TRAINING REGULATIONS

AUTO ENGINE REBUILDING 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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AUTOMOTIVE/LAND TRANSPORT SECTOR

AUTO ENGINE REBUILDING NC II

TRAINING REGULATIONS FOR
AUTO ENGINE REBUILDING NC II

SECTION 1 AUTO ENGINE REBUILDING NC II QUALIFICATION

The AUTO ENGINE REBUILDING NC II Qualification consists of competencies that a person must achieve to restore defective/worn-out engine parts back to manufacturer's specifications; inspects, measures and interprets blueprints and repair procedures; sets up and operates variety of specialized metalworking machines and uses precision measuring instrument in repairing automotive engine parts.

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 Lubricant/Coolant
ALT723205	Perform Shop Maintenance

CODE NO.	CORE COMPETENCIES
ALT723328	Interpret Technical Manual Specification of Engine Components
ALT723329	Disassemble Engine Block and Sub-Assemblies, Checks Tolerances and Components
ALT723330	Disassemble Engine Sub-Assemblies/Cylinder Heads and Check Components
ALT723331	Carry Out Pre-Repair Operations on Engine Components
ALT723332	Inspect Engine Components and Determine Preferred Action
ALT821301	Carry Out Machining Operations
ALT821302	Set, Operate and monitor Specialized Machines

ALT821303	Use and Maintain Measuring Instrument
ALT723333	Assemble Engine Block and Sub Assemblies, Check Tolerances and Carry Out Relevant Testing
ALT723334	Assemble Engine/Cylinder Heads, Check Tolerances and Carry Out Relevant Testing Procedures

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

- Automotive Engine Rebuilder
- Machinist

SECTION 2 COMPETENCY STANDARDS

This section gives the details of the contents of the basic, common and core units of competency required in AUTO ENGINE REBUILDING 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 ***Italicized*** 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 maters 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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 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
2. Underpinning Knowledge and Attitudes	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
3. Underpinning Skills	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
4. Resource Implications	4.1. Fax machine 4.2. Telephone 4.3. Writing materials 4.4. Internet
5. Methods of Assessment	5.1. Direct Observation 5.2. Oral interview and written test
6. Context of Assessment	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 ***Italicized*** 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

1. Critical aspects of competency	Assessment requires evidence that the candidate: 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
2. Underpinning Knowledge and Attitude	2.1. Communication process 2.2. Team structure 2.3. Team roles 2.4. Group planning and decision making
3. Underpinning Skills	3.1. Communicate appropriately, consistent with the culture of the workplace
4. Resource Implications	The following resources **MUST** be provided: 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
5. Methods of Assessment	Competency may be assessed through: 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
6. Context for Assessment	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 ***Italicized*** 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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 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
2. Underpinning Knowledge	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
3. Underpinning Skills	3.1 Appropriate practice of personal hygiene 3.2 Intra and Interpersonal skills 3.3 Communication skills
4. Resource Implications	The following resources **MUST** be provided: 4.1 Workplace or assessment location 4.2 Case studies/scenarios
5. Methods of Assessment	Competency may be assessed through: 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
6. Context of Assessment	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 ***Italicized*** 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

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
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 • 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

VARIABLE	RANGE
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

1. Critical Aspects of Competency	Assessment requires evidence that the candidate: 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
2. Underpinning Knowledge and Attitude	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
3. Underpinning Skills	3.1 Practice of personal hygiene 3.2 Hazards/risks identification and control skills 3.3 Interpersonal skills 3.4 Communication skills
4. Resource Implications	The following resources must be provided: 4.1 Workplace or assessment location 4.2 OHS personal records 4.3 PPE 4.4 Health records
5. Methods of Assessment	Competency must be assessed through: 5.1 Portfolio Assessment 5.2 Interview 5.3 Case Study/Situation
6. Context for Assessment	6.1 Competency may be assessed in the work place or in a simulated work place setting

COMMON COMPETENCIES
AUTOMOTIVE

UNIT OF COMPETENCY: PERFORM MENSURATION AND CALCULATION

UNIT CODE: ALT311202

UNIT DESCRIPTOR: This unit includes identifying caring, handling and use of measuring instruments.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms 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 to job 2.3 ***Calculation*** needed to complete work tasks are performed using the four basic process 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 must kept free from corrosion 3.2 Measuring instruments not dropped to avoid damage 3.3 Measuring instruments cleaned before and after using.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Measuring instruments	Measuring instruments includes: 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	Kinds of Part Mensuration 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 2.11Oil clearance 2.12 End play/thrust clearance

EVIDENCE GUIDE

1. Critical aspect 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. Underpinning knowledge and attitudes	2.1 Types of Measuring instruments and its uses 2.2 Safe handling procedures in using measuring instruments 2.3 Four fundamental operation of mathematics 2.2 Formula for Volume, Area, Perimeter and other geometric figures
3. Underpinning skills	3.1 Caring and Handling measuring instruments 3.2 Calibrating and using measuring instruments 3.1 Performing calculation by Addition, Subtraction, Multiplication and Division 3.2 Visualizing objects and shapes 3.3 Interpreting formula for volume, area, perimeter and other geometric figures
4. Resource implication	The following resources must be provided: 4.1 Workplace location 4.2 Measuring instrument appropriate to servicing processes 4.3 Instructional materials relevant to the propose activity
5. Methods of assessment	Competency must be assessed through: 5.1 Observation with questioning 5.2 Written or oral examination 5.3 Interview 5.4 Demonstration with questioning
6. Context for 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 ***Italicized*** terms 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 is checked to ensure correct specification and procedure are identified.
2. Interpret manuals	2.1 Relevant sections, chapters of manuals/specifications are located in relations to the work to be conducted 2.2 Information and procedure in the manual are interpreted in accordance to 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 is 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	Kinds of manuals: 1.1 Manufacturer's specification manual 1.2 Repair manual 1.3 Maintenance Procedure Manual 1.4 Periodic Maintenance Manual

EVIDENCE GUIDE

1.Critical aspect 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. Underpinning knowledge and attitudes	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. Underpinning 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 must be provided: 4.1 All manuals/catalogues relative to Automotive 4.2 Job order, requisitions 4.3 Actual vehicle or simulator
5. Methods of assessment	Competency must be assessed through: 5.1 Observation with questioning 5.2 Interview
6. Context for 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: MOVE AND POSITION VEHICLE

UNIT CODE: ALT723202

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

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Prepare vehicle for driving	1.1 Correct ***check-up procedures*** performed based on vehicle manufacturer 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 required 3.2 Vehicle is checked for external damages

RANGE OF VARIABLE

VARIABLE	RANGE
1. Check up procedure	Check up procedures include the following: 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	2.1 Vehicles with automatic transmission 2.2 Vehicles with manual transmission
3.Parking safety techniques	3.1 Engaging of Park brake 3.2 Vehicle parking position 3.3 Front wheel position

EVIDENCE GUIDE

1.Critical aspect of competency	Assessment requires evidence that the candidate: 1.1 Prepared vehicle for driving. 1.2 Moved and positioned vehicle 1.3 Checked the vehicle.
2. Underpinning knowledge and attitudes	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. Underpinning skills	3.1 Ability to handle vehicle/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	The following resources must be provided: 4.1 Driving range/area 4.2 Appropriate vehicle for driving 4.3 Vehicle accessories
5. Method of assessment	Competency must be assessed through: 5.1 Observation with questioning 5.2 Written or oral examination
6. Context for assessment	6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines 6.3 Assessment of practical skills must be done in a workplace or simulated environment.

UNIT OF COMPETENCY: APPLY APPROPRIATE SEALANT/ADHESIVE

UNIT CODE: ALT723201

UNIT DESCRIPTOR: This competency unit covers the selection and application of sealant/adhesives.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Identify appropriate Sealant/adhesive	1.1 ***Sealant/adhesive*** selected in line with job requirements and manufacturer's specification 1.2 ***Sealant/adhesive checking*** is performed to ensure that 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 SOP

RANGE OF VARIABLES

VARIABLE	RANGE
1. Sealant/Adhesive	Sealant/adhesive includes: 1.1Form in Place Gasket (FIPG) 1.2 Ribbon Sealer 1.3Hametite 1.4Silicon Body sealer 1.5 Prestite for Auto and Auto Aircon
2. Tools and equipment	Tools and equipment 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 2.11Goggles 2.12Gas mask
3. Safety	Safety includes: 3.1 Ventilation 3.2 Handling of Flammable/Irritating substances 3.3 Use of Personal Protective Equipment
4. Hazards	Hazard includes: 4.1 Fumes 4.2 Skin irritation 4.3 Burns
5.Adhesive/Sealant checking	Adhesive/Sealant checking includes: 5.1 Expiry date 5.2 Free of contamination 6.1 Cap/Covers 6.2 Tightly closed 6.3 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. Underpinning knowledge and attitude	2.1 OH & S regulations 2.2 Safe handling of sealant/adhesive 2.3 Industry code of practice 2.3 Procedures in sealant/adhesive application 2.4 Procedures in interpreting manuals
3. Underpinning 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 must be provided: 4.1 Materials relevant to the activity 4.2 Appropriate tools and equipment 4.3 Real or simulated workplace
5. Methods of assessment	Competency must be assessed through 5.1 Observation with questioning 5.2 Interview related to: • Safe and correct use of tools and equipment • Application of adhesive/sealant
7. Context for 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: USE AND APPLY LUBRICANTS/COOLANT

UNIT CODE: ALT723204

UNIT DESCRIPTOR: This unit identifies the competencies required to select and apply different types of lubricants.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Identify types of lubricants/ coolant	1.1 Correct information on ***lubrication schedule*** is accessed and interpreted from appropriate manufacturers specifications ***manuals*** 1.2 Type and quantity of ***lubricants/coolant*** is 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 2.1 Correct tools and equipment are selected and used in line with job requirements 2.3 Existing lubricants is removed and replaced with specified types and quantity of new materials in line with manufacturer's specification 2.4 Safe procedure and use of ***PPE*** is 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* ***Tools, equipment*** and materials are properly stored as per company SOP 3.2 Workplace is free from waste materials

RANGE OF VARIABLES

VARIABLE	RANGE
1. Manuals	1.1 Manufacturer's specification manual 1.2 Periodic Maintenance manual 1.3 Service Manual
2.Lubricants/ Coolant	Kinds of lubricants include: 2.1 Engine oil: • Diesel engine oil • Gasoline engine oil 2.2 Automatic Transmission Fluid • Destro II • T4 2.3 Gear oil lubricants: • Oil #90 • Oil #140 • Oil #30 • Oil #40 2.4 Grease • Special (velocity joint) Molybdenum disolfate) • Ordinary • Multi-purpose oil • Contact point lubricant (grease) 2.5 Brake/Clutch System • Brake fluid • DOT3 2.6 Power Steering Fluid • Hydraulic Fluid 2.7 Radiator Coolant • Long last coolant 2.8 A/C Compressor Oil • Pag oil
3. Lubricant Schedule	Schedule for changing oil: 3.1 Kilometers traveled used 3.2 No. of Hours used 3.3 Monthly
4. Tool and equipment	Tools used includes: 4.1 Hand tools 4.2 Oiler 4.3 Oil Dispenser 4.4 Grease gun
5. Personal Protective Equipment (PPE)	PPE include: 5.1 Apron 5.2 Gloves 5.3 Goggles 5.4 Safety shoes

EVIDENCE GUIDE

1. Critical aspect 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. Underpinning knowledge and attitudes	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. Underpinning 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 must be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate tools and equipment 4.3 Materials relevant to activity
5. Methods of assessment	Competency must be assessed through 5.1 Demonstration with questioning 5.2 Written/Oral examination
6. Context for 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 6.3 Assessment of underpinning knowledge 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 and checking of tools/ equipment and disposal of used materials are also incorporated in this competency

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms 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 **W*ork 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 has no error/discrepancy

RANGE OF VARIABLES

VARIABLE	RANGE
1. Work Area	Work areas 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: • Mess hall • Wash room • Comfort room
2. Cleaning requirement	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	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	Wearing of Personal protective equipment 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: 1.1Cleaned workshop tools/facilities 1.2Maintained equipment, tools and facilities 1.3Disposed wastes and used lubricants/fluid as per required procedure
2. Underpinning knowledge and attitudes	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. Underpinning 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 must 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 must be assessed through: 5.1 Written/Oral Questioning 5.2 Demonstration 5.3 Assessment of underpinning knowledge 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.

CORE COMPETENCIES

UNIT OF COMPETENCY: INTERPRET TECHNICAL MANUAL SPECIFICATION OF ENGINE COMPONENTS

CODE : ALT723328

UNIT DESCRIPTOR: This unit identifies the competence required to compare components to original manufacturer specifications and match in relation to weight, size, and capacity with reference to the technical data.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Carry out interpretation of manual specifications	1.1 Correct information is accessed and interpreted from appropriate manufacturer specifications 1.2 Symbols, codes, legends and diagrams interpreted 1.3 Representations are correctly recognized 1.4 Parts/systems/***components***/item represented is correctly identified 1.5 Information represented is correctly understood 1.6 Components are prepared for inspection/ measurement. 1.7 Appropriate ***measuring instrument*** and ***tools*** are used as prescribed. 1.8 Measurements are compared against original equipment manufacturer (OEM) specifications 1.9 Components are adjusted to meet OEM specifications without ***damage***. 1.10 All interpretation of manual specification are carried out according to industry regulations/guidelines, ***occupational health and safety*** (***OHS)*** requirements, and enterprise procedures/policies

RANGE OF VARIABLES

VARIABLE	RANGE
1. Components	Components to be measured includes but is not limited to: 1.1 Crankshaft journals •Main journal •Connecting rod journal (Crank pin) 1.2 Cylinder Head 1.3 Cylinder Bores 1.4 Camshaft journal 1.5 Connecting rods 1.6 All clearances • Bearing • Piston • Ring end gaps • Camshaft clearance • Crankshaft • Backlash
2 Damages	Damages incurred during measurement of components includes: 2.1 Useless repairs 2.2 Unnecessary expenses 2.3 Waste of time, efforts, and materials
3 Measuring instruments/ equipment and Tools	3.1 Lifting equipment, balancing equipment, scales, measuring equipment (both graduated and volumetric devices) 3.2 Handtools, Power tool, 3.3 Manuals
4 OHS Requirements	4.1 Wearing of personal protective equipment such as apron, goggles, gloves, safety shoes 4.2 Disposal of wastes materials 4.3 Workshop housekeeping

EVIDENCE GUIDE

1. Critical aspects competency	Assessment requires evidence that the candidate: 1.1 Interpreted the blueprint of components without damage or injury to tools, equipment and personnel 1.2 Interpreted the blueprint of components to specified tolerances following company procedures
2. Underpinning knowledge and attitudes	2.1 Technical information including technical drawings and technical symbols 2.2 Equipment safety requirements 2.3 Personal safety requirements 2.4 Equipment and machinery safety requirements 2.5 Techniques in measuring, balancing and machining 2.6 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3. Underpinning skills	3.1 Accessing and interpreting technical information 3.2 Using relevant tools/equipment 3.3 Applying measuring techniques 3.4 Applying balancing techniques 3.5 Applying relevant machining techniques
4. Resource implications	The following resources must 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 must be assessed through: 5.1 Actual demonstration of skills in weighing, balancing, checking volumes, machining, measuring and comparison from specification 5.2 Written/Oral examination
6. Context for assessment	6.1 Competency elements must be assessed in a safe working environment, using tools and equipment as stipulated in the resources section of the Evidence Guide 6.2 Assessment must be undertaken in accordance with the TESDA Assessment Guidelines. 6.3 The assessment of practical skills must only take place after a period of supervised practice and repetitive experience. If workplace conditions are not available, assessment in simulated workplace conditions is acceptable.

UNIT OF COMPETENCY: DISASSEMBLE ENGINE BLOCK AND SUB-ASSEMBLIES, CHECK TOLERANCES AND COMPONENTS

UNIT CODE: ALT723329

UNIT DESCRIPTOR: This unit identifies the competence required to disassemble, inspect, evaluate and determine preferred repair action for engine block and sub-assemblies as part of a reconditioning procedure.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1.Disassemble engine block and sub-assemblies	1.1 ***Engine*** block and sub-assemblies are disassembled without causing damage to any ***component or system***. 1.2 Engine block and sub-assemblies are disassembled using approved ***methods*** and appropriate ***equipment*** and ***tools.*** 1.3 Correct information is accessed and interpreted from appropriate manufacturer specifications. 1.4 Components/system are cleaned in preparation for evaluation 1.5 All disassembling/cleaning activities are carried out according to industry regulations/guidelines, ***occupational health and safety procedures*** and company policies using appropriate tools and equipment.
2. Inspect/measure/ test engine block and sub-assembly components and determine repair procedures	2.1 Inspection/measurement/testing method is completed without causing damage to any component or system. 2.2 Correct information is accessed and interpreted from appropriate manufacturer specifications 2.3 Engine block and sub-assembly components are measured against manufacturer specifications and tolerances. 2.4 Engine block and sub-assembly components are evaluated against measurements, test and inspections made. 2.5 Repair requirements are identified and reported according to enterprise policy and procedure. 2.6 Appropriate workplace documentation is completed and dealt with relevant to inspection/measurements/testing outcomes. 2.7 All inspection/measurement/testing activities are carried out according to industry regulations/guidelines, occupational health and safety and company policies using appropriate tools and equipment.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Engine	1.1 Gasoline 1.2Diesel
2. Components or System	Components or system of the engine includes Short engines, various engine components Such as: 2.1 Crankshafts 2.9 Gears 2.2 Camshaft 2.10 Timing Chains 2.3 Cylinder blocks 2.11 Timing Belts 2.4 Idler shaft 2.12 Pulleys 2.5 Pistons 2.13 Engine Oil pumps 2.6 Connecting rods 2.14 Cylinder head 2.7 Bearings 2.15 Rocker Arm Shaft 2.8 Piston Rings
3.Methods	Methods applied under normal operating condition includes: 3.1Disassembling 3.2 Cleaning 3.3 Measuring against specifications 3.4Various testing (e.g. crack and pressure tests) 3.5Visual inspection 3.6Comparing against specifications
4. Tools/Equipment	4.1 Handtools 4.2 Power Tools/Equipment 4.3 Special equipment 4.4 Measuring equipment/tools • Straight edge • Caliper • feeler gage • micrometer • Vernier caliper • inside caliper • dial gage) 4.5 Lifting equipment (Hoist or Jack) 4.6 Testing equipment 4.7 Cleaning equipment 4.8 Crack testing equipment 4.9 Pressure testing equipment
5. Occupational Health and Safety Procedures	5.1 Use of Personal Protective Equipment • Face Shields/safety goggles • Gloves • Apron • Safety shoes 5.2 Safe Handling of • Equipment • Tools and materials

EVIDENCE GUIDE

1.	Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Disassembled and conducted accurate assessment of condition of engine block and sub-assembly. 1.2 Determined appropriate repair action
2.	Underpinning knowledge and attitudes	2.1 Disassembling methods and procedures 2.2 Procedure in measuring and testing 2.3 Methods of repair 2.4 Equipment safety requirements 2.5 Relevant company policies 2.6 Personal safety requirements 2.7 Manual handling techniques 2.8 Cleaning methods and materials 2.9 Construction and Principle of engine operation 2.10 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3.	Underpinning skills	3.1 Accessing and interpreting technical information 3.2 Applying dismantling procedures 3.3 Applying testing techniques 3.4 Using relevant tools and equipment 3.5 Maintaining customer/company records 3.6 Using measuring equipment and instruments 3.7 Applying manual handling procedures 3.8 Checking and comparing various components to actual specifications 3.9 Deciding on most appropriate repair action necessary 3.10 Explaining to customers on repair action to be done
4.	Resource implications	The following resources must be provided 4.1 Tools, equipment and facilities appropriate to processes or activities 4.2 Materials relevant to the activity
5.	Method of assessment	Competency must be assessed through: 5.1 Direct observation of the task on disassembling engine block and sub-assemblies and check components 5.2 Written or oral (short-answer) questions 5.3 Practical exercises relevant to this unit of competency. 5.4 Portfolio assessment
6.	Context for assessment	6.1 Competency may be assessed in the workplace or in simulated workplace environment

UNIT OF COMPETENCY: DISASSEMBLE ENGINE SUB-ASSEMBLIES/ CYLINDER HEADS AND CHECK COMPONENTS

UNIT CODE: ALT723330

UNIT DESCRIPTOR: This unit identifies the competence required to disassemble, inspect, check and determine preferred repair action for engines and/or cylinder heads as a part of a reconditioning procedure.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Disassemble engine sub-assembly /cylinder head	1.1 ***Engine*** sub-assembly/cylinder head is disassembled without causing damage to any workplace property, equipment or components and in accordance to ***company standard operating procedures***. 1.2 ***Engine sub-assembly***/cylinder head is disassembled using approved methods and appropriate tools/equipment. 1.3 Correct information is accessed and interpreted from appropriate manufacturer ***Manual*** specifications. 1.4 Component parts are cleaned using appropriate ***tools equipment*** and ***materials*** in preparation for evaluation.
2. Inspect engine sub-assembly / cylinder head components and determine repair procedures.	2.1 Inspection is completed without causing damage to any workplace property, equipment or components. 2.2 Correct information is accessed and interpreted from appropriate manufacturer specifications. 2.3 Engine sub-assembly/cylinder head components are measured against manufacturer specifications and tolerances. 2.4 Engine sub-assembly/cylinder head components are evaluated against the measurements, tests and inspections made. 2.5 Repair procedures are reported for engine sub-assembly/cylinder head components. 2.6 Actions performed and results achieved relative to this competency element are recorded and dealt with according to company policies and procedures.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Engine	1.1 Gasoline engine 1.2 Diesel engine
2. Engine Sub-Assemblies	Kinds of Engine and its sub-assemblies/Components include: 2.1 Cylinder heads 2.2Camshafts 2.3 Rocker Arm 2.4Idler shafts 2.5Timing Chains 2.6Timing Belts 2.7Pulleys 2.8Valve Truing mechanism 2.9 Engine pump
3. Manual	3.1 Maintenance Procedure Manual 3.2 Periodic Maintenance Data 3.4 Service Manual 3.5 Parts Checklist
4.Company Standard Operating Procedure	4.1 Job Order 4.2 Requisition slip 4.3 Wearing of Personal Protective Equipment such as Goggles, hand gloves, apron, safety shoes
5. Tools, Equipment and Supplies	5.1 Hand tools, power tools, 5.2 Special tools/equipment 5.3 Measuring equipment (straight edge, caliper, feeler gage, micrometer, Vernier caliper, inside caliper dial gage) 5.4 Lifting equipment (Jack, Hoist) 5.5 Testing equipment (Probing tools, multitester, VOM) 5.6 Cleaning equipment (Degreaser, Pressurized water 5.7 Crack testing (Megaflux powder, chemical spray, kerosene)

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Disassembled engine sub-assembly/cylinder head 1.2 Disassembled and assessed the components without causing damage or injury to tools, equipment and personnel 1.3 Determined appropriate action for repair
2. Underpinning knowledge and attitudes	2.1 Dismantling methods 2.2 Measuring and testing procedures 2.3 Equipment safety requirements 2.4 Relevant company policies 2.5 Personal safety requirements 2.6 Manual handling techniques 2.7 Cleaning methods and materials 2.8 Construction and Principles of operation of Engine 2.9 Construction and operation relevant to application 2.10 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3. Underpinning skills	3.1 Use of tools and equipment in disassembling engine component 3.2 Identifying defect/faults in an engine component 3.3 Handling of parts and components 3.4 Technique in disassembling component
4. Resource implications	The following resources must 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 must be assessed through: 5.1 Direct observation while the tasks are being performed 5.2 Questions/Interview related to the Underpinning skills
6. Context for assessment	6.1 Competency must be assessed on the job or in a simulated environment. 6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.

UNIT OF COMPETENCY: CARRY OUT PRE-REPAIR OPERATIONS ON ENGINE COMPONENTS

UNIT CODE: ALT723331

UNIT DESCRIPTOR: This unit identifies the competence required to clean components by chemical or mechanical means and remove component in preparation for either storage or repair.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1.Clean components prior to repairs and/or storage	1.1 Cleaning of ***engine*** components is achieved without causing damage to any component or system 1.2 ***Cleaning agents*** are used according to cleaning agent manufacturer instructions 1.3 Component of the engine is cleaned to facilitate inspection, assessment, replacement, repair and/or storage. 1.4 Used cleaning agents and waste materials are safely disposed of according to company policy and national legislation. 1.5 ***Cleaning operations*** are carried out according to industry regulations/guidelines, ***occupational health and safety procedures*** and company policy.
2. Segregate, tag and store components	2.1 Components are segregated, tagged and stored without causing damage to any component or system. 2.2 Correct ***information*** is accessed and interpreted from appropriate manufacturing specifications. 2.3 Components are removed, tagged and stored in accordance with manufacturer specifications and enterprise procedures 2.4 Removal and storage activities are carried out according to industry standards/guidelines, occupational health and safety and company policy. 2.5 Report on additional parts required to complete the repair (not listed in quotation) is completed in accordance with company policy.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Engine Components	Kinds of Engine and its sub-assemblies/ Components include: 1.1 Long engines and short engines, 1.2Cylinder heads 1.3 Camshafts 1.4Rocker Arm 1.5 Idler shafts 1.6 Timing Chains 1.7 Timing Belts 1.8 Pulleys 1.9 Valve Train Mechanism 1.10 Engine pump
2. Cleaning operations	2.1 Manual cleaning 2.2 Machine-assisted cleaning
3. Occupational Health and Safety procedures	3.1 Use of Personal Protective Equipment • Safety shoes • Face Shields/safety goggles • Gloves • Apron • Safety shoes 3.2 Safe Handling of • Equipment • Tools • Materials
4. Cleaning agents	4.1 De-waxing 4.2 Detergent 4.3 Degreaser 4.4 Special purpose agents
5. Information	Sources of information/documents may include: 5.1 Vehicle manufacturer specification 5.2 Company operating procedure 5.3 Insurance company instruction 5.4 Product manufacturer specifications 5.5 Material safety data sheets 5.6 Industry/workplace code of practice

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Interpreted and communicated operational information 1.2 Practiced working safely 1.3 Observed vehicle protection methods 1.4 Removed, stored and cleaned component of engine.
2. Underpinning knowledge and attitudes	2.1 Occupational health and Safety 2.2 Personal safety protection procedures 2.3 Manual handling techniques 2.4 Equipment safety requirements 2.5 Vehicle safety requirements 2.6 Types of cleaning agents and their uses 2.7 Procedure in removing and storing parts 2.8 Methods in tagging components 2.9 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3. Underpinning skills	3.1 Accessing and applying safety and technical information 3.2 Applying correct manual handling techniques 3.3 Applying personal safety requirements 3.4 Using relevant tools and equipment 3.5 Cleaning components using the appropriate agents 3.6 Removing and replacing components 3.7 Storing removed components
4. Resource implications	The following resources must be provided 4.1 Tools, equipment and facilities appropriate to processes or activities 4.2 Materials relevant to the proposed activity
5. Method of assessment	Competency must be assessed through: 5.1 Direct observation or Demonstration 5.2 Written or oral (short-answer) questions 5.4 Portfolio assessment
6. Context for assessment	6.1 Competency may be assessed in the workplace or in simulated workplace environment 6.2 The underpinning knowledge and skills may be assessed on or off-the-job. 6.3 The prescribed outcome must be achieved without direct supervision.

UNIT OF COMPETENCY: INSPECT ENGINE COMPONENTS AND DETERMINE PREFERRED REPAIR ACTION

UNIT CODE: ALT723332

UNIT DESCRIPTOR: This unit identifies the competency required to carry out an inspection of engine components and decide on the most appropriate repair/replacement methods.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables (***All*** inspections methods ***are carried out according to industry regulations/guidelines,*** occupational health and safety and company procedures)
1.Conduct visual inspection of engine components to determine defects	1.1 Information is accessed from appropriate sources to gain knowledge of the fault. 1.2 Vehicle components are isolated/disassembled to permit an accurate inspection for defects. 1.3 ***Inspection method*** for engine components is conducted as per procedure.
2. Lift and move materials/ components/parts	2.1 ***Lift and move work*** is completed without causing damage to any component or system 2.2 Materials weight is determined correctly utilizing most appropriate techniques 2.3 Appropriate ***tools and equipment*** are selected and used when required 2.4 Items to be lifted up are checked for hazardous implications 2.5 Lifting techniques are undertaken wherein types of movement, methods, storage, heights and position are considered 2.6 Parts/components/materials are placed safely on moving equipment and relocated ensuring safety of personnel and security of parts/components/materials. 2.7 All activities are carried out in accordance with industry standards/guidelines, ***occupational health and safety and company policies.***

3. Carry out diagnostic procedures	3.1 Information and assistance (if necessary) is accessed from appropriate sources in distinguishing between "symptoms" and "causes". 3.2 Permission to partly disassemble components is obtained, to accurately inspect and diagnose defects. 3.3 A diagnosis strategy is developed that can be used to determine a fault within the engine component. 3.4 Identification of defects and needed repairs are made from test results using appropriate tools and equipment and a plan of action is decided upon to rectify defects 3.5 All inspections are carried out in accordance to industry regulations/guidelines, occupational health and safety, and company policies
4. Prepare written repair quotations	4.1 Quotation is prepared accurately on approved format. 4.2 ***Repair quotation*** is prepared is prepared accurately as per enterprise-approved format 4.4 Customer is consulted as per standard operating procedures. 4.5 Approval to complete repairs is sought as per standard operating procedures 4.6 Quotation is filed as per standard operating procedures.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Inspection Methods	1.1 Actual 1.2 Visual 1.3 Operational assessment
2. Lift and Move work	2.1 Manual lifting and moving using hand operated equipment 2.2 Consideration on hazard implications (eg. Chemical, liquids, gases)
3. Occupational Health and Safety procedures	3.1 Use of Personal Protective Equipment • Safety shoes • Face Shields/safety goggles • Gloves • Apron • Dust Mask or with Filter Diaphragm 3.2 Safe Handling of • Equipment • Tools • Materials
4. Tools and equipment	4.1 Hand tools, power tools, 4.2 Special equipment/tools 4.3 Measuring equipment (straight edge, caliper, feeler gage, micrometer, Vernier caliper, inside caliper dial gage) 4.4 Lifting equipment (Jack, Hoist) 4.5 Testing equipment (Probing tools, multitester, VOM) 4.6 Cleaning equipment (Degreaser, Pressurized water 4.7Crack testing (Magnaflux powder, chemical spray, kerosene)
5. Repair quotation	Repair quotation include overhead such as 5.1 light 5.9 security 5.2 power 5.10 professional association fee 5.3 rental 5.11 wage 5.4 taxes 5.12 work schedule 5.5 communication 5.13 fuel 5.6 stationery 5.14 materials 5.7 charges 5.15 spare parts 5.8 Government charges

EVIDENCE GUIDE

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Located the defects without damage or injury to tools, equipment or personnel 1.2 Lifted, moved and handled components or parts as per company procedure 1.3 Conducted appropriate testing and diagnosing to accurately find defects. 1.4 Prepared quotation and recommended the appropriate repair action
2. Underpinning knowledge and attitude	2.1 Equipment safety requirements 2.2 Correct manual handling technique/safe lifting and moving procedures 2.3 Diagnostic procedures and problem solving 2.4 Safety requirements 2.5 Written communication and report writing 2.6 Oral communication
3. Underpinning skills	3.1 Preparing customer reports 3.2 Maintaining relevant records 3.3 Preparing/ presenting repair quotations 3.4 Using diagnostic tools/ chart and equipment 3.5 Exchanging technical ideas 3.6 Applying mathematical ideas to inspection process of engine system and components 3.7 Exchanging information with customers and recommending repair actions
4. Resource implications	The following resources must be provided 4.1 Tools, equipment and facilities appropriate to processes or activities 4.2 Materials relevant to the proposed activity
5. Method of assessment	Competency must be assessed through: 5.1 Direct observation 5.2 Written or oral (short-answer) questions 5.3 Practical exercises. 5.4 Portfolio assessment
6. Context for assessment	6.1 Competency may be assessed in the workplace or in simulated workplace environment 6.2 The underpinning knowledge and skills may be assessed on or off-the-job. 6.3 The prescribed outcome must be achieved without direct supervision.

UNIT OF COMPETENCY: CARRY OUT MACHINING OPERATIONS

UNIT CODE: ALT821301

UNIT DESCRIPTOR: This unit identifies the competence required to set up and machine components to specifications using lathe, drilling and cutting machines for all mechanical streams

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Set up machinery prior to machining	1.1 Machinery set up is completed without causing damage to any components, system, ***tools and equipment***. 1.2 Correct information is accessed and interpreted from appropriate manufacturer specifications 1.3 ***Material*** to be machined is positioned and clamped 1.4 Correct speed and feed is selected to suit materials 1.5 ***Personal safety requirement*** including machine guards are worn and positioned 1.6 Setting up of components including machine guards are worn and positioned 1.7 All ***machinery set up*** activities are carried out according to industry regulations/guidelines, OHS and enterprise policies
2. Machine components	2.1 Components are machined without causing damage to any components or system 2.2 Correct information is accessed and interpreted from appropriate manufacturer specifications 2.3 Components are measured for size and finish 2.4 Size and finish are compared with specifications 2.5 Area is cleaned prior to removal from machine 2.6 Machining/cutting of components is carried out in accordance with manufacturer current specifications for methods, equipment used and tolerance relative to the component being machined out/cut 2.7 All machining/cutting activities are carried out according to industry regulations/guidelines, OHS, and enterprise procedures/policies.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Materials	1.1 Cast iron 1.2 Steel 1.3 Bronze 1.4 Plastic (polyurethane)
2. Tools and equipment	2.1 Handtools, 2.2 Power hacksaw or cut off saw 2.3 Lathe and tool bits 2.4 Measuring equipment, lifting equipment 2.5 Drills and bits
3. Personal safety requirements	3.1 Wearing of personal protective devices such as Gloves, Goggles, Apron Safety shoes 3.2 Housekeeping 3.3 Maintenance of tools and equipment
4. Machinery set-up	4.1 Clamping 4.2 Positioning 4.3 Centering 4.4 Checking of speed 4.5 Setting up 4.6 Lubricating 4.7 Checking of oil level 4.8 Checking of angle of tool bit

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate 1.1 Performed turning and/or grinding and/or cutting operations. 1.2 Reconditioned automotive components to restore surface 1.3 Finishes, working clearances and component alignment 1.4 Components are machined without damage to tools, equipment and personnel 1.5 Components are machined to tolerances following manufacturer specification
2. Underpinning knowledge and attitudes	2.1 Equipment safety requirements 2.2 Machinery safety requirements 2.3 Relevant methods of machining and/or cutting 2.4 Measuring instruments, application and procedures 2.5 Speed and feed ratios 2.6 Personal safety requirements 2.7 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3 Underpinning skills	3.1 Access, interpret and apply technical information 3.2 Use relevant tools, equipment and machinery safely 3.3 Use measuring equipment correctly 3.4 Apply setting up procedures (relevant to application) 3.5 Apply machining procedures (relevant to application)
4 Resource implications	The following resources must 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 must be assessed through: 5.1 Actual demonstration of skills in lathe turning, grinding, cutting, drilling. 5.2 Written examination
6 Context for assessment	6.1 The assessment of practical skills must only take place after a period of supervised practice and repetitive experience. If workplace conditions are not available, assessment in simulated workplace conditions is acceptable.

UNIT OF COMPETENCY: SET, OPERATE AND MONITOR SPECIALIZED MACHINES

UNIT CODE: ALT821302

UNIT DESCRIPTOR: This unit identifies the competence required to set, operate and monitor specialized machines used in reconditioning engine and/or vehicle components

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Set machines	1.1 ***Machines*** are set without causing damage to any component or system 1.2 Correct information is accessed and interpreted from appropriate manufacturer specifications 1.3 Components are measured and repair action determined 1.4 Components is positioned and clamped 1.5 Machine is set in accordance with defined procedures 1.6 Machine is adjusted to meet operational requirements and specifications using appropriate measuring equipment 1.7 ***Tools and accessories*** are selected according to job specifications 1.8 Worn-out or damaged tool is identified and changed/sharpened 1.9 All setting activities are carried out according to industry regulations/guidelines, ***OHS requirements*** and enterprise procedures/policies
2. Operate and monitor machine	2.1 Machine is operated and monitored without damage to any component or system 2.2 Correct information is accessed and interpreted from appropriate manufacturer specifications 2.3 Machine is operated in accordance with enterprise procedures 2.4 Components are checked with appropriate ***instruments*** to ensure compliance to specifications 2.5 Sharpness of tools is monitored and tools are sharpened or replaced to meet requirements when necessary 2.6 Finished products is checked for alignment, tolerance and finish 2.7 All ***machining operations*** are carried out according to industry regulations/guidelines, OHS, and enterprise procedures/policies

RANGE OF VARIABLES

VARIABLE	RANGE
1. Machine	1.1 Build Up Machine 1.2 Straightening Machine 1.3 Line Boring 1.5 Crankshaft Grinding 1.6 Balancing Machine 1.7 Connecting Rod Balancer 1.8 Valve Replacer 1.9 Reboring/Honing
2. Tools and accessories	2.1 Measuring equipment 2.2 Relevant safety equipment, hand tools, power/air tools, lathe, milling machines, line borers, pin fitting machines, precision grinders, lifting equipment, cleaning equipment
3. OHS Requirements	3.1 Industry Occupational Health &Safety includes: 3.2 Wearing of personal protective equipment such as apron, goggles, gloves, safety shoes 3.3 Disposal of wastes materials 3.4 Workshop housekeeping
4. Instrument	4.1 Bore Gage 4.2 Dial Gage 4.3 Feeler Gage 4.4 Inside Caliper
5. Machining operation	5.1 Reboring/Honing Operation 5.2 Line Boring Operation 5.3 Crankshaft Grinding 5.4 Valve seat Grinding 5.5 Camshaft Grinding 5.6 Engine Balancing 5.7 Connecting Rod and Piston Balancing 5.8 Valve Replacer

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate 1.1 Performed machining of components without damage or injury to tools, equipment and personnel 1.2 Performed machining of components to specified tolerances and finishes following enterprise procedures
2. Underpinning knowledge and attitudes	2.1 The necessary cleaning/lubricating agents 2.2 Relevant technical information including technical drawings 2.3 Equipment safety requirements 2.4 Machining methods 2.5 Industry codes of Practice 2.6 Pool sharpening methods 2.7 Personal safety requirements 2.8 Manual handling techniques 2.9 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3. Underpinning skills	3.1 Access and interpret technical information 3.2 Use relevant tools/equipment 3.3 Carry out machining processes 3.4 Sharpening machining tools 3.5 Setting the machines 3.6 Apply manual handling techniques 3.7 Use of personal protective equipment 3.8 Monitoring machining processes
4. Resource implications	The following resources must 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 must be assessed through 5.1 Demonstration of skills in measuring equipment, relevant safety equipment, handtools, power/air tools, lathes, milling machines, line borers, pin fitting machines, precision grinders, lifting equipment, cleaning equipment 5.2 Written/Oral examination
6. Context for assessment	6.1 The assessment of practical skills must only take place after a period of supervised practice and repetitive experience in safe working environment. If workplace conditions are not available, assessment in simulated workplace conditions is acceptable.

UNIT OF COMPETENCY: USE AND MAINTAIN MEASURING INSTRUMENT

UNIT CODE: ALT821303

UNIT DESCRIPTOR: This unit identifies the competence required to measure components or sections using non-specialist instrument and maintain the measuring instrument.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1. Measure dimensions or variables using appropriate instrument	1.1 ***Measurement of dimensions and variables*** are completed without causing damage to any instrument or components 1.2 Appropriate ***measuring instrument*** is selected 1.3 Relevant ***measuring techniques*** are used and results appropriately recorded 1.4 All measuring activities are carried out according to industry regulations/guidelines ***OHS & requirements*** and enterprise/procedures policies
2. Maintain measuring instrument	2.1 Maintenance of measuring instrument is achieved without causing damage to any instrument or component 2.2 ***Routine care and storage of measuring instrument*** is undertaken according to manufacture specifications 2.3 Checking and calibrating of measuring devices is done prior to use. 2.4 All maintenance activities of measuring instruments are carried out according to industry regulations/guidelines OHS legislation, and enterprise procedures policies

RANGE OF VARIABLES

VARIABLE	RANGE
1. Dimension and Variables Measurement	1.1 Cylinder bore • Taper • Out of round 1.2 Crankshaft journal (roundness, straightness, alignment) • Out of round • Taper • Straightness • Alignment 1.3 Cylinder Head • Warpage • Thickness 1.4 Valve depth 1.5 Camshaft • cam lobe height • straightness 1.6 Cylinder Block (Aluminum) • Warpage
2. Measuring instrument and tools	2.1 Handtools 2.2 Bore gage 2.3 Depth gage 2.4 Vernier Caliper 2.5 Micrometer 2.6 Dial Gage 2.7 Straight edge 2.8 Feeler gage 2.9 Inside Caliper 2.10 T-squares, 2.11 Flat edges, 2.12 Dividers 2.13 Protractors)
3. Measuring technique	3.1 correct usage of the above mentioned measuring instrument and tools. 3.2 Out of round or ovality 3.3 Cylindricity or taper conicity
4. OHS Requirements	4.1 Wearing of personal protective instrument such as apron, goggles, gloves, safety shoes 4.2 Disposal of wastes materials 4.3 Workshop housekeeping
5. Routine care and storage of measuring instrument	5.1 Periodic check up of micrometer with standard bars 5.2 Storage in box separated from hand tools 5.3 Proper handling 5.4 Not to exposed to liquid such as water.

EVIDENCE GUIDE

1. Critical aspects competency	Assessment requires evidence that the candidate: 1.1 Measured components or section using correct instrument. 1.2 Maintained measuring instrument.
2. Underpinning knowledge and attitudes	2.1 Personal and instrument safety requirements 2.2 Measuring instrument types and their application 2.3 Measuring procedures 2.4 Measuring instrument graduation 2.5 Measuring instrument maintenance procedures 2.6 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3. Underpinning skills	3.1 Accessing, interpreting and applying technical information 3.2 Using tools and instrument correctly and safely 3.3 Maintain measuring instrument 3.4 Using measuring instrument
4 Resource implications	The following resources must be provided: 4.1 Workplace: Real or simulated work area 4.2 Appropriate Tools & instrument 4.3 Materials relevant to the activity
5 Method of assessment	Competency must be assessed through 5.1 Demonstration of skills in measurement of length, squareness, flatness, angles, roundness, depth, clearance or any measurements that can be taken from analogue or digital devices. 5.2 Written examination
6 Context for assessment	6.1 The assessment of practical skills must only take place after a period of supervised practice and repetitive experience in a safe working environment. If workplace conditions are not available, assessment in simulated workplace conditions is acceptable.

UNIT OF COMPETENCY: ASSEMBLE ENGINES/CYLINDER HEADS, CHECK TOLERANCES AND CARRY OUT RELEVANT TESTING PROCEDURES

UNIT CODE: ALT723333

UNIT DESCRIPTOR: This unit covers the knowledge skills and attitudes required to assemble engines and/or cylinder heads, check tolerances and carry out relevant testing procedures as part of a re-conditioning procedure.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variable (All standard of performance for Disassemble ***Engine Sub-assemblies***/Cylinder Heads And Evaluate Components is in accordance with ***Company Standard Operating Procedure*** and Manufacturer's Specification ***Manuals*** using specified ***tools and equipment***.)
1. Use appropriate methods to check tolerances	1.1 ***Tolerances*** are checked without causing damage to any workplace property, equipment or components. 1.2 Correct tolerances are obtained using relevant engine/component manufacturer specifications. 1.3 Tasks are carried out as per established industry guidelines. 1.4 Final quality inspection procedure is performed.
2. Assemble engines/cylinder head.	2.1 Engine/cylinder head is assembled without causing damage to any workplace property, equipment or components. 2.2 Assembly is carried out to comply with manufacturer specifications and established industry guidelines. 2.3 Checking procedure is done according to manufacturer specification.
3. Carry out relevant test procedures.	3.1 Test procedures are completed without causing damage to any workplace property, equipment or components. 3.2 Relevant test procedures are performed using industry approved procedures and equipment. 3.3 Testing is carried out to comply with manufacturer specifications

RANGE OF VARIABLES

VARIABLE	RANGE
1. Engine	1.1 Gasoline engine 1.2 Diesel engine
2. Engine Sub-Assemblies	Kinds of Engine and its sub-assemblies/Components include: 2.1 Long engines and short engines, 2.2 Cylinder heads 2.3 Camshafts 2.4 Cylinder blocks 2.5 Idler shafts 2.6 Chains 2.7 Belts 2.8 Pulleys 2.9 Valve Train Mechanism .10 Engine pump
3.Manual	Manufacturer Specification Manual 3.1 Maintenance Procedure Manual 3.2 Periodic Maintenance Data 3.3 Service Manual 3.4 Parts Checklist
4.Company Standard Operating Procedure	4.1 Job Order 4.2 Requisition slip 4.3Cancellation slip 4.4 Additional job slip 4.5 Letter of authority 4.6 Insurance repair instruction 4.7 Wearing of Personal Protective Equipment such as • Goggles, hand gloves, apron, safety shoes
5.Tools and equipment	5.1Hand tools, power tools 5.2 Special equipment, measuring equipment, relevant testing procedures, relevant tolerance checking methods, measuring equipment, lubricating equipment, gasket sealing materials

EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Interpreted and communicated operational information 1.2 Measured and checked parts/components against manufacturer specifications 1.3 Assembled and conducted testing procedures 1.4 Observed safe working practices
2. Underpinning knowledge and attitudes	2.1 Personal safety requirements 2.2 Construction and operation relevant to application 2.3 Relevant assembling methods 2.4 Measuring and testing procedures 2.5 Equipment safety requirements 2.6 Tensioning procedures 2.7 Torquing procedure 2.8 Relevant company policies 2.9 Manual handling technique 2.10 Engine operating principles 2.11 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3. Underpinning skills	3.1 Handling of Components and sub-assemblies parts 3.2 Checking of tolerances 3.3 Using Testing equipment and tools 3.4 Conducting tests procedures
4. Resource implications	The following resources must 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 must be assessed through: 5.1 Direct observation while the tasks are being performed 5.2 Questions/Interview related to the Underpinning skills 5.3 Assessment of underpinning knowledge and practical skills may be combined.
6. Context for assessment	6.1 Competency elements 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: ASSEMBLE ENGINE BLOCK AND SUB-ASSEMBLIES, CHECK TOLERANCES AND CARRY OUT RELEVANT TESTING PROCEDURES

UNIT CODE: ALT723334

UNIT DESCRIPTOR: This unit covers the knowledge, skills and attitudes required to assemble engine block and sub-assemblies, check tolerances, fit cylinder head(s) and carry out relevant testing and adjustment procedures as part of a re-conditioning procedure.

ELEMENT	PERFORMANCE CRITERIA ***Italicized*** terms are elaborated in the Range of Variables
1.Use appropriate methods to check tolerances	1.1 Tolerances are checked without causing damage to any ***component or system*** 1.2 Tolerances are checked based on industry approved procedures/***methods, equipment and tools and materials*** 1.3 Correct tolerances are obtained using relevant engine/component manufacturer specifications 1.4 Tasks are carried out to comply within established industry guidelines 1.5 All checking activities are carried out according to industry regulations/guidelines, ***occupational health and safety*** (OHS) and company policies.
2. Assemble engine block and sub-assemblies/fit cylinder head(s)	2.1 ***Engine*** block and sub-assemblies are assembled and cylinder head(s) are fitted without causing damage to any component or system 2.2 Assembly and fitting is carried out to comply with manufacturer specification and established industry guidelines and operating procedure 2.3 All assembly and fitting activities are carried out according to industry regulations/guidelines, OHS, and industry policies. 2.4 Inspection of new parts quality, condition, fittings are done as per company standard operating procedures.
3. Carry out relevant testing and adjustment procedures	3.1 Test and adjustments are completed without causing damage to any component or system. 3.2 Testing and adjustment is carried out to comply with manufacturer's specifications, established industry guidelines and standard. 3.3 Testing and adjusting of tightening torque is carried out and confirmed by the supervisor.

RANGE OF VARIABLES

VARIABLE	RANGE
1. Engine	1.1 Gasoline 1.2 Diesel
2. Components or System	Includes: Short engine , various engine components such as 2.1 Crankshafts 2.2 Camshaft 2.3 Cylinder blocks 2.4 Idler shaft 2.5 Pistons 2.6 Connecting rods 2.7 Bearings 2.8 Rings 2.9 Cylinder head assemblies 2.10 Gears 2.11 Chains 2.12 Belts 2.13 Pulleys 2.14 Oil pumps 2.15 Short/long motors (cylinder head fitting) 2.16 Auxiliary-engine valve railings and tensioner
3. Methods	Methods applied under normal operating condition includes: 3.1 Tolerance checking procedure 3.2 Assembly/repair procedure 3.3 Tensioning procedures 3.4 Visual checking 3.5 Use of tools and equipment
4. Tools/Equipment and Supplies and Materials	4.1 Handtools 4.2 Power Tools 4.3 Special equipment 4.4 Measuring instrument/tools/materials • Steel rule • Vernier caliper • Micrometer caliper • Gages (thread, drill, surface finish, radius, • Screw pitch, taper, feeler gage) • Plastigauge 4.5 Relevant testing equipment 4.6 Personal protective equipment 4.7 Lubricating equipment 4.8 Gasket sealing materials
5. Occupational Health and Safety (OHS)	5.1 Use of Personal Protective Equipment • Safety shoes • Face Shields/safety goggles • Gloves • Apron • Dust mask 5.2 Safe Handling of • Equipment • Tools • Materials 4.3 Implementation of 5S

EVIDENCE GUIDE

1.Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Measured and checked components against manufacturer's specifications 1.2 Repaired engine block and sub-assemblies 1.3 Assembled and tested components and sub-assemblies 1.4 Capability or skill to countercheck newly reconditioned engine components.
2.Underpinning knowledge and attitudes	2.1 Personal safety requirements 2.2 Construction and operation of engine block and sub-assemblies relevant to application 2.3 Procedures on Assembly and repair of engine block 2.4 Procedure on measuring, adjusting and testing engine components 2.5 Equipment safety requirements 2.6 Procedure on tensioning 2.7 Relevant company policies 2.8 Manual handling techniques 2.9 Engine operating principles 2.10 Familiarity with Manufacturer's Manuals 2.11 Positive Work values (Perseverance, Patience, Honesty, Attention to Details)
3.Underpinning skills	3.1 Accessing and interpreting technical information 3.2 Checking/adjusting tolerances 3.3 Using relevant measuring instruments 3.4 Applying manual handling procedures 3.5 Maintaining customer/company records 3.6 Testing and adjusting engines for both technical and legal requirements 3.7 Tensioning various components 3.8 Assembling/Repairing engines/components 3.9 Ordering of Parts
4.Resource implications	The following resources must be provided 4.1 Tools, equipment and facilities appropriate to the activities 4.2 Materials relevant to the proposed activity
5.Method of assessment	Competency must be assessed through 5.1 Observation/Demonstration of the task on assembling engine block and sub-assemblies, checking tolerances and carrying out relevant testing procedures 5.2 Written or oral (short-answer) questions 5.3 Practical exercises relevant to this unit of competency. 5.4 Portfolio
6.Context for assessment	6.1 Competency may be assessed in the workplace or in simulated workplace environment

SECTION 3 TRAINING STANDARDS

These guidelines are set to provide the Technical and Vocational Education and Training (TVET) providers with information and other important requirements to consider when designing training programs for AUTO ENGINE REBUILDING NC II.

3.1 CURRICULUM DESIGN

Course Title: **AUTO ENGINE REBUILDING** NC Level: **NC II**

Nominal Training Duration: **18 Hours** (Basic Competencies)
20 Hours (Common Competencies)
120 Hours (Core Competencies)

Course Description:

This course is designed to equip individual with operational skills in automotive engine rebuilding which restores defective/worn-out engine parts back to manufacturer's specifications; performs the necessary inspections; mensuration, and interpretation of blueprints and repair procedures; set up and operate variety of specialized metal working machines and uses precision measuring instruments in repairing automotive engine parts.

This course is also designed to provide basic and common skills to equip individual with operational skills in automotive engine rebuilding.

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.	• Group discussion • Interaction	• 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.	• Discussion • Interaction	• 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.	• Discussion • Interaction	• Demonstration • Observation • Interviews/ questioning
4. Practice occupational health and safety	4.1Evaluate hazard and risks 4.2 Control hazards and risks 4.3 Maintain occupational health and safety awareness	• Discussion • Plant tour • Symposium	• 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	• Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning	• 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	• Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning	• 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	• Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning	• 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	• Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning	• 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	• Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning	• 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	• Lecture/ Demonstration • Dual training • Self paced (modular) • Distance Learning	• Written test • Oral questioning • Direct observation • Project method • Interview

CORE COMPETENCIES

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Interpret Technical Manual Specifications of Engine Components	1.1 Carry out blueprinting of components to manufacturer's specifications	• Demonstration • Discussion	• Written examination • Demonstration of practical skills • Practical Test
2. Disassemble Engine Block and Sub-assemblies, Check Tolerances and Components	2.1 Dismantle engine block sub-assemblies 2.2 Inspect/measure/ test engine block and sub-assembly components and determine repair procedures	• Demonstration • Discussion	• Interview • Practical test • Direct Observation
3. Disassemble Engine Sub-assemblies/ Cylinder Heads and Check Components	3.1 Dismantle engine sub-assemblies/ cylinder head 3.2 Inspect engine sub-assembly/cylinder head components and determine repair procedures	• Demonstration • Discussion	• Direct Observation • Questioning • Interview • Practical test
4. Carry-out Pre-repair Operation on Engine Components	4.1 Clean components prior to repairs or storage 4.3 Segregate, tag and store components	• Demonstration • Discussion	• Practical test
5. Inspect Engine Components and Determine Preferred Repair Action	5.1 Conduct visual inspection of engine components to determine defects 5.2. Lift and move materials/ components/parts	• Demonstration	• Direct Observation • Questioning • Interview • Practical test
6. Carry-out Machining Operations	6.1 Set-up machinery prior to machining 6.2 Machine components	• Demonstration	• Direct Observation • Questioning • Interview • Practical test
7. Set, Operate and Monitor Specialized Machines	7.1 Set machine	• Demonstration	• Direct Observation • Questioning • Interview • Practical test

8. Use and Maintain Measuring Instruments	8.1 Measure dimensions or variables using appropriate instruments 8.2 Maintain measuring instruments	• Demonstration	• Direct Observation • Questioning • Interview • Practical test
9. Assemble Engines/ Cylinder Heads, Check Tolerances and Carry Out Relevant Testing Procedures	9.1 Use appropriate methods to check tolerances 9.2 Assemble engine/ cylinder head 9.3 Carry out relevant test procedures	• Demonstration	• Direct Observation • Questioning • Interview • Practical test
10. Assemble Engine Block and Sub-Assemblies, Check Tolerances and Carry Out Relevant Testing	10.1 Use appropriate methods to check tolerances 10.2 Assemble engine block and sub-assemblies/fit cylinder head(s) 10.3 Carry out relevant testing and adjustment procedures	• Demonstration	• Direct Observation • Questioning • Interview • Practical test

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 learner-centered and should accommodate individualized and self-paced learning strategies;
- 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 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.
- Project-Based Instruction is an authentic instructional model or strategy in which students plan, implement and evaluate projects that have real world applications.

3.3 TRAINEE ENTRY REQUIREMENTS

This section specifies the qualifications of trainees and educational experience. Other requirements like health and physical requirements are also stated. Passing entry written examinations may also be indicated if necessary.

- With good moral character;
- Ability to communicate both oral and written; and
- Physically and mentally fit

3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS AUTO ENGINE REBUILDING – NC II

Recommended list of tools, equipment and materials for the training of 25 trainees for Auto Engine Rebuilding – NC II

TOOLS		EQUIPMENT		MATERIALS	
QTY		QTY		QTY	
2 sets	• Box wrench	1 pc.	• Parts cleaning tank	2 copies	• SDS (Service Data Specification)
2 sets	• Open end wrench	1 pc.	• High-pressure cleaner-heated	2 copies	• Service Manual
2 sets	• Socket wrench	1 pc.	• Work bench - 2000mm	2 copies	• Engineering Drawing
2 pcs.	• Adjustable wrench	1 pc.	• Work bench - steel top	2 sets	• Overhauling gasket - Gas engine - Diesel engine
2 sets	• Screw driver (T-handle)	1 pc.	• Engine stand	2 sets	• Piston rings (1 set)
2 sets	• Screw driver (flat & Phillips head)	1 pc.	• Crankshaft grinder	2 sets	• Bearing / Bushing - Connecting rod camshaft / bushing - Main bearing / cracker arm/ bushing
4 pcs.	• Pliers (side cutting)	1 pc.	• Center lathe – 140mm	2 pcs.	• Timing belts

4 pcs.	• Pliers (long nose)	1 pc.	• Cylinder head + block grinder	2 sets	• Valve assembly - Exhaust valve(1 set) - Intake valve(1 set)
4 pcs.	• Mechanical pliers	1 pc.	• Pedestal grinder – 200mm	2 sets	• Cleaning equipment - Degreaser - Pressurized water
4 pcs.	• Hammer (ball peen)	1 pc.	• Hydraulic press – 1000KN	2 sets	• Magnaflux powder - Chemical spray - Kerosene
4 pcs.	• Hammer (plastic faced)	1 pc.	• Cylinder boring m/c – 130mm	2 btls.	• De-waxing, Detergent
4 pcs.	• Feeler gauge	1 pc.	• Cylinder boring m/c – 60mm	2 btls.	• Special purpose agent
2 pcs.	• Snap ring pliers (internal)	1 pc.	• Static balancing device	2 pcs.	• Plastigage
2 pcs.	• Snap ring pliers (external)	1 pc.	• Line boring bar	10 liters	• Engine oil
1 set	• Puncher (hollow)	1 pc.	• Precision honing machine	10 liters	• Gasoline oil
2 pcs.	• Piston ring expander	1 pc.	• Air compressor – 1100 L/min	10 liters	• Diesel oil
2 pcs.	• Piston ring compressor	1 pc.	• Welding unit – AC/DC	10 pcs.	• Gloves
2 pcs.	• Torque wrench (dial type)	1 pc.	• Gas welding & cutting set	10 pcs.	• Goggles
2 pcs.	• Valve spring remover	1 pc.	• Con-rod reconditioning machine	10 pcs.	• Clean rags
2 pcs.	• Dial gauge	1 pc.	• Arbor press – 20 KN	10 pcs.	• Clean brush
2 pcs.	• Bore gauge	1 pc.	• Honing bar	2 pcs.	• Oil filter
2 pcs.	• Depth gauge	1 pc.	• Bench storage cabinet	2 pcs.	• Fuel filter

2 pcs.	• Straight edge	1 pc.	• Pillar drilling machine	2 pcs.	• Air filter
2 pcs.	• Micrometer (inside)	1 pc.	• Oil dispenser - portable		
2 pcs.	• Micrometer (outside)	1 pc.	• Lubricating pump		
	• Special service tool (SST) – refer to service manual	1 pc.	• Valve & clutch spring tester		
1 set	• Taps and die	1 pc.	• Clutch assembly fixture – 80mm	**Training Materials:**	
1 set	• Drills and bits	1 pc.	• Connecting rod aligning jig		• Reference books
2 pcs.	• Hacksaw w/ blade	1 pc.	• Pedestal grinder – 200mm		• Manuals
		1 pc.	• Engine valve grinder		• Catalogs
		1 pc.	• Valve seat turning kit		• Brochures
		1 pc.	• Storage for reconditioned motors		• Modules/LEs
		1 pc.	• Open shelf units		• CDs/Video tapes
		1 pc.	• Storage cabinet		
		1 pc.	• Portable crane		
		1 pc.	• Power hacksaw		

3.5 TRAINING FACILITIES
AUTO ENGINE REBUILDING– NC II

Based on a class size of 25 students/trainees

SPACE REQUIREMENT	SIZE IN METERS	AREA IN SQ. METERS	TOTAL AREA IN SQ. METERS
• Building (permanent)	26.00 x 28.00	728.00	728.00
• Trainee Working Space	3.50 x 3.50 per student/trainee	12.25 per student	306.00
• Lecture Room	9.00 x 10.00	90.00	90.00
• Learning Resource Center	5.00 x 8.00	40.00	40.00
• Facilities/ Equipment/ Circulation Area	-	-	291.75

3.6 TRAINER'S QUALIFICATIONS FOR AUTOMOTIVE/ LAND TRANSPORT SECTOR

AUTO ENGINE REBUILDING – NC II

TRAINER QUALIFICATION (TQ II)

- Must be a holder of Auto Engine Rebuilding NC III
- Must have undergone training on Training Methodology II (TM II)
- Must be computer literate
- Must be physically and mentally fit
- *Must have at least 2 years job/industry experience
- Must be a civil service eligible (for government position or appropriate professional license issued by the Professional Regulatory Commission)

* Optional. Only when required by the hiring institution.

Reference: TESDA Board Resolution No. 2004 03

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 Auto Engine Rebuilding NC II, the candidate must demonstrate competence in all the units listed in Section 1. Successful candidates shall be awarded a National Certificate signed by the TESDA Director General.

4.2 The qualification of Auto Engine Rebuilding NC II may be attained through demonstration of competence through a single comprehensive project-type assessment covering all required units of competency of the qualification.

4.3 Assessment shall focus on the core units of competency. The basic and common units shall be integrated or assessed concurrently with the core units.

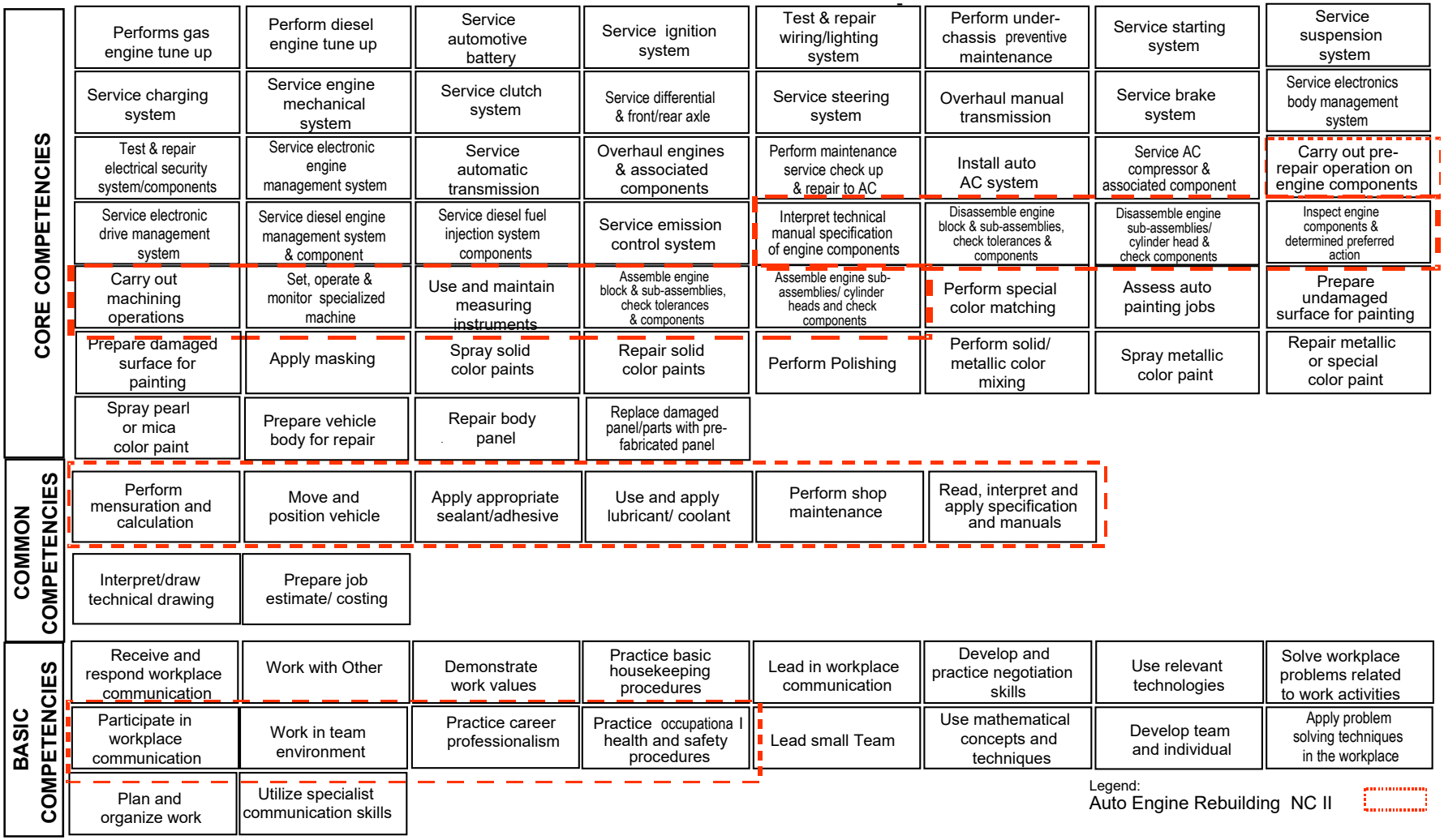
4.4 The following are qualified to apply for assessment and certification:

1.1.1 Graduates of formal, non-formal and informal including enterprise-based training programs.

1.1.2 Experienced workers (wage employed or self-employed)

4.5 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 (PTQCS).

COMPETENCY MAP- AUTOMOTIVE SECTOR



DEFINITION OF TERMS

1. Babbit	A metal used to line bearing; consisting of tin, antimony, copper and other metals
2. Bore Out	To increase the engine cylinder diameter by boring it larger, requires the fitting of oversize piston.
3. Calibrate	To check or correct the initial setting of a test instrument.
4. Cold Welding	Process of repairing a crack in a metal by drilling a hole through the crack, threading the hole, and screwing in a section of threaded rod to form a seal.
5. Crankpins	Part of the crankshaft to which the connecting rod is attached. Also called the crank throw or connecting rod journal.
6. Dynamic Unbalance	Results when there are two weights in separate planes that will set up separate forces which causes the crankshaft to rock or twist on an axis perpendicular tot he axis of rotation.
7. Guide Sleeve	A tubular sleeve put on a connecting rod bolt before the rod is removed from the block to prevent scratching of the crankpins by the bolt threads.
8. Honing	The process of restoring the cylinder into a straight, round shape and smooth surface by machining to remove only a small amount of metal or to obtain the desired cylinder finished after reboring.
9. Journals	The part of the rotating shaft which turns in a bearing.
10. Kinetic unbalance	Unbalanced state that tends to throw the mass outward due to the centrifugal force and cause a bending or flexing of the crankshaft.
11. Line Boring	Using a special boring machine, centered on the original center of the cylinder-block main bearing bores, to rebore the crankcase into alignment.
12. Machining	The process of using a machine to remove metal from a metal part.
13. Magna Flux	A process that uses an electromagnet and special magnet powder to detect surface and subsurface cracks in iron and steel.
14. Rebore	To increase the diameter of a cylinder.

15. Reboring	Reconditioning process by cutting or grinding some amount of metals from the cylinder surface to fit the nearest oversize piston.
16. Re-sleeving	Restoring the cylinder condition into standard diameter by removing the worn sleeves and replacing them with new ones.
17. Rod Small End	The end of the connecting rod through which the piston pin passes to connect the piston tot he connecting rod.
18. Rod Big End	The end of the connecting rod that attached around the crankpins.
19. Specifications	Information provided by the manufacturer for each engine and its components, operation, clearances. Also the service procedure to be followed for a system to operate properly.
20. Static Unbalance	Condition at which when the crankshaft placed on knife-edges and rotated will come to rest always on the heaviest part at the bottom.
21. Tolerance	The range of variation in a given dimension.
22. Valve seat Insert	A metal ring installed in the cylinder head to act as a valve seat.

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