standard operating procedures
4. Service diesel fuel injector	4.1 Injection nozzle is inspected and repaired as per service repair manual 4.2 Fuel system cleaning is performed in accordance with standard operating procedures

RANGE OF VARIABLES

VARIABLE	RANGE
1. Engine Mechanical System	May include: 1.1 Cooling system 1.2 Lubricating system 1.3 Fuel system 1.4 Diesel Fuel injector 1.5 Emission control system
2. Manual	May include: 2.1 Maintenance Procedure Manual 2.2 Periodic Maintenance Data 2.3 Service Manual 2.4 Parts Checklist
3. Company Standard Operating Procedure	May include: 3.1 Job Order 3.2 Requisition slip 3.3 Wearing of Personal Protective Equipment such as <ul style="list-style-type: none"> • Apron • Gloves • Gas mask • Goggles
4. Tools and equipment	May include: 4.1 Common hand tools 4.2 Injection nozzle 4.3 hand tester 4.4 C.O. meter 4.5 Gas analyzer

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Serviced engine mechanical systems
2. Required knowledge	2.1 Water pump overhauling procedure 2.2 Principle and operation of cooling system 2.3 Procedure in coolant leak test 2.4 Principle and operation of lubricating system 2.5 Procedure in checking oil pressure 2.6 Procedure in adjusting idle mixture 2.7 Procedure in overhauling carburetor 2.8 Fuel quality and characteristics 2.9 Unit measurement 2.10 Procedure in injector testing 2.11 Procedure in overhauling injector 2.14 Fuel system basic principle and operation 2.15 Oil quality and type 2.16 Exhaust gas theory and production 2.17 Procedure in measuring CO concentration 2.18 Emission component inspection procedure 2.19 Positive Work Values (Patience, Honesty, Perseverance, Attention to Details) 2.20 Quality procedures, e.g., 5S 2.21 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3. Required skills	3.1 Use and interpretation of Repair Manual 3.2 Usage of CO meter and gas analyzer 3.3 Operating motor driven cooling fan 3.4 Diagnosing trouble 3.5 Usage of injector nozzle hand tester 3.6 Overhauling injector 3.7 Usage of Measuring tools
4. Resource implications	The following resources should be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Direct observation with Questioning 5.2 Interview
6. Context for assessment	6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: SERVICE CLUTCH SYSTEM

UNIT CODE: ALT723310

UNIT DESCRIPTOR: This unit deals with servicing clutch system. It also include repairing and replacing the damaged parts/components of the system.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms are elaborated in the Range of Variables</i> (Note: All standard of performance for Service Clutch System is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools and equipment .)
1. Diagnose clutch failure/problem	1.1 Clutch should engage/disengage engine and transmission smoothly
2. Pull-out and mount clutch Component parts	2.1 Clutch is dismounted 2.2 Damaged parts is replaced 2.3 Clutch is mounted
3. Overhaul hydraulic clutch mechanism	3.1 Worn out Rubber cups and "O" rings replaced as per prescribed procedure 3.2 Scored Master cylinder is replaced 3.3 Valve checked for damage 3.4 Hydraulic clutch mechanism is replaced 3.5 Master cylinder, slave, booster tested
4. Perform clutch parts failure analysis	4.1 Clutch failure identified accurately and corresponding repair recommended
5. Set/Adjust clutch system components	5.1 Clutch pedal free play is set 5.2 Special service tools is used
6. Bleed clutch hydraulic system	6.1 Checking of fluid leakage and level are checked 6.2 Clutch hydraulic system bled.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Clutch System	May include: 1.1 Pressure plate assembly 1.2 Clutch Disk Assembly 1.3 Mechanical Clutch Linkage 1.4 Hydraulic Clutch Linkage
2. Manuals	May include: 2.1 Manufacturer specification manual 2.2 Maintenance Procedure Manual 2.3 Periodic Maintenance Data 2.4 Service and Repair Manual Parts Checklist
3. Company standard operating procedure	May include: 3.1 Job Order 3.2 Requisition slip 3.3 Wearing of personal protective equipment such as <ul style="list-style-type: none"> • Gloves, Apron, Safety shoes, Skull guard
4. Tools and equipment	May include: 4.1 Hydraulic lifter/Mechanical lifter 4.2 Support stand 4.3 Transmission jack 4.4 Basic Handtools set 4.5 Clutch centering guide 4.6 Snap ring pliers (in/out)
5. Clutch failure / Problems	May include: 5.1 pedal goes to floorboard when depressed 5.2 slips when engaged 5.3 spine or drags while engaged 5.4 chatters or grabs while being engaged 5.5 related vibration 5.6 area noises 5.7 pedal pulsation

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Serviced Clutch system 1.2 Repaired/Replaced clutch system components or parts
2. Required knowledge	2.1 Clutch system types, components, function and operation 2.2 Clutch system adjustment 2.3 Handling of special tools for dismantling clutch system components 2.4 Hydraulic clutch mechanism function and operation 2.5 Precaution in handling hydraulic fluids and special tools 2.6 Positive Work Values (Patience, Honesty, Perseverance, Attention to Details) 2.7 Quality procedures, e.g., 5S 2.8 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3. Required skills	3.1 Access, interpret and apply technical information 3.2 Use of relevant tools and equipment 3.3 Remove and replace clutch mechanism 3.4 Overhauling hydraulic clutch mechanism 3.5 Testing master cylinder, clutch slave and booster 3.6 Setting adjusting clutch components 3.7 Apply personal safety procedures 3.8 Maintain customer records
4. Resource implications	The following resources should be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate tools and equipment 4.3 Materials relevant to the proposed activity and tasks 4.4 Manufacturer's repair manual
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Direct observation with Questioning 5.2 Interview
6. Context for assessment	6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY : SERVICE DIFFERENTIAL AND FRONT/REAR AXLE

UNIT CODE: ALT723311

UNIT DESCRIPTOR: This unit deals with servicing differential and front axle. It also includes overhauling rear wheel hub, analyzing king pin condition and troubleshooting I-beam defective condition.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (All standard of performance for Service <i>Differential and Front Axle</i> is in accordance with <i>company standard operating procedure</i> and manufacturer's specification <i>Manuals</i> using specified <i>tools and equipment</i> .)
1. Inspect drive shaft and joint	1.1 Drive shaft and joint inspected thoroughly for worn-out cross joint, defective slip joint, unbalanced propeller shaft
2. Dismount differential assembly	2.1 Differential body is pulled out/dismounted 2.2 Penetrating oil applied on hold down clamp
3. Overhaul differential	3.1 Differential parts is dismantled 3.2 Parts analyzed and defects identified 3.3 Corresponding repair works recommended 3.4 Differential adjusted as per manual instruction 3.5 Special service tools is used 3.6 Parts cleaned with solvent and dried 3.7 Damaged parts is replaced 3.8 Differential assembled and adjusted
4. Mounting differential assembly	4.1 Differential assembly is mounted 4.2 Tools for mounting is used
5. Overhaul rear/front wheel hub	5.1 Defective wheel hub identified and corresponding repair works recommended 5.2 Wheel bearing is replaced 5.3 Wheel bearing pre-load is set/adjusted
6. Analyze king pin condition	6.1 King pin parts failure identified and corrective action recommended 6.2 Damaged king pin parts is replaced 6.3 Replacement parts is selected and used
7. Inspect/replace I-beam	7.1 I beam failure identified and corresponding repair works recommended 7.2 Misalignment of I-beam identified and corrected

RANGE OF VARIABLES

VARIABLE	RANGE
1. Drive shaft and Joint components	May include: 1.1 Propeller Shaft <ul style="list-style-type: none"> • Torque tube • Hotchkiss 1.2 Slip Joint <ul style="list-style-type: none"> • External splines • Internal splines • Yoke 1.3 Universal Joint Constant Velocity Ball & Trunion
2. Differential Adjustment	May include: 2.1 Pinion depth 2.2 Pinion bearing pre-load 2.3 Backlash
3. Company standard operating procedure	May include: 3.1 Job Order 3.2 Requisition slip 3.3 personal protective equipment such as: <ul style="list-style-type: none"> • Apron, Goggles, Gloves, Safety shoes, Skull Guard
4. Manual	May include: 4.1 Manufacturer specification manual 4.2 Maintenance procedure manual 4.3 Periodic maintenance data 4.4 Service and Repair Manual 4.5 Parts checklist
5. Tools and equipment	May include: 5.1 Hydraulic lifter/mechanical lifter 5.2 Support stand 5.3 Socket wrench 5.4 Dial gauge with stand 5.5 Basic handtools 5.6 Hub wrench 5.7 Spreading tool 5.8 Axle puller 5.9 Spider nit wrench 5.10 Ballpeen hammer 5.11 Bearing greasing machine 5.12 Hydraulic press

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Serviced differential and Front Axle 1.2 Set and adjusted differential components 1.3 Overhauled rear and front wheel hub
2. Required knowledge	2.1 Removal, replacement and repair procedures 2.2 Construction and operation of differential and front axle 2.3 Measuring and testing procedures 2.4 Relevant technical information 2.5 Equipment safety requirements 2.6 Vehicle/plant safety requirements 2.7 Relevant manufacturer/enterprise policies 2.8 Manual handling techniques 2.9 Personal safety procedures 2.10 Positive Work Values (Patience, Honesty, Perseverance, Attention to Details) 2.11 Quality procedures, e.g., 5S 2.12 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3. Required skills	3.1 Accessing, interpreting and applying technical information 3.2 Using relevant tools and equipment 3.3 Identifying faults in differential and front axle 3.4 Repairing, removing and replacing differential mounting, king pin, I-beam 3.5 Testing and adjusting differential & front axle, rear wheel hub 3.6 Applying manual handling methods 3.7 Applying personal safety procedures 3.8 Maintaining customer records
4. Resource implications	The following resources should be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Direct observation while the tasks are being performed 5.2 Questions/Interview related to the underpinning knowledge/skills 5.3 Assessment of Underpinning Knowledge and attitude and practical skills may be combined.
6. Context for assessment	6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: SERVICE MANUAL STEERING SYSTEM

UNIT CODE: ALT723312

UNIT DESCRIPTOR: This unit deals with servicing steering system. It also includes conduct of wheel alignment and overhauling front wheel hub.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (Note: All standard of performance for Service Manual Steering System is in accordance with company Standard Operating procedure and manufacturer's Specification Manual using specified tools and Equipment)
1. Analyze front end geometry failure	1.1 Visual inspection on tire wear /steering system is performed 1.2 Wheel alignment equipment is set-up 1.3 Camber, caster and toe-angle are inspected and necessary adjustments are made as
2. Service steering system	2.1 Steering component is pulled-out 2.2 Steering defects such as deformation, cracks, tube leaks and loose parts is checked identified 2.3 Steering component is dismantled/installed 2.4 Damaged parts is replaced
3. Perform wheel balancing	3.1 Wheel weight location and size is identified 3.2 Wheel balancing machine is set-up
4. Conduct wheel alignment	4.1 Steering and suspension component accurately checked prior alignment 4.2 Wheel alignment equipment positioned/installed 4.3 Equipment reading interpreted and required adjustment is done 4.4 Wheel alignment is adjusted

RANGE OF VARIABLES

VARIABLE	RANGE
1. Steering system	May include: 1.1 Recirculating ball Gear 1.2 Worn and Taper Pin 1.3 Rack and Pinion
2. Manual	May include: 2.1 Manufacturer's specification manual 2.2 Maintenance procedure manual 2.3 Periodic maintenance data 2.4 Service and repair manual 2.5 Parts checklist
3. Company standard operating procedure	May include: 3.1 Job order 3.2 Requisition slip protective equipment such as: • Gloves, Apron, Goggles, Safety shoes
4. Front end Geometry	May include: 4.1 Camber-positive/negative 4.2 Caster-positive/negative 4.3 Steering Axis inclination 4.4 Toe-in 4.5 Turning Radius 4.6 Wheel alignment procedures
5. Tire wear	May include: 5.1 Shoulder wear-incorrect camber • inside shoulder-too much negative • outside shoulder – too much positive 5.2 Both shoulder wear-Under inflation 5.3 Cornering wear – Driver's habit 5.4 Center tire wear – Over inflation 5.5 Feather wear – Toe problem
6. Tools and Equipment	May include: 6.1 Hydraulic lifter/mechanical lifter 6.2 Support Stand 6.3 Socket wrench 6.4 Torque wrench 6.5 Basic hand tools 6.6 Caster gauge 6.7 Camber 6.8 Toe-in, toe-out aligning bar 6.9 Puller 6.10 Wheel balancer 6.11 Wheel alignment equipment or equivalent

EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Serviced Steering System 1.2 Conducted wheel alignment 1.3 Performed wheel balancing
2. Required knowledge	<ul style="list-style-type: none"> 2.1 Operating principles of steering system 2.2 Service procedures 2.3 Wheel alignment types/classification and description 2.4 Relevant technical information 2.5 Equipment and tools safe handling 2.6 Vehicle safety requirements 2.7 Relevant manufacturer/enterprise policies 2.8 Personal safety procedures 2.9 Positive Work Values (Patience, Honesty, Perseverance, Attention to Details) 2.10 Quality procedures, e.g., 5S 2.11 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3. Required skills	<ul style="list-style-type: none"> 3.1 Access, interpret and apply technical information 3.2 Use relevant tools and equipment 3.3 Test and adjust front end geometry 3.4 Pull-out install steering system component 3.5 Check steering system deformities and its causes 3.6 Apply personal safety procedures 3.7 Maintain customer records
4. Resource implications	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity
5. Method of assessment	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Written/Oral examination 5.2 Demonstration with Questioning
6. Context for assessment	<ul style="list-style-type: none"> 6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: SERVICE BRAKE SYSTEM

UNIT CODE: ALT723314

UNIT DESCRIPTOR: This unit deals with servicing brake system. It also includes diagnosing, adjusting and repairing brake mechanism.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (Note: All standard of performance for Service Brake System is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools and equipment)
1. Pull-out/mount brake system components	1.1 Brake system components are pulled out/mounted. 1.2 Brake system assembly accurately tagged/marked
2. Disassemble/assemble brake system components	2.1 Component parts tagged/marked 2.2 Parts rinsed with cleaning solution 2.3 Damaged parts identified and replaced 2.4 Assembled brake system component is tested
3. Conduct road test	3.1 Pre-starting check-up performed prior vehicle operation 3.2 Vehicle driven at specified speed to detect brake trouble 3.3 Findings are recorded and recommendation is given

RANGE OF VARIABLES

VARIABLE	RANGE
1. Brake system	May include: 1.1 Drum brake system 1.2 Antiskid or Antilock brake system (ABS) 1.3 Disc Brake System 1.4 Power Brake system type (Brake Booster) 1.5 Master cylinder 1.6 Air Brake
2 Manual	May include: 2.1 Manufacturer's specification manual 2.2 Maintenance procedure manual 2.3 Periodic Maintenance Data 2.4 Service and Repair manual 2.5 Parts checklist
3 Company standard operating procedures	May include: 3.1 Job Order 3.2 Requisition slip 3.3 Wearing of personal protective equipment and clothing such as <ul style="list-style-type: none"> • Hand cleaner • Hand gloves • Safety shoes • Skull guard • Apron
4 Tools and equipment	May include: 4.1 Hydraulic lifter/mechanical lifter 4.2 Support stand 4.3 Socket wrench 4.4 Dial gauge with stand 4.5 Basic Handtools set 4.6 Snap ring plier (in/out) 4.7 Brake adjusting tool 4.8 Ballpeen hammer 4.9 Bleeding tool

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Diagnosed brake system faults 1.2 Pulled-out/mount brake system components 1.3 Disassembled/assembled brake system components
<p>2. Required knowledge</p>	<ul style="list-style-type: none"> 2.1 Operating principles of brake system 2.2 Brake system types and components 2.3 Service procedures 2.3 Hydraulic brake system/fluid 2.4 Relevant technical information 2.5 Equipment and tools safe handling 2.6 Vehicle safety requirements 2.7 Relevant manufacturer/enterprise policies 2.8 Personal safety procedures 2.9 Positive Work Values (Patience, Honesty, Perseverance, Attention to Details) 2.10 Quality procedures, e.g., 5S 2.11 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
<p>3. Required skills</p>	<ul style="list-style-type: none"> 3.1 Accessing, interpreting and applying technical information 3.2 Using relevant tools and equipment 3.3 Adjusting/setting emergency/parking brakes 3.4 Adjusting brake pedal height/free-play 3.5 Changing hydraulic fluid with no spillage 3.6 Applying personal safety procedures 3.7 Maintaining orderliness and cleanliness 3.8 Maintaining customer records
<p>4. Resource implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity
<p>5. Method of assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Written/Oral examination 5.2 Observation with Questioning
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> 6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: SERVICE SUSPENSION SYSTEM

UNIT CODE: 502723315

UNIT DESCRIPTOR: This unit deals with repairing the suspension system.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (All standard of performance for Service Suspension System is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools and equipment)
1. Diagnose suspension system failure	1.1 Suspension system failure are identified and repair works recommended
2. Dismount/mount suspension components parts	2.1 Suspension components are dismantled/mounted 2.2 Dismounted parts are tagged/marked 2.3 Parts are dismantled without causing damage to vehicle components
3. Disassemble/ Assemble suspension parts	3.1 Suspension parts are disassembled/assembled 3.2 Suspension parts are disassembled/assembled without causing damage to other vehicle components/system 3.3 Disassembled parts are rinsed with cleaning solution
4. Inspect/replace suspension component parts	4.1 Suspension system components are checked for cracks, loose nuts, bolt or bushing, and leak 4.2 Damaged suspension parts are identified 4.3 Damaged parts are replaced

RANGE OF VARIABLES

VARIABLE	RANGE
1. Suspension system failure	<p>May include:</p> <p>1.1 Suspension system problem indicated by:</p> <ul style="list-style-type: none"> • Noise during stop and starts or over bumps • Poor directional stability or automobile does not go in a straight line unless the driver fights the steering wheel • The vehicle may steer very hard or have too much movement or play in the steering • Front wheel may shimmy when the vehicle is driven at highway speed, or it may pull or tend to turn by itself. <p>1.2 Common suspension components that lead to system failure:</p> <ul style="list-style-type: none"> • Steering knuckle and spindle • Ball joint • Stabilizer bar • Coil spring • Torsion bar • Shock absorbers • Suspension bushings
2. Manuals	<p>May include:</p> <p>2.1 Manufacturer's specification manual</p> <p>2.2 Service and repair manual</p> <p>2.3 Parts checklist</p>
3. Company standard operating procedure	<p>May include:</p> <p>3.1 Job order</p> <p>3.2 Requisition slip</p> <p>3.3 Wearing of Personal Protective Equipment such as:</p> <ul style="list-style-type: none"> • Hand cleaner, hand gloves, safety shoes, skull guard, Apron
4. Tools and equipment	<p>May include:</p> <p>4.1 Hydraulic lifter/Mechanical lifter</p> <p>4.2 Support stand</p> <p>4.3 Grease dispenser</p> <p>4.4 Coil spring compressor</p> <p>4.5 Socket wrench</p> <p>4.6 Basic Handtools</p> <p>4.7 Hydraulic press</p> <p>4.8 Torque wrench</p> <p>4.9 Air compressor</p> <p>4.10 Hard rubber mallet</p> <p>4.11 Ballpeen hammer</p>

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Serviced Suspension System 1.2 Diagnosed suspension system failure 1.3 Conducted suspension system balance adjustment
2. Required knowledge	2.1 Operating principles of suspension system 2.2 Service procedures 2.3 Air suspension balance adjustment procedures 2.4 Equipment and tools safe handling 2.5 Vehicle safety requirements 2.6 Relevant manufacturer/enterprise policies 2.7 Personal safety procedures 2.8 Positive Work Values (Patience, Honesty, Perseverance, Attention to Details) 2.9 Quality procedures, e.g., 5S 2.10 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
3. Required skills	3.1 Accessing, interpreting and applying technical information 3.2 Using relevant tools and equipment 3.3 Cleaning suspension parts 3.4 Applying personal safety procedures 3.5 Maintaining orderliness and cleanliness 3.6 Maintaining customer records
4. Resource implications	The following resources should be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity 4.4 Manufacturer's repair manual
5. Method of assessment	Competency in this unit may be assessed through: 5.1 Written/Oral examination 5.2 Demonstration with Questioning
6. Context for assessment	6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: PERFORM UNDERCHASSIS PREVENTIVE MAINTENANCE

UNIT CODE: ALT723306

UNIT DESCRIPTOR: This unit deals with the checking, replacing of fluids and minor repair of underchassis components including tires.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (Note: All standards of performance for Perform Underchassis Components Preventive Maintenance is in accordance with company standard operating procedure and manufacturer's specification Manuals using specified tools and equipment .)
1. Check clutch fluid and lines	1.1 Clutch fluid level is checked and maintained between minimum and maximum 1.2 Clutch lines are checked for twist and bends 1.3 Clutch cover must be fitted in the cap 1.4 Clutch fluid used
2. Inspect brake system	2.1 Brake fluid level is checked and maintained between the minimum and maximum, and clear, undiluted fluid is used 2.2 Brake lines or hoses are checked and freed of twist and bends 2.3 Brake pedal free play specified 2.4 Brakes operation is checked and tested 2.5 Hydraulic fluid used/changed without spillage and at the level specified 2.6 Brake pedal/height/pre-play checked and adjusted 2.7 Bleed hydraulic brake 2.8 Emergency brake functions is checked 2.9 Points for adjustment of emergency brake is identified
3. Inspect/change transmission/differential gear oil	3.1 Gear oil inspected 3.2 The vehicle is positioned 3.3 Transmission gear selected and used is clear and not diluted with other substances 3.4 Grade/classification and level of gear oil used must be in accordance with manufacturer's specification
4. Inspect/Replace power steering fluid	4.1 Power steering linkages and connections inspected 4.2 Vehicle is parked and engine running is ran at idle speed 4.3 Fluid is inspected/replaced
5. Check/Re-fill automatic transmission fluid	5.1 ATF checked and replenished to required level
6. Inspect/Bleed air tank	6.1 Air tank inspected and bled
7. Check tires and tire pressures	7.1 Tires is inspected for damage or deformities and free of solid object 7.2 Tire pressure is checked and maintained 7.3 Tire rotation is performed.
8. Check under-chassis body bolts and nuts	8.1 Bolts/nuts including tire studs bolts/nuts are checked 8.2 Body bolts/nut torque is checked and maintained 8.3 Checking procedure according to manufacturer's specifications. 8.4 Tightness of the bolts is determined by the sound produced by tapping lightly bolts/nuts with pointed hammer.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Underchassis Components	May include: 1.1 Clutch-Master cylinder, fluid lines, secondary (slave) Cylinder 1.2 Brakes-Master cylinder, wheel cylinders, Fluid lines 1.2 Manual transmission – Front/rear oil seal, drain plug, filler Hole 1.4 Differential – Oil seal, drain plug/Filler hole 1.5 Power Steering – Pump, Linkages/Fluid lines/Connections, Rack, Pinion Oil seal, Steering box oil seal 1.6 Automatic Transmission – Oil seals, Filler hole/drain plug, linkages/oil lines 1.7 Air Tank-Drain plug, air lines/hoses, pressure gauge 1.8 Wheels and Tires – Tire valves, thread and traction, Tire pressures 1.9 Body bolts/Studs/Nuts-Wheels and tire studs/nuts, chassis, body mounting bolt, studs, nuts
2. Manuals	May include: 2.1 Manufacturer's specifications manual 2.2 Preventive Maintenance procedure manual 2.3 Service Manual 2.4 Parts checklist
3. Company standard Operating Procedure	May include: 3.1 Job Order 3.2 Requisition slip 3.3 Wearing of Personal Protective Equipment such as: <ul style="list-style-type: none"> • Hand cleaner, hand gloves, safety shoes, skull guard, Apron
4. Tools and equipment	May include: 4.1 Hydraulic/mechanical lifter 4.2 Support stand 4.3 Gear oil dispenser 4.4 Socket wrench 4.5 Basic hand tools 4.6 Ball peen hammer
5. Tire	May include: 5.1 Tube 5.2 Tubeless

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Checked/Inspected clutch/brake fluid and lines 1.1 Inspected/changed transmission/ differential gear oil 1.2 Inspected/Replaced power steering fluid 1.3 Checked/Re-filled automatic transmission fluid 1.4 Inspected/Bled air tank 1.5 Checked tires and tire pressures 1.6 Checked under-chassis body bolts and nuts
<p>2. Required knowledge</p>	<ul style="list-style-type: none"> 2.1 Types/Classification of lubricants 2.2 Clutch Parts, Function and Operation 2.3 Brake component parts, function and operation 2.4 Brake lines/piping construction & types 2.5 Types/Classification of Gear oil 2.6 Transmission/Differential gear Component parts, function and operation 2.7 Cause and Effect of Gear Oil Dilution 2.8 Classification of Power Steering Fluid 2.9 Power Steering component parts, function and operation 2.10 Positive Work Values (Patience, Honesty, Perseverance, Attention to details) 2.11 Quality procedures, e.g., 5S 2.12 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
<p>3. Required skills</p>	<ul style="list-style-type: none"> 3.1 Handling of fluids and oil (clutch, brake, gear, auto transmission, etc) 3.2 Interpreting and Usage of Preventive Maintenance Manuals 3.3 Familiarization with Underchassis Components
<p>4. Resource implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & equipment 4.3 Materials relevant to the activity 4.4 Manufacturer's repair manual
<p>5. Method of assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Actual observation or practical test while the task is being performed 5.2 Written exam based on the topic under the underpinning knowledge 5.3 Assessment of Underpinning Knowledge and attitude and practical skills may be combined.
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> 6.1 Competency must be assessed on the job or simulated environment.

UNIT OF COMPETENCY: OVERHAUL MANUAL TRANSMISSION

UNIT CODE: ALT723313

UNIT DESCRIPTOR: This unit deals with diagnosing, overhauling manual transmission. It also includes testing the transmission.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables (All standard of performance for Overhaul <i>Manual Transmission</i> is in accordance with <i>company standard operating procedure</i> and manufacturer's specification <i>Manuals</i> using specified <i>tools and equipment</i>)
1. Diagnose manual transmission failure	1.1 <i>Manual transmission failure</i> is tested such as humming noise, shifting condition, moving parts condition, gear oil contamination, leaky gear oil.
2. Pull-out manual transmission	2.1 Transmission gear oil drained 2.2 Transmission is placed/positioned to transmission jack 2.3 Bolt/nuts are loosened of as per torque, sequence, and pattern
3. Disassemble manual transmission	3.1 Disassembled parts tagged and marked 3.2 Parts rinsed with appropriate solution 3.3 Manual transmission installed using reference marks 3.4 Damaged parts is replaced
4. Inspect manual transmission parts	4.1 Worn-out and cracked parts and gear back lash and end play inspected/measured and accurately identified 4.2 Defects identified and recommendation given 4.3 Transmission parts tested using testing instruments 4.4 Transmission parts is inspected without causing damage
5. Assemble manual transmission	5.1 Component parts are cleaned, lubricated and coated with new gear oil 5.2 Manual transmission assemble using tools 5.3 Manual transmission assembled as per standard operating procedures
6. Test manual transmission	6.1 Transmission gear oil checked after installation 6.2 Manual transmission assembly is mounted 6.3 Transmission linkages/attachments are installed 6.4 Transmission test is conducted.
7. Road test Transmission	7.1 Transmission performance is evaluated (visual/aural) with emphasis on performance of every shifting, pattern, noise and operation

RANGE OF VARIABLES

VARIABLE	RANGE
1. Manual Transmission	May include: 1.1 Three (3) speed manual transmission 1.2 Four (4) speed manual transmission 1.3 Five (5) speed and overdrive manual transmission 1.4 Transaxle manual transmission (combination of manual transmission and differential)
2. Manual Transmission Failure	May include: 2.1 The transmission or transaxle shifts hard 2.2 The gear clash when shifting 2.3 The transmission/transaxle is noisy 2.4 The transmission/transaxle jumps out of gear 2.5 The transmission/transaxle is locked in one gear and cannot be shifted out of that gear
3. Manuals	May include: 3.1 Manufacturer's specification manual 3.2 Maintenance procedure manual 3.3 Periodic Maintenance Data 3.4 Service and Repair manual 3.5 Parts checklist
4. Company Standard Operating Procedure	May include: 4.1 Job Order 4.2 Requisition slip 4.3 Wearing of personal protective equipment and clothing such as hand cleaner, hand gloves, safety shoes, skull guard, apron
5. Tools and equipment	May include: 5.1 Hydraulic lifter/Mechanical lifter 5.2 Support stand 5.3 Transmission jack 5.4 Snap ring expander (in/out) 5.5 Bearing puller 5.6 Long drift or punch 5.7 Basic hand tools set 5.8 Bench vise

EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1 Diagnose manual transmission failure 1.2 Overhauled manual transmission 1.3 Restored manual transmission to its normal running condition
<p>2. Required knowledge</p>	<ul style="list-style-type: none"> 2.1 Overhauling procedures 2.2 Transmission lubricants/fluids and their application 2.3 Operating principles of manual and belt drive transmissions 2.4 Relevant technical information 2.5 Equipment safety requirements 2.6 Vehicle/plant safety requirements 2.7 Relevant manufacturer/enterprise policies 2.8 Personal safety procedures 2.9 Positive work Values (Patience, Honesty, Perseverance Attention to details) 2.10 Quality procedures, e.g., 5S 2.11 Environmental-conservation procedures, e.g., 3R (reduce, reuse, recycle)
<p>3. Required skills</p>	<ul style="list-style-type: none"> 3.1 Accessing, interpreting and applying technical information 3.2 Using relevant tools and equipment 3.3 Overhauling manual and/or belt drive transmissions 3.4 Checking transmission for normal operation 3.5 Driving 3.6 Applying personal safety procedures 3.7 Maintaining customer records
<p>4. Resource implications</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> 4.1 Workplace 4.2 Appropriate tools and equipment 4.3 Materials relevant to the proposed activity and tasks 4.4 Manufacturer's repair manual
<p>5. Method of assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> 5.1 Observation with Questioning 5.2 Written/Oral examination
<p>6. Context for assessment</p>	<ul style="list-style-type: none"> 6.1 Competency must be assessed on the job or simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

SECTION 3. TRAINING STANDARDS

These standards are set to provide technical and vocational education and training (TVET) providers with information and other important requirements to consider when designing training programs for Automotive Servicing NC II.

3.1 CURRICULUM DESIGN

Course Title: **AUTOMOTIVE SERVICING**

NC Level **NC II**

Nominal Training Duration: **18 Hours** (Basic Competencies)
40 Hours (Common Competencies)
618 Hours (Core Competencies)
676 Hours

Course Description:

This course is designed to enhance the knowledge, skills and attitudes of an individual in the field of automotive servicing in accordance with industry standards. It covers specialized competencies such as service automotive battery, service ignition system, Test and Repair Wiring/ Lighting System, Perform Under Chassis Preventive Maintenance, Perform Shop Maintenance, repair charging and starting system, service engine mechanical system, service and repair clutch system, service and repair differential and front axle, Service steering system, Overhaul Manual Transmission, Service Brake System, Repair Suspension System Repair Suspension System. It covers the basic, common and core competencies.

This course is also designed to enhance the basic and common knowledge, skills and attitudes of an individual in the field of automotive servicing.

To obtain this, all units prescribed for this qualification must be achieved.

BASIC COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Participate in workplace communication	1.1 Obtain and convey workplace information. 1.2 Complete relevant work related documents. 1.3 Participate in workplace meeting and discussion.	<ul style="list-style-type: none"> • Group discussion • Interaction 	<ul style="list-style-type: none"> • Demonstration • Observation • Interviews/questioning
2. Work in a team environment	2.1 Describe and identify team role and responsibility in a team. 2.2 Describe work as a team member.	<ul style="list-style-type: none"> • Discussion • Interaction 	<ul style="list-style-type: none"> • Demonstration • Observation • Interviews/questioning
3. Practice career professionalism	3.1 Integrate personal objectives with organizational goals. 3.2 Set and meet work priorities. 3.3 Maintain professional growth and development.	<ul style="list-style-type: none"> • Discussion • Interaction 	<ul style="list-style-type: none"> • Demonstration • Observation • Interviews/questioning
4. Practice occupational health and safety	4.1 Evaluate hazard and risks 4.2 Control hazards and risks 4.3 Maintain occupational health and safety awareness	<ul style="list-style-type: none"> • Discussion • Plant tour • Symposium 	<ul style="list-style-type: none"> • Observation • Interview

COMMON COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Apply Appropriate Sealant/ Adhesive	1.1. Identify appropriate sealant/ adhesive 1.2. Prepare surface for sealant/ adhesive application 1.3. Store unused and dispose used sealant/adhesive	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
2. Move and Position Vehicle	2.1. Prepare vehicle for driving 2.2. Move and position vehicle 2.3. Check the vehicle	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
3. Perform Mensuration and Calculation	3.1. Select measuring instrument and carry out measurement and calculations. 3.2. Maintain measuring instruments	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
4. Read, Interpret and Apply Specifications and Manual	4.1. Identify/accessed manuals and interpret data and specification 4.2. Apply information accessed in manual 4.3. Store manual	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
5. Use and Apply Lubricant/ Coolant	5.1. Identify type of lubricant/coolant 5.2. Use and apply lubricant	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
6. Perform Shop Maintenance	6.1. Inspect/clean tools and work area 6.2. Store/arrange tools and shop equipment 6.3. Dispose wastes/used lubricants 6.4. Report damaged tools/equipment	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
7.Prepare job estimates	7.1 Identify nature/scope of work 7.2 Prepare and present estimates	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self-paced (modular) • Distance learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
8. Interpret/Draw technical drawing	8.1 Interpret technical drawing 8.2 Select correct technical drawing 8.3 Apply freehand sketching	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self-paced (modular) • Distance learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
9.Practice health, safety and environment procedures	9.1 Apply basic safety procedures 9.2 Apply emergency procedures	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self-paced (modular) • Distance learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
10.Inspect technical quality of work	10.1 Gather information to carry out inspection 10.2 Inspect and apply quality standards to work 10.3 Achieve quality work outcomes	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self-paced (modular) • Distance learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
11.Maintain quality systems	11.1 Conduct final quality check on completed work/ orders 11.2 Report on the quality of processes and work outcomes 11.3 Implement improvements to work processes	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self-paced (modular) • Distance learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
12.Provide work skill instructions	12.1 Organize instruction and demonstration 12.2 Conduct instruction and demonstration 12.3 Check training performance 12.4 Review personal training performance and finalize documentation	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self-paced (modular) • Distance learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview
13.Identify and select original automotive parts and products	13.1 Identify the part/ product and its end use 13.2 Identify details of the part/ product 13.3 part/ product is supplied or ordered for customer	<ul style="list-style-type: none"> • Lecture/ Demonstration • Dual training • Self-paced (modular) • Distance learning 	<ul style="list-style-type: none"> • Written test • Oral questioning • Direct observation • Project method • Interview

CORE COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Service Automotive Battery	1.1 Identify and explain the operation and safe handling of different types of battery 1.2 Demonstrate the testing of an automobile battery 1.3 Demonstrate the correct procedure for removing and replacing batteries 1.4 Demonstrate the correct procedure for servicing and charging batteries 1.5 Demonstrate the procedure of jump starting a battery	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Demonstration of practical skills • Direct observation • Interview
2. Service Ignition System	2.1 Identify and explain the function of ignition system components 2.2 Check ignition coil, ballast resistor and high-tension cable resistance. 2.2 Check distributor assembly	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Interview • Written • Practical • Direct Observation
3. Test and Repair Wiring/ Lighting System	3.1 Explain principle of auto electricity 3.2 Identify components of auto lighting system and explain its function 3.3 Install wiring/lighting system 3.4 Test electrical system, identify faults and determine preferred repair action 3.5 Carry out necessary repairs in the electrical system	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Interview • Written • Practical • Direct Observation
4. Service Starting System.	4.1 Test starting system components and identify faults. 4.2 Disassemble starter 4.3 Repair/replace starter component/parts 4.4 Test starting system component and identify faults 4.5 Assemble starter	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Demonstration of practical skills • Direct observation • Interview
5. Service Charging System.	5.1 Test charging system components and identify faults. 5.2 Disassemble alternator 5.3 Repair/replace alternator component/parts 5.4 Test charging system component and identify faults 5.5 Assemble alternator	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Demonstration of practical skills • Direct observation • Interview
6. Service Engine Mechanical System	6.1 Explain coolant circulation within cooling system. 6.2 Check thermostat condition 6.3 Perform leakage test on cooling system 6.4 Repair/Replace water pump 6.5 Apply coolant additives 6.6 Explain oil cycle within the engine 6.7 Identify types, Classifications and Applications of engine oil 6.8 Overhaul oil pump, replace oil fitter and change oil	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Written examination • Demonstration of practical skills • Direct observation • Interview

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
	6.9 Explain Fuel Octane Rating 6.10 Identify Fuel pump types/classification 6.11 Perform carburetor adjustment 6.12 Overhaul carburetor 6.13 Overhaul turbo charger 6.14 Check turbo charger operation 6.15 Overhaul fuel diesel injector 6.16 Calibrate/Install injector		•
7. Service Clutch System	7.1 Diagnosing clutch failure/problem 7.2 Pulling out and mounting clutch component parts 7.3 Dismantling/Installing clutch mechanism 7.4 Overhauling hydraulic clutch mechanism 7.5 Performing clutch parts failure analysis 7.6 Setting/Adjusting clutch system components 7.7 Bleeding clutch hydraulic system	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Demonstration of practical skills • Direct observation • Interview
8. Service Differential and Front Axle	8.1 Inspect drive shaft and joint properly & safety 8.2 Dismount & mount differential assembly properly & safety 8.3 Dismantle & assemble differential parts properly & safety 8.4 Diagnose differential parts failure accurately 8.5 Set/Adjust differential components precisely 8.6 Overhaul rear/front wheel hub properly & safety 8.7 Analyze king pin condition accurately 8.8 Inspect/replace I beam properly & safety	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Demonstration of practical skills • Direct observation • Interview
9. Service Steering System	9.1 Service steering system. 9.2 Diagnose power steering system failure. 9.3 Adjust/align tie-rod end to wheel. 9.4 Dismantle/Install steering component. 9.5 Conduct wheel alignment.	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Demonstration • Direct Observation
10. Service Brake System	10.1 Identify the types of hydraulic brake (hydraulic ABS) and its corresponding component and function. 10.2 Explain the operating principle of ABS equipped brake. 10.3 Interpret schematic diagrams and circuitry. 10.4 Performed brake system preventive maintenance. 10.5 Diagnose brake system failure. 10.6 Performed ABS component testing. 10.7 Pull-out and disassemble hydraulic brake component.	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Written examination • Demonstration of practical skills • Direct observation • Interview •

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
	10.8 Check, assemble and mount hydraulic brake component. 10.9 Use appropriate tools and instrument.		
11. Service Suspension System	11.1 Identify the types of suspension system, component and its operating principle (conventional and air suspension). 11.2 Diagnose Suspension system failure. 11.3 Disassemble and assemble suspension system (conventional type). 11.4 Inspect and replace suspension system component (conventional type). 11.5 Service air suspension system.	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Written examination • Demonstration of practical skills • Direct observation • Interview
12. Perform Under Chassis Preventive Maintenance	12.1 Check clutch and brake fluid and lines 12.2 Inspect/change power transmission/different gear oil 12.3 Inspect/replace power steering fluid 12.4 Check/refill automatic transmission fluid 12.5 Inspect/bleed air tank 12.6 Check tire and tire pressure 12.7 Check under chassis body bolts and nuts	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Interview • Practical • Direct Observation
13. Overhaul Manual Transmission	13.1 Identify types of transmission and components. 13.2 Testing transmission. 13.3 Pull-out and dismount manual transmission and associate component. 13.4 Disassemble manual transmission. 13.5 Inspect and check manual transmission component. 13.6 Assemble manual transmission component. 13.7 Install, mount manual transmission and associated 13.8 Test manual transmission performance.	<ul style="list-style-type: none"> • Demonstration • Discussion • Dual training • Distance learning 	<ul style="list-style-type: none"> • Written examination • Demonstration of practical skills • Direct observation • Interview

3.2 TRAINING DELIVERY

The delivery of training should adhere to the design of the curriculum. Delivery should be guided by the 10 basic principles of competency-based TVET.

- The training is based on curriculum developed from the competency standards;
- Learning is modular in its structure;
- Training delivery is individualized and self-paced;
- Training is based on work that must be performed;
- Training materials are directly related to the competency standards and the curriculum modules;
- Assessment is based in the collection of evidence of the performance of work to the industry required standard;
- Training is based both on and off-the-job components;
- Allows for recognition of prior learning (RPL) or current competencies;
- Training allows for multiple entry and exit; and
- Approved training programs are nationally accredited.

The competency-based TVET system recognizes various types of delivery modes, both on and off-the-job as long as the learning is driven by the competency standards specified by the industry. The following training modalities may be adopted when designing training programs:

- The dualized mode of training delivery is preferred and recommended. Thus programs would contain both in-school and in-industry training or fieldwork components. Details can be referred to the Dual Training System (DTS) Implementing Rules and Regulations.
- Modular/self-paced learning is a competency-based training modality wherein the trainee is allowed to progress at his own pace. The trainer facilitates the training delivery
- Peer teaching/mentoring is a training modality wherein fast learners are given the opportunity to assist the slow learners.
- Supervised industry training or on-the-job training is an approach in training designed to enhance the knowledge and skills of the trainee through actual experience in the workplace to acquire specific competencies prescribed in the training regulations.
- Distance learning is a formal education process in which majority of the instruction occurs when the students and instructor are not in the same place. Distance learning may employ correspondence study, or audio, video or computer technologies.

3.3 TRAINEE ENTRY REQUIREMENTS

Trainees or students should possess the following requirements:

- can communicate both oral and written;
- can perform basic mathematical computation.

This list does not include specific institutional requirements such as educational attainment, appropriate work experience, and others that may be required of the trainees by the school or training center delivering the TVET program.

3.4 TOOLS, EQUIPMENT AND MATERIALS AUTOMOTIVE SERVICING – NC II

Recommended list of tools, equipment and materials for the training of 20 trainees for Automotive Servicing – NC II

TOOLS		EQUIPMENT		MATERIALS	
QTY		QTY		QTY	
4 sets	• Box wrench	2 units	• Motor Vehicle	50 ltrs.	• Engine oil
4 sets	• Socket wrench	2 units	• Engine	10 ltrs.	• Grease
4 sets	• Pliers	2 units	• Hydraulic jack/lift	10 ltrs.	• Sealant /adhesive
4 sets	• Screw driver	4 units	• Growler tester	50 ltrs.	• Hydraulic oils/gear oil
4 sets	• Wire stripper	4 units	• Ignition timing light	50 ltrs.	• Automatic transmission fluid
4 sets	• Mechanic's hammer	4 units	• Tachometer	10 pcs.	• Wheel wedges
20 pcs.	• Apron	4 units	• Differential and front axle	10 pcs.	• Test lamp
20 pcs.	• Goggle	4 units	• Multimeter		
20 pcs.	• Glove				
4 sets	• Torque wrench				
4 sets	• Feeler gauge				
4 sets	• Battery tester				
4 sets	• Hydrometer				
4 sets	• Dial gauge				
4 sets	• Bore gauge				
4 sets	• Micrometer caliper				

3.5 TRAINING FACILITIES

AUTOMOTIVE SERVICING – NC II

The automotive workshop must be made of reinforced concrete or steel structure. The size must be suited on the requirements of the competencies. The class size of 25 students/trainees is reserved for the lecture room and the practical demonstration area for carrying out servicing of minor automotive parts. Most of the learning activities such as on-vehicle servicing are performed in the workshop.

SPACE REQUIREMENT	SIZE IN METERS	AREA IN SQ. METERS	TOTAL AREA IN SQ. METERS
• Building (permanent)	12.00 x 32.00	-	384.00
• Student/Trainee Working Space	2.50 x 2.50 per student/trainee	6.25 per student	156.25
• Contextual Learning Laboratory	4.00 x 5.00	20.00	20.00
• Lecture Room	4.00 x 7.00	28.00	28.00
• Learning Resource Center	4.00 x 5.00	20.00	20.00
• Facilities/Equipment /Circulation Area	-	-	159.75

3.6 TRAINERS' QUALIFICATION

AUTOMOTIVE/LAND TRANSPORT SECTOR

AUTOMOTIVE SERVICING – NC II

- Holder of National TVET Trainers Certificate (NTTC) Level 1 - Automotive Servicing NC II
- Must be computer literate
- *Must have at least 2 years job/industry experience

3.7 INSTITUTIONAL ASSESSMENT

Institutional assessment is undertaken by trainees to determine their achievement of units of competency. A certificate of achievement is issued for each unit of competency.

SECTION 4 NATIONAL ASSESSMENT AND CERTIFICATION ARRANGEMENTS

- 4.1 To attain the National Qualification of Automotive Servicing NC II, the candidate must demonstrate competence through project-type assessment covering all the units listed in Section 1. Successful candidates shall be awarded a National Certificate signed by the TESDA Director General.
- 4.2 Individual aspiring to be awarded the qualification of Automotive Servicing NC II must acquire Certificates of Competency in all the following core units of the Qualification. Candidates may apply for assessment in any accredited assessment center.

4.2.1 Service Engine Component

- Service Engine Mechanical Components

4.2.2 Service Automotive Electrical Components

- Service Automotive Battery
- Service Ignition System
- Test and Repair Wiring/Lighting System
- Service Starting System
- Service Charging System

4.2.3 Service Underchassis Components

- Perform Underchassis Preventive Maintenance
- Service Steering System
- Service Brake System
- Service Suspension System

4.2.4 Service Powertrain Components

- Service Clutch System
- Service Differential and Front Axle
- Overhaul Manual Transmission

Successful candidates shall be awarded Certificates of Competency (COC).

- 4.3 Accumulation and submission of all COCs acquired for the relevant units of competency comprising a qualification, an individual shall be issued the corresponding National Certificate.
- 4.4 Assessment shall focus on the core units of competency. The basic and common units shall be integrated or assessed concurrently with the core units.
- 4.5 The following are qualified to apply for assessment and certification:
- 4.5.1 Graduates of formal, non-formal and informal including enterprise-based training programs.
 - 4.5.2 Experienced workers (wage employed or self employed)
- 4.6 The guidelines on assessment and certification are discussed in detail in the "Procedures Manual on Assessment and Certification" and " Guidelines on the Implementation of the Philippine TVET Qualification and Certification System (PTOQCS)".

**COMPETENCY MAP -
AUTOMOTIVE SERVICING NC II**

**CORE
COMPETENCIES**

Service automotive battery	Service ignition system	Test and repair wiring/lighting system	Service starting system	Service charging system	Service engine mechanical system
Service clutch system	Service differential and front axle	Service steering system	Service brake system	Service suspension system	Perform underchassis preventive maintenance
					Overhaul manual transmission

**COMMON
COMPETENCIES**

Practice health safety and environment procedures	Inspect technical quality of work	Maintain quality systems	Provide work skill instructions	Identify and select original automotive parts and products
Perform mensuration and calculation	Move and position vehicle	Apply appropriate sealant/adhesive	Use and apply lubricant/ coolant	Perform shop maintenance
				Read, interpret and apply specification and manuals
				Interpret/draw technical drawing
				Prepare job estimate/costing

**BASIC
COMPETENCIES**

Receive and respond workplace communication	Work with Other	Demonstrate work values	Practice basic housekeeping procedures	Lead in workplace communication	Develop and practice negotiation skills	Use relevant technologies	Solve problems related to work activities
Participate in workplace communication	Work in team environment	Practice career professionalism	Practice occupational health and safety procedures	Lead small Team	Use mathematical concepts and techniques		
Plan and organize work	Utilize specialist communication skills	Promote environmental Protection	Develop team and individual	Apply problem solving techniques in the workplace	Collect, analyze and organize work		

DEFINITION OF TERMS

1. **Light Duty Vehicles** These are motor vehicles whose gross vehicle weight is equal or less than 3,500 kgs. Powered by a gas or diesel engine.
2. **Automotive Service Technician** Refers to an all around auto serviceman that can perform both mechanical and electrical as well as auto electronics maintenance checking and inspection of motor vehicle. Assesses vehicle problems, perform all necessary diagnostic test or installation of accessories and competently repairs or replaces faulty parts.
3. **Adhesives** Substance used to hold gasket in place during assembly. It also maintains a tight seal by filling in small irregularities on a surface and prevents gasket from shifting due to vibration.
4. **Anti-Lock Braking System** System that automatically controls wheel slip or prevents sustained wheel locking on braking
5. **Automatic Transmission** A transmission in which gear or ratio changes are self-activated, eliminating the necessity of hand shifting gears
6. **Backlash** The amount of clearance or play between two meshed gears
7. **Catalytic Converter** Emission The control device fitted in the exhaust system of an internal combustion engine. The converter reduces the toxicity of products of combustion by catalytic re-combination
8. **Charcoal Canister** Trap containing charcoal granules to store fuel evaporating from a fuel system and prevent its loss to atmosphere, particularly from a carburetor and fuel tank.
9. **Electronics** Electrical assemblies, circuit and system that use electronic devices such as transistors and diodes.
10. **Emissions** Any air contaminant, pollutant, gas stream from a known source which is introduced into the atmosphere.
11. **Final Drive** The end of the drive train before power is transmitted to the wheels.
12. **Fuel Injection** An electronic system that increases the performance ad fuel economy because it monitors engine conditions and provides the correct air/fuel mixture based on the engine's demand. It injects fuel directly into the cylinder head enabling more precise control over the quantity used.
13. **Governor** A speed sensing device that employs centrifugal force and spring tension to govern engine speed.
14. **Hotchkiss Drive** The type of rear suspension in which leaf springs absorbs the rear axle housing torque.
15. **Intake Manifold** Tubing attached to the engine through which the air/fuel mixture reaches the cylinder.

- 16. Ignition System** Electrical system devised to produce timed sparks from engine spark plug. Consisting of a battery, induction coil, capacitor, distributor, spark plugs and relevant switches and wiring.
- 17. Master Cylinder** The liquid-filled cylinder in the hydraulic brake system or clutch, where hydraulic pressure is developed when depresses a foot pedal.
- 18. Periodic Maintenance Service** The regular servicing prescribed by manufacturer to maintain the vehicle's top performance.
- 19. Positive Crank Ventilation** Emission control system that prevents crank case gases from entering the atmosphere, usually by drawing the gases from the crank case and feeding them into the engine's induction system.
- 20. Power Steering** Steering that has been designed to make the wheel move more easily than in a manual steering system. Hydraulic assists the process utilizing hydraulic fluid. The fluid increases pressure in the power steering pump and aids in the movement of the steering mechanism. This fluid, called power steering fluid, is what is replaced at regular intervals to keep steering soft and comfortable.
- 21. Super Charged Engine** An engine that is similar to a turbo-charged engine which uses a series of belts or chains from the crankshaft to turn the turbines that forces the air/fuel mixture into the cylinder heads under pressure creating a bigger explosion which generates more power. A turbocharger uses the exhaust gases to turn the turbines to create the same effect.
- 22. Transaxle** Type of construction in which the transmission and differential are combined in one unit.
- 23. Thermostat** A device for automatic regulation of temperature
- 24. Turbo Charged Engine** A performance-increasing turbine positioned in the exhaust system. Expanding exhaust gases spin an impeller (very small fan-type blades) at speeds up to 25 thousand rpm, driving a similar compressing impeller. Compressed air from the driven impeller is forced into the induction system, which squeezes more air/fuel mixture into the combustion chambers. With the greater charge of air and fuel, a more powerful combustion burn results, thus more power. The big advantage of the turbo over directly driven superchargers is the increased efficiency, although there is a slight lag before the turbine spins up and increases the power output. Originally turbo were developed to enable aircraft to fly at high altitudes, then they found use in diesel trucks and train engines to increase their torque.
- 25. U-joint** A four-joint cross-connected to two U-shaped yokes that serve as a flexible coupling between shafts.

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