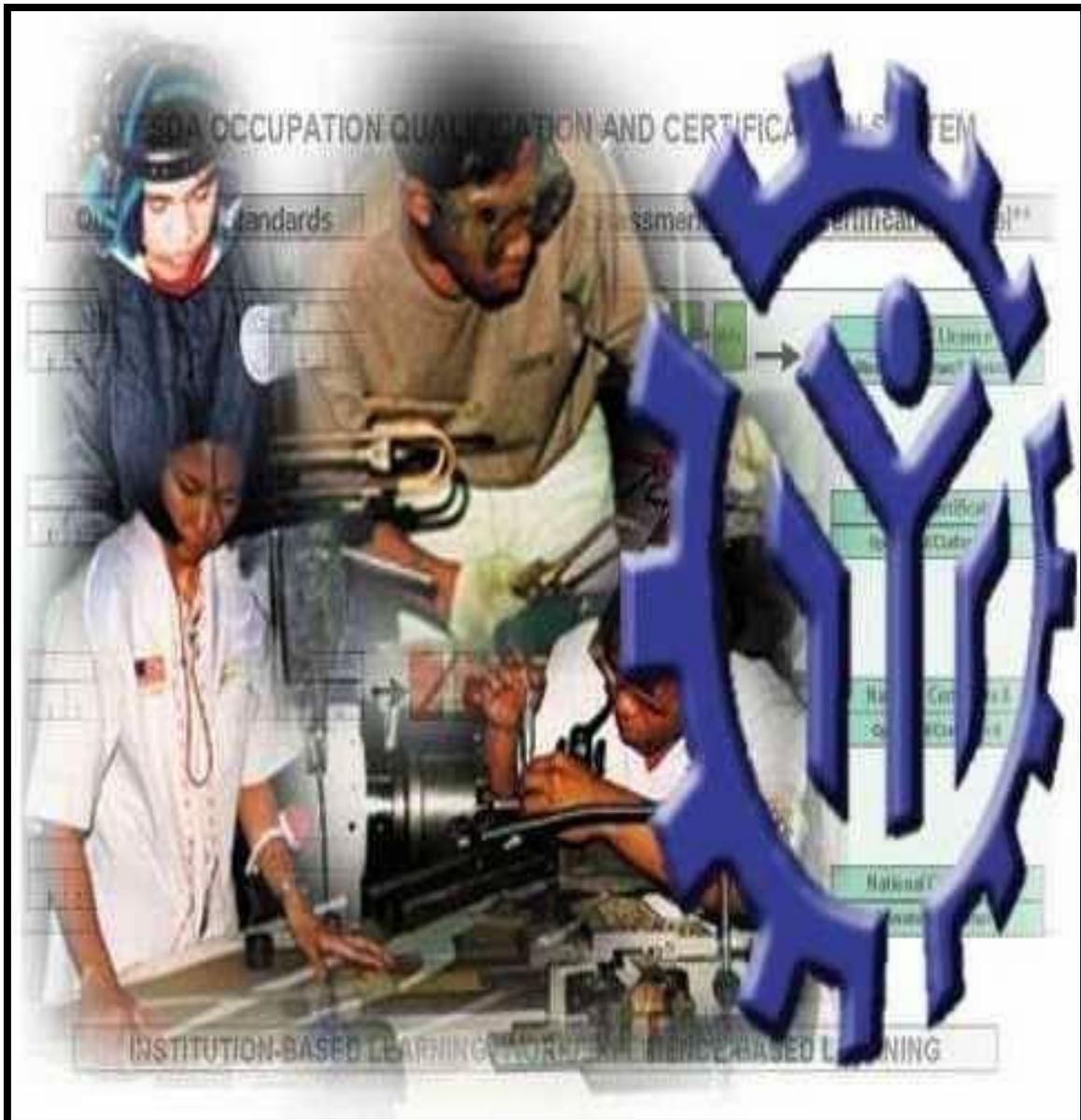


# TRAINING REGULATIONS

## DIESEL POWER PLANT OPERATION AND MAINTENANCE NC III



### UTILITIES SECTOR

**Technical Education and Skills Development Authority**

East Service Road, South Superhighway, Taguig, Metro Manila

*Technical Education and Skills Development Act of 1994  
(Republic Act No. 7796)*

**Section 22, “Establishment and Administration of the National Trade Skills Standards” of the RA 7796 known as the TESDA Act mandates TESDA to establish national occupational skill standards. The Authority shall develop and implement a certification and accreditation program in which private industry group and trade associations are accredited to conduct approved trade tests, and the local government units to promote such trade testing activities in their respective areas in accordance with the guidelines to be set by the Authority.**

The Training Regulations (TR) serves as basis for the:

1. Competency assessment and certification;
2. Registration and delivery of training programs; and
3. Development of curriculum and assessment instruments.

Each TR has four sections:

- Section 1      Definition of Qualification - refers to the group of competencies that describes the different functions of the qualification.
- Section 2      Competency Standards - gives the specifications of competencies required for effective work performance.
- Section 3      Training Standards - contains information and requirements in designing training program for certain Qualification. It includes curriculum design, training delivery; trainee entry requirements; tools and requirements; tools and equipment; training facilities and trainer's qualification.
- Section 4      National Assessment and Certification Arrangements - describe the policies governing assessment and certification procedure

**TABLE OF CONTENTS**  
**UTILITIES SECTOR**  
**DIESEL POWER PLANT**  
**OPERATION AND MAINTENANCE**  
**NC III**

	Page No.
<b>SECTION 1 DIESEL POWER PLANT OPERATION AND MAINTENANCE NC III QUALIFICATION</b>	<b>1</b>
<b>SECTION 2 COMPETENCY STANDARDS</b>	
• <b>Basic Competencies</b>	<b>2 - 19</b>
• <b>Common Competencies</b>	<b>20 - 34</b>
• <b>Core Competencies</b>	<b>35 - 43</b>
<b>SECTION 3 TRAINING STANDARDS</b>	
<b>3.1 Curriculum Design</b>	<b>44</b>
• <b>Basic Competencies</b>	<b>44</b>
• <b>Common Competencies</b>	<b>45</b>
• <b>Core Competencies</b>	<b>46</b>
<b>3.2 Training Delivery</b>	<b>47</b>
<b>3.3 Trainee Entry Requirements</b>	<b>48</b>
<b>3.4 List of Tools, Equipment and Materials</b>	<b>48 - 49</b>
<b>3.5 Training Facilities</b>	<b>50</b>
<b>3.6 Trainers' Qualifications</b>	<b>50</b>
<b>3.7 Institutional Assessment</b>	<b>50</b>
<b>SECTION 4 NATIONAL ASSESSMENT AND CERTIFICATION ARRANGEMENTS</b>	<b>51</b>
<b>Annex A: COMPETENCY MAP</b>	<b>52</b>
<b>DEFINITION OF TERMS</b>	<b>53 - 55</b>
<b>ACKNOWLEDGEMENTS</b>	

## **TRAINING REGULATIONS FOR DIESEL POWER PLANT OPERATION AND MAINTENANCE NC III**

### **SECTION 1 DIESEL POWER PLANT OPERATION AND MAINTENANCE NC III QUALIFICATIONS**

The DIESEL POWER PLANT OPERATION AND MAINTENANCE NC III Qualification consists of competencies that a person must achieve to enhance the knowledge, skills and attitudes of a trainee/student in operating a diesel power plant including tending, maintaining and repairing diesel engine and alternator.

This Qualification is packaged from the competency map of the Utility Industry Sector as shown in Annex A.

The Units of Competency comprising this Qualification include the following:

<b>CODE</b>	<b>BASIC COMPETENCIES</b>
500311109	Lead Workplace Communication
500311110	Lead Small Teams
500311111	Develop and Practice Negotiation skills
500311112	Solve Problems Related to Work Activities
500311113	Use Mathematical Concepts and Techniques
500311114	Use Relevant Technologies

<b>CODE</b>	<b>COMMON COMPETENCIES</b>
UTL311202	Perform Mensuration and Calculation
UTL723203	Read, Interpret and Apply Specifications and Manuals
UTL723205	Perform Shop Maintenance
UTL713202	Perform Basic Bench Works
UTL724201	Perform Basic Electrical Works

<b>CODE</b>	<b>CORE COMPETENCIES</b>
UTL723206	Tend Diesel Engine
UTL723207	Operate Diesel Power Plant
UTL723208	Maintain and Repair Diesel Engine Systems and Alternator

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

- Diesel power plant operator**
- Diesel power plant maintenance technician**

## SECTION 2 COMPETENCY STANDARDS

This section gives the details of the contents of the basic, common and core units of competency required in Diesel Power Plant Operation and Maintenance NC III.

### BASIC COMPETENCIES

UNIT OF COMPETENCY : **LEAD WORKPLACE COMMUNICATION**

UNIT CODE : **500311109**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to lead in the dissemination and discussion of ideas, information and issues in the workplace.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized terms</i> are elaborated in the Range of Variables
1. Communicate information about workplace processes	1.1 Appropriate <i>communication method</i> is selected 1.2 Multiple operations involving several topics areas are communicated accordingly 1.3 Questions are used to gain extra information 1.4 Correct sources of information are identified 1.5 Information is selected and organized correctly 1.6 Verbal and written reporting is undertaken when required 1.7 Communication skills are maintained in all situations
2. Lead workplace discussions	2.1 Response to workplace issues are sought 2.2 Response to workplace issues are provided immediately 2.3 Constructive contributions are made to workplace discussions on such issues as production, quality and safety 2.4 Goals/objectives and action plan undertaken in the workplace are communicated
3. Identify and communicate issues arising in the workplace	3.1 Issues and problems are identified as they arise 3.2 Information regarding problems and issues are organized coherently to ensure clear and effective communication 3.3 Dialogue is initiated with appropriate personnel 3.4 Communication problems and issues are raised as they arise

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Methods of communication	1.1 Non-verbal gestures 1.2 Verbal 1.3 Face to face 1.4 Two-way radio 1.5 Speaking to groups 1.6 Using telephone 1.7 Written 1.8 Internet

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Dealt with a range of communication/information at one time</li> <li>1.2 Made constructive contributions in workplace issues</li> <li>1.3 Sought workplace issues effectively</li> <li>1.4 Responded to workplace issues promptly</li> <li>1.5 Presented information clearly and effectively written form</li> <li>1.6 Used appropriate sources of information</li> <li>1.7 Asked appropriate questions</li> <li>1.8 Provided accurate information</li> </ul>
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> <li>2.1 Organization requirements for written and electronic communication methods</li> <li>2.2 Effective verbal communication methods</li> </ul>
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> <li>3.1 Organize information</li> <li>3.2 Understand and convey intended meaning</li> <li>3.3 Participate in variety of workplace discussions</li> <li>3.4 Comply with organization requirements for the use of written and electronic communication methods</li> </ul>
<p>4. Resource implications</p>	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 Variety of Information</li> <li>4.2 Communication tools</li> <li>4.3 Simulated workplace</li> </ul>
<p>5. Method of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Competency in this unit must be assessed through</li> <li>5.2 Direct Observation</li> <li>5.3 Interview</li> </ul>
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> <li>6.1 Competency may be assessed in the workplace or in simulated workplace environment</li> </ul>

UNIT OF COMPETENCY : **LEAD SMALL TEAMS**

UNIT CODE : **500311110**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes to lead small teams including setting and maintaining team and individual performance standards.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized terms</i> are elaborated in the Range of Variables
1. Provide team leadership	1.1 <b>Work requirements</b> are identified and presented to team members 1.2 Reasons for instructions and requirements are communicated to team members 1.3 <b>Team members' queries and concerns</b> are recognized, discussed and dealt with
2. Assign responsibilities	2.1 Duties, and responsibilities are allocated having regard to the skills, knowledge and aptitude required to properly undertake the assigned task and according to company policy 2.2 Duties are allocated having regard to individual preference, domestic and personal considerations, whenever possible
3. Set performance expectations for team members	3.1 Performance expectations are established based on client needs and according to assignment requirements 3.2 Performance expectations are based on individual team members duties and area of responsibility 3.3 Performance expectations are discussed and disseminated to individual team members
4. Supervised team performance	4.1 <b>Monitoring of performance</b> takes place against defined performance criteria and/or assignment instructions and corrective action taken if required 4.2 Team members are provided with <b>feedback</b> , positive support and advice on strategies to overcome any deficiencies 4.3 <b>Performance issues</b> which cannot be rectified or addressed within the team are referenced to appropriate personnel according to employer policy 4.4 Team members are kept informed of any changes in the priority allocated to assignments or tasks which might impact on client/customer needs and satisfaction 4.5 Team operations are monitored to ensure that employer/client needs and requirements are met 4.6 Follow-up communication is provided on all issues affecting the team 4.7 All relevant documentation is completed in accordance with company procedures

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Work requirements	1.1 Client Profile 1.2 Assignment instructions
2. Team member's concerns	2.1 Roster/shift details
3. Monitor performance	3.1 Formal process 3.2 Informal process
4. Feedback	4.1 Formal process 4.2 Informal process
5. Performance issues	5.1 Work output 5.2 Work quality 5.3 Team participation 5.4 Compliance with workplace protocols 5.5 Safety 5.6 Customer service

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Maintained or improved individuals and/or team performance given a variety of possible scenario</li> <li>1.2 Assessed and monitored team and individual performance against set criteria</li> <li>1.3 Represented concerns of a team and individual to next level of management or appropriate specialist and to negotiate on their behalf</li> <li>1.4 Allocated duties and responsibilities, having regard to individual's knowledge, skills and aptitude and the needs of the tasks to be performed</li> <li>1.5 Set and communicated performance expectations for a range of tasks and duties within the team and provided feedback to team members</li> </ul>
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> <li>2.1 Company policies and procedures</li> <li>2.2 Relevant legal requirements</li> <li>2.3 How performance expectations are set</li> <li>2.4 Methods of Monitoring Performance</li> <li>2.5 Client expectations</li> <li>2.6 Team member's duties and responsibilities</li> </ul>
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> <li>3.1 Communication skills required for leading teams</li> <li>3.2 Informal performance counseling skills</li> <li>3.3 Team building skills</li> <li>3.4 Negotiating skills</li> </ul>
<p>4. Resource implications</p>	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 Access to relevant workplace or appropriately simulated environment where assessment can take place</li> <li>4.2 Materials relevant to the proposed activity or task</li> </ul>
<p>5. Method of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Direct observations of work activities of the individual member in relation to the work activities of the group</li> <li>5.2 Observation of simulation and/or role play involving the participation of individual member to the attainment of organizational goal</li> <li>5.3 Case studies and scenarios as a basis for discussion of issues and strategies in teamwork</li> </ul>
<p>6. Context of assessment</p>	<ul style="list-style-type: none"> <li>6.1 Competency assessment may occur in workplace or any appropriately simulated environment</li> <li>6.2 Assessment shall be observed while task are being undertaken whether individually or in-group</li> </ul>

UNIT OF COMPETENCY : **DEVELOP AND PRACTICE NEGOTIATION SKILLS**

UNIT CODE : **500311111**

UNIT DESCRIPTOR : This unit covers the skills, knowledge and attitudes required to collect information in order to negotiate to a desired outcome and participate in the negotiation.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized terms</i> are elaborated in the Range of Variables
1. Plan negotiations	1.1 Information on <b><i>preparing for negotiation</i></b> is identified and included in the plan 1.2 Information on creating <b><i>non verbal environments</i></b> for positive negotiating is identified and included in the plan 1.3 Information on <b><i>active listening</i></b> is identified and included in the plan 1.4 Information on different <b><i>questioning techniques</i></b> is identified and included in the plan 1.5 Information is checked to ensure it is correct and up-to-date
2. Participate in negotiations	2.1 Criteria for successful outcome are agreed upon by all parties 2.2 Desired outcome of all parties are considered 2.3 Appropriate language is used throughout the negotiation 2.4 A variety of questioning techniques are used 2.5 The issues and processes are documented and agreed upon by all parties 2.6 Possible solutions are discussed and their viability assessed 2.7 Areas for agreement are confirmed and recorded 2.8 Follow-up action is agreed upon by all parties

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Preparing for negotiation	1.1 Background information on other parties to the negotiation 1.2 Good understanding of topic to be negotiated 1.3 Clear understanding of desired outcome/s 1.4 Personal attributes 1.4.1 self awareness 1.4.2 self esteem 1.4.3 objectivity 1.4.4 empathy 1.4.5 respect for others 1.5 Interpersonal skills 1.5.1 listening/reflecting 1.5.2 non verbal communication 1.5.3 assertiveness 1.5.4 behavior labeling 1.5.5 testing understanding 1.5.6 seeking information 1.5.7 self disclosing 1.6 Analytic skills 1.6.1 observing differences between content and process 1.6.2 identifying bargaining information 1.6.3 applying strategies to manage process 1.6.4 applying steps in negotiating process 1.6.5 strategies to manage conflict 1.6.6 steps in negotiating process 1.6.7 options within organization and externally for resolving conflict
2. Non verbal environments	2.1 Friendly reception 2.2 Warm and welcoming room 2.3 Refreshments offered 2.4 Lead in conversation before negotiation begins
3. Active listening	3.1 Attentive 3.2 Don't interrupt 3.3 Good posture 3.4 Maintain eye contact 3.5 Reflective listening
4. Questioning techniques	4.1 Direct 4.2 Indirect 4.3 Open-ended

## EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Demonstrated sufficient knowledge of the factors influencing negotiation to achieve agreed outcome</li> <li>1.2 Participated in negotiation with at least one person to achieve an agreed outcome</li> </ul>
2. Underpinning knowledge and attitude	<ul style="list-style-type: none"> <li>2.1 Codes of practice and guidelines for the organization</li> <li>2.2 Organizations policy and procedures for negotiations</li> <li>2.3 Decision making and conflict resolution strategies procedures</li> <li>2.4 Problem solving strategies on how to deal with unexpected questions and attitudes during negotiation</li> <li>2.5 Flexibility</li> <li>2.6 Empathy</li> </ul>
3. Underpinning skills	<ul style="list-style-type: none"> <li>3.1 Interpersonal skills to develop rapport with other parties</li> <li>3.2 Communication skills (verbal and listening)</li> <li>3.3 Observation skills</li> <li>3.1 Negotiation skills</li> </ul>
4. Resource implications	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 Room with facilities necessary for the negotiation process</li> <li>4.2 Human resources (negotiators)</li> </ul>
5. Method of assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Observation/demonstration and questioning</li> <li>5.2 Portfolio assessment</li> <li>5.3 Oral and written questioning</li> <li>5.4 Third party report</li> </ul>
6. Context of assessment	<ul style="list-style-type: none"> <li>6.1 Competency to be assessed in real work environment or in a simulated workplace setting.</li> </ul>

UNIT OF COMPETENCY : **SOLVE PROBLEMS RELATED TO WORK ACTIVITIES**

UNIT CODE : **500311112**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required to solve problems in the workplace including the application of problem solving techniques and to determine and resolve the root cause of problems.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized terms</i> are elaborated in the Range of Variables
1. Identify the problem	1.1 Variances are identified from normal operating parameters; and product quality 1.2 Extent, cause and nature are of the problem are defined through observation, investigation and <b>analytical techniques</b> 1.3 <b>Problems</b> are clearly stated and specified
2. Determine fundamental causes of the problem	2.1 Possible causes are identified based on experience and the use of problem solving tools / analytical techniques. 2.2 Possible cause statements are developed based on findings 2.3 Fundamental causes are identified per results of investigation conducted
3. Determine corrective action	3.1 All possible options are considered for resolution of the problem 3.2 Strengths and weaknesses of possible options are considered 3.3 Corrective actions are determined to resolve the problem and possible future causes 3.4 <b>Action plans</b> are developed identifying measurable objectives, resource needs and timelines in accordance with safety and operating procedures
4. Provide recommendation/s to manager	4.1 Report on recommendations are prepared 4.2 Recommendations are presented to appropriate personnel. 4.3 Recommendations are followed-up, if required

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Analytical techniques	1.1 Brainstorming 1.2 Intuitions/Logic 1.3 Cause and effect diagrams 1.4 Pareto analysis 1.5 SWOT analysis 1.6 Gant chart, Pert CPM and graphs 1.7 Scattergrams
2. Problem	2.1 Non – routine process and quality problems 2.2 Equipment selection, availability and failure 2.3 Teamwork and work allocation problem 2.4 Safety and emergency situations and incidents
3. Action plans	3.1 Priority requirements 3.2 Measurable objectives 3.3 Resource requirements 3.4 Timelines 3.5 Co-ordination and feedback requirements 3.6 Safety requirements 3.7 Risk assessment 3.8 Environmental requirements

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Identified the problem</li> <li>1.2 Determined the fundamental causes of the problem</li> <li>1.3 Determined the correct / preventive action</li> <li>1.4 Provided recommendation to manager</li> </ul> <p>These aspects may be best assessed using a range of scenarios / case studies / what ifs as a stimulus with a walk through forming part of the response. These assessment activities should include a range of problems, including new, unusual and improbable situations that may have happened.</p>
<p>2. Underpinning knowledge</p>	<ul style="list-style-type: none"> <li>2.1 Competence includes a thorough knowledge and understanding of the process, normal operating parameters, and product quality to recognize non-standard situations</li> <li>2.2 Competence to include the ability to apply and explain, sufficient for the identification of fundamental cause, determining the corrective action and provision of recommendations <ul style="list-style-type: none"> <li>2.2.1 Relevant equipment and operational processes</li> <li>2.2.2 Enterprise goals, targets and measures</li> <li>2.2.3 Enterprise quality, OHS and environmental requirement</li> <li>2.2.4 Principles of decision making strategies and techniques</li> <li>2.2.5 Enterprise information systems and data collation</li> <li>2.2.6 Industry codes and standards</li> </ul> </li> </ul>
<p>3. Underpinning skills</p>	<ul style="list-style-type: none"> <li>3.1 Using range of formal problem solving techniques</li> <li>3.2 Identifying and clarifying the nature of the problem</li> <li>3.3 Devising the best solution</li> <li>3.4 Evaluating the solution</li> <li>3.5 Implementation of a developed plan to rectify the problem</li> </ul>
<p>4. Resource implications</p>	<p>4.1 Assessment will require access to an operating plant over an extended period of time, or a suitable method of gathering evidence of operating ability over a range of situations. A bank of scenarios / case studies / what ifs will be required as well as bank of questions which will be used to probe the reason behind the observable action.</p>
<p>5. Method of assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Case studies on solving problems in the workplace</li> <li>5.2 Observation</li> </ul> <p>The unit will be assessed in a holistic manner as is practical and may be integrated with the assessment of other relevant units of competency. Assessment will occur over a range of situations, which will include disruptions to normal, smooth operation. Simulation may be required to allow for timely assessment of parts of this unit of competency. Simulation should be based on the actual workplace and will include walk through of the relevant competency components.</p>
<p>6. Context of assessment</p>	<p>6.1 In all workplace, it may be appropriate to assess this unit concurrently with relevant teamwork or operation units.</p>

UNIT OF COMPETENCY : **USE MATHEMATICAL CONCEPTS AND TECHNIQUES**

UNIT CODE : **500311113**

UNIT DESCRIPTOR : This unit covers the knowledge, skills and attitudes required in the application of mathematical concepts and techniques.

<b>ELEMENT</b>	<b>Performance Criteria</b> <i>Italicized terms</i> are elaborated in the Range of Variables
1. Identify mathematical tools and techniques to solve problem	1.1 Problem areas are identified based on given condition 1.2 <b><i>Mathematical techniques</i></b> are selected based on the given problem
2. Apply mathematical procedure/solution	2.1 Mathematical techniques are applied based on the problem identified 2.2 Mathematical computations are performed to the level of accuracy required for the problem 2.3 Results of mathematical computation is determined and verified based on job requirements
3. Analyze results	3.1 Result of application is reviewed based on expected and required specifications and outcome 3.2 <b><i>Appropriate action</i></b> is applied in case of error

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Mathematical techniques	May include but are not limited to: 1.1 Four fundamental operations 1.2 Measurements 1.3 Use/Conversion of units of measurements 1.4 Use of standard formulas
2. Appropriate action	2.1 Review in the use of mathematical techniques (e.g. recalculation, re-modeling) 2.2 Report error to immediate superior for proper action

## EVIDENCE GUIDE

1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 Identified, applied and reviewed the use of mathematical concepts and techniques to workplace problems
2. Underpinning knowledge	2.1 Fundamental operation (addition, subtraction, division, multiplication) 2.2 Measurement system 2.3 Precision and accuracy 2.4 Basic measuring tools/devices
3. Underpinning skills	3.1 Applying mathematical computations 3.2 Using calculator 3.3 Using different measuring tools
4. Resource implications	The following resources <b>MUST</b> be provided: 4.1 Calculator 4.2 Basic measuring tools 4.3 Case Problems
5. Method of assessment	Competency may be assessed through: 5.1 Authenticated portfolio 5.2 Written Test 5.3 Interview/Oral Questioning 5.4 Demonstration
6. Context of assessment	6.1 Competency may be assessed in the work place or in a simulated work place setting

UNIT OF COMPETENCY : **USE RELEVANT TECHNOLOGIES**

UNIT CODE : **500311114**

UNIT DESCRIPTOR : This unit of competency covers the knowledge, skills, and attitude required in selecting, sourcing and applying appropriate and affordable technologies in the workplace.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized terms</i> are elaborated in the Range of Variables
1. Study/select appropriate technology	1.1 Usage of different <b>technologies</b> is determined based on job requirements 1.2 Appropriate technology is selected as per work specification
2. Apply relevant technology	2.1 Relevant technology is effectively used in carrying out function 2.2 Applicable software and hardware are used as per task requirement 2.3 <b>Management concepts</b> are observed and practiced as per established industry practices
3. Maintain/enhance relevant technology	3.1 Maintenance of technology is applied in accordance with the <b>industry standard operating procedure</b> , <b>manufacturer's operating guidelines</b> and <b>occupational health and safety procedure</b> to ensure its operative ability 3.2 Updating of technology is maintained through continuing education or training in accordance with job requirement 3.3 Technology failure/ defect is immediately reported to the concern/responsible person or section for <b>appropriate action</b>

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Technology	May include but are not limited to: 1.1 Office technology 1.2 Industrial technology 1.3 System technology 1.4 Information technology 1.5 Training technology
2. Management concepts	May include but not limited to: 2.1 Real Time Management 2.2 KAIZEN or continuous improvement 2.3 5S 2.4 Total Quality Management 2.5 Other management/productivity tools
3. Industry standard operating procedure	3.1 Written guidelines relative to the usage of office technology/equipment 3.2 Verbal advise/instruction from the co-worker
4. Manufacturer's operating guidelines/instructions	4.1 Written instruction/manuals of specific technology/equipment 4.2 General instruction manual 4.3 Verbal advise from manufacturer relative to the operation of equipment
5. Occupational health and safety procedure	5.1 Relevant statutes on OHS 5.2 Company guidelines in using technology/equipment
6. Appropriate action	6.1 Implementing preventive maintenance schedule 6.2 Coordinating with manufacturer's technician

## EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Studied and selected appropriate technology consistent with work requirements</li> <li>1.2 Applied relevant technology</li> <li>1.3 Maintained and enhanced operative ability of relevant technology</li> </ul>
2. Underpinning knowledge	<ul style="list-style-type: none"> <li>2.1 Awareness on technology and its function</li> <li>2.2 Repair and maintenance procedure</li> <li>2.3 Operating instructions</li> <li>2.4 Applicable software</li> <li>2.5 Communication techniques</li> <li>2.6 Health and safety procedure</li> <li>2.7 Company policy in relation to relevant technology</li> <li>2.8 Different management concepts</li> <li>2.9 Technology adaptability</li> </ul>
3. Underpinning skills	<ul style="list-style-type: none"> <li>3.1 Relevant technology application/implementation</li> <li>3.2 Basic communication skills</li> <li>3.3 Software applications skills</li> <li>3.4 Basic troubleshooting skills</li> </ul>
4. Resource implications	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 Relevant technology</li> <li>4.2 Interview and demonstration questionnaires</li> <li>4.3 Assessment packages</li> </ul>
5. Method of assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Interview</li> <li>5.2 Actual demonstration</li> <li>5.3 Authenticated portfolio (related certificates of training/seminar)</li> </ul>
6. Context of assessment	<ul style="list-style-type: none"> <li>6.1 Competency may be assessed in actual workplace or simulated environment</li> </ul>

## COMMON COMPETENCIES

UNIT OF COMPETENCY : **PERFORM MENSURATION AND CALCULATION**

UNIT CODE : **UTL311202**

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

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

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Measuring instruments	Measuring instruments includes: <ul style="list-style-type: none"> <li>1.1 Multitester</li> <li>1.2 Micrometer (In-out, depth)</li> <li>1.3 Vernier caliper (Out, inside)</li> <li>1.4 Dial Gauge with Mag. Std.</li> <li>1.5 Plastigauge</li> <li>1.6 Straight Edge</li> <li>1.7 Thickness gauge</li> <li>1.8 Torque Gauge</li> <li>1.9 Small Hole gauge</li> <li>1.10 Telescopic Gauge</li> <li>1.11 Try square</li> <li>1.12 Protractor</li> <li>1.13 Combination gauge</li> <li>1.14 Steel rule</li> </ul>
2. Calculation	Kinds of part mensuration include: <ul style="list-style-type: none"> <li>2.1 Volume</li> <li>2.2 Area</li> <li>2.3 Displacement</li> <li>2.4 Inside diameter</li> <li>2.5 Circumference</li> <li>2.6 Length</li> <li>2.7 Thickness</li> <li>2.8 Outside diameter</li> <li>2.9 Taper</li> <li>2.10 Out of roundness</li> <li>2.11 Oil clearance</li> <li>2.12 End play/thrust clearance</li> </ul>

## EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Selected measuring instruments</li> <li>1.2 Carried-out measurements and calculations.</li> <li>1.3 Maintained measuring instruments</li> </ul>
2. Underpinning knowledge	<ul style="list-style-type: none"> <li>2.1 Types of Measuring instruments and its uses</li> <li>2.2 Safe handling procedures in using measuring instruments</li> <li>2.3 Four fundamental operation of mathematics</li> <li>2.2 Formula for Volume, Area, Perimeter and other geometric figures</li> </ul>
3. Underpinning skills	<ul style="list-style-type: none"> <li>3.1 Caring and Handling measuring instruments</li> <li>3.2 Calibrating and using measuring instruments</li> <li>3.1 Performing calculation by Addition, Subtraction, Multiplication and Division</li> <li>3.2 Visualizing objects and shapes</li> <li>3.3 Interpreting formula for volume, area, perimeter and other geometric figures</li> </ul>
4. Resource implications	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 Workplace location</li> <li>4.2 Measuring instrument appropriate to servicing processes</li> <li>4.3 Instructional materials relevant to the propose activity</li> </ul>
5. Method of assessment	<p>Competency must be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Observation with questioning</li> <li>5.2 Written or oral examination</li> <li>5.3 Interview</li> <li>5.4 Demonstration with questioning</li> </ul>
6. Context of assessment	<ul style="list-style-type: none"> <li>6.1 Competency elements must be assessed in a safe working environment</li> <li>6.2 Assessment may be conducted in a workplace or simulated environment</li> </ul>

UNIT OF COMPETENCY : **READ, INTERPRET AND APPLY SPECIFICATIONS AND MANUALS.**

UNIT CODE : **UTL723203**

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

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized terms</i> are elaborated in the Range of Variables
1. Identify and access manual/ specification	1.1 Appropriate <b>manuals</b> 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 1.5 Operation and maintenance instructions manual 1.6 Spare Parts Catalogue

## EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Identified and accessed manual/specification</li> <li>1.2 Interpreted manuals</li> <li>1.3 Applied information in manuals</li> <li>1.4 Stored manuals</li> </ul>
2. Underpinning knowledge	<ul style="list-style-type: none"> <li>2.1 Types of manuals used in automotive industry</li> <li>2.2 Identification of symbols used in the manuals</li> <li>3.1 Identification of units of measurements</li> <li>3.2 Unit conversion</li> </ul>
3. Underpinning skills	<ul style="list-style-type: none"> <li>3.1 Reading and comprehension skills required to identify and interpret automotive manuals and specifications</li> <li>3.2 Accessing information and data</li> </ul>
4. Resource Implications	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 All manuals/catalogues relative to Automotive</li> <li>4.2 Job order, requisitions</li> <li>4.3 Actual vehicle or simulator</li> </ul>
5. Method of assessment	<p>Competency <b>MUST</b> be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Observation with questioning</li> <li>5.2 Interview</li> </ul>
6. Context of assessment	<ul style="list-style-type: none"> <li>6.1 Assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines</li> <li>6.2 Assessment may be conducted in the workplace or a simulated environment.</li> </ul>

UNIT OF COMPETENCY : **PERFORM SHOP MAINTENANCE**

UNIT CODE : **UTL723205**

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.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized terms</i> are elaborated in the Range of Variables
1. Inspect/clean tools and work area	1.1 Cleaning solvent used as per workshop/tools <b><i>cleaning requirement</i></b> 1.2 Work area is checked and cleaned 1.3 Wet surface/spot in work area is wiped and dried
2. Store/arrange tools and shop equipment	1.1 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 of waste materials	3.1 Containers for used materials are visibly labeled 3.2 Waste materials are disposed as per workshop SOP
4. Report damaged tools/equipment	4.1 Complete inventory of tools/equipment is maintained 4.2 Damaged tools/equipment/facilities are identified and repair recommendation is given 4.3 Reports prepared have no error/discrepancy

## RANGE OF VARIABLES

VARIABLE	RANGE
1 Cleaning requirement	1.1 Cleaning solvent 1.2 Inventory of supplies, tools, equipment, facilities 1.3 List of mechanics/technicians 1.4 Rags 1.5 Broom 1.6 Map 1.7 Pail 1.8 Dust/waste bin

## EVIDENCE GUIDE

1. Critical aspects of competency	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Cleaned workshop tools/facilities</li> <li>1.2 Maintained equipment, tools and facilities</li> <li>1.3 Disposed wastes and used lubricants/fluid as per required procedure</li> </ul>
2. Underpinning knowledge and attitudes	<ul style="list-style-type: none"> <li>2.1 5 S or Total Quality Management (TQM)</li> <li>2.2 Service procedures</li> <li>2.3 Relevant technical information</li> <li>2.4 Safe handling of Equipment and tools</li> <li>2.5 Equipment safety requirements</li> <li>2.6 Workshop policies</li> <li>2.7 Personal safety procedures</li> <li>2.8 Fire Extinguishers and prevention</li> <li>2.9 Storage/Disposal of Hazardous/flammable materials</li> <li>2.10 Positive Work Values (Perseverance, Honesty, Patience, Attention to Details)</li> </ul>
3. Underpinning skills	<ul style="list-style-type: none"> <li>3.1 Handling/Storing of tools/equipment/supplies and material</li> <li>3.2 Disposing of wastes and fluid</li> <li>3.3 Preparing inventory of s/m and tools and equipment</li> <li>3.4 Monitoring of supplies/materials and tools/equipment</li> </ul>
4. Resource implications	<p>The following resources <b>MUST</b> be provided:</p> <ul style="list-style-type: none"> <li>4.1 Workplace: Real or simulated work area</li> <li>4.2 Appropriate Tools &amp; equipment</li> <li>4.3 Materials relevant to the activity</li> </ul>
5. Method of assessment	<p>Competency <b>MUST</b> be assessed through:</p> <ul style="list-style-type: none"> <li>5.1 Written/Oral Questioning</li> <li>5.2 Demonstration</li> </ul> <p>Assessment of underpinning knowledge and practical skills may be combined.</p>
6. Context of assessment	<ul style="list-style-type: none"> <li>6.1 Competency must be assessed on the job or simulated environment.</li> <li>6.2 The assessment of practical skills must take place after a period of supervised practice and repetitive experience.</li> </ul>

UNIT OF COMPETENCY : **PERFORM BASIC BENCHWORK**

UNIT CODE : **UTL713202**

UNIT DESCRIPTOR: This unit covers the knowledge, skills and attitudes in preparing materials, tools and equipment, lay-outing dimensions and performing basic benchwork based on the required performance standards.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Prepare materials, tools and equipment	1.1 <b>Work plan</b> is interpreted to determine job requirements 1.2 <b>Materials, tools and equipment</b> are identified and prepared according to job requirements 1.3 Materials are checked according to the required specifications 1.4 Tools and equipment conditions are checked following the standard operating procedures (SOPs)
2. Lay-out and mark dimensions/features on workplace	2.1 Metallic and non-metallic materials are selected according to the requirements specified in the blueprint 2.2 <b>Dimensions/features</b> are laid-out/marked according to job specifications/blueprint and within the required tolerance 2.3 Dimensions are checked against the actual work plan
3. Perform required benchworks	3.1 <b>Work instructions are followed</b> to ensure work safety 3.2 <b>Benchworks</b> are performed applying knowledge on safety procedures and according to job requirements 3.1 Workpieces are clamped in <b>workholding device</b> to avoid damage and accidents 3.2 Work pieces are cut, chipped or filed according to required measurements, tolerance specified in the blueprint and free from burrs and sharp edges 3.3 Drilling is performed according to recommended sequence and specifications 3.6 Proper usage of materials, tools and equipment is observed 3.7 Appropriate <b>PPE</b> and safety procedures are applied 3.8 Worksite is cleaned and cleared of all debris and left in safe state in accordance with OHS regulations

## RANGE OF VARIABLES

VARIABLE	RANGE	
1. Work plan	1.1 Job requirements 1.2 Schedule of work	
2. Materials	May include but not limited to: 2.1 Steel brackets 2.2 Grinding disc 2.3 Drill bit	2.4 Flat/angle bars 2.5 Fastening screws 2.6 Masonry
3. Tools and equipment	May include but not limited to: 3.1 Portable grinder 3.2 Hacksaw 3.3 File 3.4 Bench vise 3.5 Markers 3.6 Screw drivers 3.7 Ballpen hammer	3.8 L-square/steel square 3.9 Steel rule 3.10 Measuring tools 3.11 PPE 3.12 Portable electric drill 3.13 Bench wire 3.14 Tri-square
4. Metallic materials	May include but not limited to: 4.1 Mild steel plate 4.2 Flat bar 4.3 Square bar 4.4 Angle bar 4.5 Round bar	4.6 G.I. sheet 4.7 B.I. sheet 4.8 Beam 4.9 G.I. and B.I. pipes
5. Non-metallic materials	May include but not limited to: 5.1 PVC 5.2 Rubber 5.3 Wood	5.4 Fiber glass 5.5 Plastic 5.6 Ceramics
6. Dimensions	6.1 Measurements 6.2 Tolerances	
7. Work instructions	7.1 Work plan 7.2 Blueprint 7.3 Manufacturer's specifications	
8. Personal Protective Equipment (PPE)	May include but not limited to: 8.1 Safety shoes 8.2 Gloves 8.3 Goggles	
9. Benchworks	May include but not limited to: 9.1 Cutting 9.2 Filing 9.3 Drilling	
10. Workholding device	May include but not limited to: 10.1 Machine vise 10.2 Pliers 10.3 Vise grip	
11. Manual	May include but not limited to: 11.1 Procedures manual 11.2 Instructional manual	

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Interpreted work plan to determine job requirements</li> <li>1.2 Identified and prepared supplies, materials, tools and equipment in accordance with job requirements</li> <li>1.3 Selected and used appropriate processes, tools and equipment to carry out task</li> <li>1.4 Laid-out and checked dimensions in accordance with job requirements and within the tolerances</li> <li>1.5 Followed work instructions to ensure safety</li> <li>1.6 Performed benchworks in accordance with job requirements</li> <li>1.7 Cleaned worksite and left in safe state in accordance with OSHA regulations</li> </ol>
<p>2. Underpinning knowledge</p>	<ol style="list-style-type: none"> <li>2.1 <b>TRADE MATHEMATICS</b> <ul style="list-style-type: none"> <li>• Linear measurements</li> <li>• Dimensions</li> <li>• Unit conversion</li> </ul> </li> <li>2.2 <b>TRADE THEORY</b> <ul style="list-style-type: none"> <li>• Basic Benchwork</li> </ul> </li> <li>2.3 <b>SAFETY PRACTICES</b> <ul style="list-style-type: none"> <li>• PPE</li> <li>• Handling of tools, supplies and equipment</li> <li>• Good housekeeping</li> </ul> </li> </ol>
<p>3. Underpinning skills</p>	<ol style="list-style-type: none"> <li>3.1 Performing basic benchwork</li> <li>3.2 Communicating effectively</li> <li>3.3 Work safety</li> <li>3.4 Preparing materials, tools and equipment</li> <li>3.5 Proper handling of tools and equipment</li> </ol>
<p>4. Resource implications</p>	<p>The following resources should be provided:</p> <ol style="list-style-type: none"> <li>4.1 Workplace</li> <li>4.2 Work plan</li> <li>4.3 Materials, tools and equipment relevant to the proposed activity/task</li> </ol>
<p>5. Methods of assessment</p>	<p>Competency should be assessed through:</p> <ol style="list-style-type: none"> <li>5.1 Actual demonstration</li> <li>5.2 Direct observation</li> <li>5.3 Written/questioning related to underpinning knowledge</li> </ol>
<p>6. Context of assessment</p>	<ol style="list-style-type: none"> <li>6.1 Competency assessment may occur in workplace or any appropriate simulated environment</li> <li>6.2 Assessment shall be observed while task are being undertaken whether individually or in group</li> </ol>

UNIT OF COMPETENCY : **PERFORM BASIC ELECTRICAL WORKS**

UNIT CODE : **UTL724201**

UNIT DESCRIPTOR: This unit covers the knowledge, skills and attitudes in preparing materials, tools and equipment, testing electrical components and basic repairing in electricity based on the required performance standards.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Prepare electrical tools and test instruments	1.1 <b>Work plan</b> is interpreted to determine job requirements 1.2 <b>Electrical tools and instruments</b> are identified and prepared according to job requirements 1.3 Electrical tools and instruments are checked for conditions and calibrated as required
2. Test power supply and electrical components	2.1 Instruments are tested in accordance with PEC 2.2 Power supply and electrical components are checked in accordance with manufacturer's specifications/PEC 2.3 Defects of power supply and electrical components are identified and recorded 2.4 Safe working habits is observed
3. Perform basic electrical repair	3.1 <b>Work instructions</b> are followed to ensure safety work 3.2 Loose connections are tightened in accordance with PEC 3.3 Defective electrical components are replaced and tested in accordance with PEC 3.4 Work place is cleaned and in safe state in line with OHSА regulations

## RANGE OF VARIABLES

VARIABLE	RANGE
1. Work plan	1.1 Job requirements 1.2 Schedule of work
2. Materials	May include but not limited to: 2.1 Solid, stranded wire 2.2 Service plug/outlet 2.3 Electrical components 2.4 Soldering lead 2.5 Terminal clips 2.6 Terminal lugs 2.7 Fuses 2.8 PVC/Flexible non-metallic conduit 2.9 Electrical tape
3. Tools and equipment	May include but not limited to: 3.1 Clamp ammeter 3.2 Multi tester 3.3 Insulation tester 3.4 PPE 3.5 Soldering gun/iron 3.6 Wire stripper 3.7 Measuring tool 3.8 Markers 3.9 Crimping tools 3.10 Screw drivers 3.11 Electrician pliers 3.12 Electric drill 3.13 Long nose
4. Work instructions	May include but not limited to: 4.1 Work plan 4.2 Schematic diagrams 4.3 Installation instruction

## EVIDENCE GUIDE

<p>1. Critical aspects of competency</p>	<p>Assessment requires that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Interpreted work plan to determine job requirements</li> <li>1.2 Selected and used appropriate processes, tools and equipment to carry out task</li> <li>1.3 Identified electrical tools and instruments are tested in accordance with PEC</li> <li>1.4 Replaced defective tools and instruments</li> <li>1.5 Checked power supply and electrical components in accordance with PEC</li> <li>1.6 Cleaned work place and left in safe state in line with OHSA regulations</li> <li>1.7 Completed wiring electrical system based in working drawings and PEC</li> <li>1.8 Communicated effectively to ensure safety works</li> </ol>
<p>2. Underpinning knowledge</p>	<ol style="list-style-type: none"> <li>2.1 <b>TRADE MATHEMATICS</b> <ul style="list-style-type: none"> <li>• Linear measurements</li> <li>• Dimensions</li> <li>• Unit conversion</li> </ul> </li> <li>2.2 <b>TRADE THEORY</b> <ul style="list-style-type: none"> <li>• Basic electricity</li> </ul> </li> <li>2.3 <b>SAFETY PRACTICES</b> <ul style="list-style-type: none"> <li>• PPE</li> <li>• Handling of tools and equipment</li> <li>• Good housekeeping</li> </ul> </li> </ol>
<p>3. Underpinning skills</p>	<ol style="list-style-type: none"> <li>3.1 Installing and repairing electrical fixtures</li> <li>3.2 Communicating effectively</li> <li>3.3 Work safety</li> <li>3.4 Proper handling of materials, tools and equipment</li> <li>3.5 Preparing materials, tools and equipment</li> <li>3.6 Wiring components</li> <li>3.7 Testing power supply and electrical component</li> </ol>
<p>4. Resource Implications</p>	<p>The following resources should be provided:</p> <ol style="list-style-type: none"> <li>4.1 Work place</li> <li>4.2 Work plan</li> <li>4.3 Materials, tools and equipment relevant to the proposed activity/task</li> </ol>
<p>5. Methods of Assessment</p>	<p>Competency should be assessed through:</p> <ol style="list-style-type: none"> <li>5.1 Direct observation</li> <li>5.2 Written test/questioning relevant to underpinning knowledge</li> </ol>
<p>6. Context of Assessment</p>	<ol style="list-style-type: none"> <li>6.1 Competency assessment may occur in workplace or any appropriate simulated environment</li> <li>6.2 Assessment shall be observed while task are being undertaken whether individually or in group</li> <li>6.3 Competency assessment must be undertaken in accordance with the endorsed TESDA assessment guidelines</li> </ol>

## CORE COMPETENCIES

This section gives the details of the contents of the core units of competency required in DIESEL POWER PLANT OPERATION AND MAINTENANCE NC III.

UNIT OF COMPETENCY : **TEND DIESEL ENGINE**

UNIT CODE : **UTL723206**

UNIT DESCRIPTOR: This unit covers the required performance in executing the preparation and tending of diesel engine and its auxiliary equipment.

ELEMENT	PERFORMANCE CRITERIA
	<i>Italicized</i> terms are elaborated in the Range of Variables
1. Perform pre-operation check of diesel engine and auxiliary equipment	1.1. <b>Walk around check</b> of plant system is performed in accordance with enterprise procedure. 1.2. <b>Fluid deficiencies</b> are refilled/ topped-up in accordance with enterprise procedures 1.3. <b>Non-fluid deficiencies</b> are identified and corrected in accordance with enterprise procedures. 1.4. Result of walk around check are recorded and reported to shift in charge.
2. Perform operation check	2.1. Engine running condition is monitored for normal operation based on <b>indicating parameters</b> . 2.2. <b>Routine check</b> is performed during operation in accordance with equipment checklist. 2.3. Unit abnormalities are recorded and reported to shift in charge.
3. Perform post-operation procedure	3.1. Shutdown procedure is coordinated with the control operator in accordance with enterprise policy. 3.2. Emergency stop push button is engaged in accordance with the operations manual. 3.3. <b>Daily operation</b> is recorded and reported in accordance with the enterprise policy.

## RANGE OF VARIABLES

1. Walk-around check	<p>Checking may include the following:</p> <p>1.1 Pre-operation:</p> <ul style="list-style-type: none"> <li>1.1.1 Emergency stop button initial position</li> <li>1.1.2 Cooling system</li> <li>1.1.3 Fuel system</li> <li>1.1.4 Lube oil system</li> <li>1.1.5 Aspiration system</li> <li>1.1.6 DC system</li> <li>1.1.7 Speed regulating system</li> <li>1.1.8 Compressed air system</li> <li>1.1.9 Leaks</li> <li>1.1.10 Loose parts connection</li> <li>1.1.11 Missing parts</li> </ul>
2. Routine check	<p>Routine check may include the following:</p> <ul style="list-style-type: none"> <li>2.1 Temperature and Pressure checking</li> <li>2.2 Leaks inspection</li> <li>2.3 Fuel level checking</li> <li>2.4 Oil level checking</li> <li>2.5 Coolant level checking</li> <li>2.6 Smoke emission monitoring</li> <li>2.7 Abnormal sound, smell and vibration monitoring</li> </ul>
3. Fluid deficiencies	<ul style="list-style-type: none"> <li>3.1 Coolant quality and level</li> <li>3.2 Impurities in fuel and fuel level</li> <li>3.3 Lube oil quality and level</li> <li>3.4 Electrolyte level</li> </ul>
4. Non-fluid deficiencies	<ul style="list-style-type: none"> <li>4.1 Activated air restriction indicator</li> <li>4.2 Incorrect belt tension</li> <li>4.3 Clogged fuel/water filter</li> <li>4.4 Dirty fuel/water separator</li> <li>4.5 Loose bolts, wiring connection and/or components</li> <li>4.6 Leaky components</li> </ul>
5. Indicating Parameters	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>5.1 Temperature</li> <li>5.2 Pressure</li> </ul>
6. Daily operation	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>6.1 Computation of fuel consumption</li> <li>6.2 Computation of lube oil consumption</li> <li>6.3 Consumption of water and inhibitor</li> <li>6.4 Records of parameter readings</li> </ul>

## EVIDENCE GUIDE

<p>1. Critical Aspect of Competency</p>	<p>Assessment requires that the candidate:</p> <p>1.1 Conducted walk-around check while the engine is running and not running.</p> <p>1.2 Performed pre and post operation activities in diesel power plant</p> <p>1.3 Recorded power plant operation</p>
<p>2. Underpinning Knowledge</p>	<p>2.1 Diesel Power Plant Operation</p> <p>2.1.1 duties and responsibilities</p> <p>2.1.2 pre-operation activities</p> <p>2.1.3 operation activities</p> <p>2.1.4 post-operation activities</p> <p>2.2 Familiarity with generating set operation with 15kW to 750 kW and 1.2 MW</p> <p>2.2.1 Plant systems</p> <p>2.2.2 System function</p> <p>2.2.3 System flowpath</p> <p>2.2.4 Interrelationship of plant systems/components</p> <p>2.2.5 System component function, location and description</p> <p>2.2.6 System controls and indications</p> <p>2.2.7 Required maintenance</p> <p>2.3 Plant Safety procedures and environmental awareness</p>
<p>3. Underpinning Skills</p>	<p>3.1 Checking of plant systems and components</p> <p>3.2 Correcting minor/operational defects in plant systems and components</p> <p>3.3 Refilling of deficient fluid levels</p> <p>3.4 Replacing filters</p> <p>3.5 Recording operation activities</p> <p>3.6 Monitoring of generating set operation</p> <p>3.7 Cleaning and replacing battery terminals</p> <p>3.8 Using hand tools and test instruments</p>
<p>4. Resource Implications</p>	<p>4.1 Diesel generating set</p> <p>4.2 PPE</p> <p>4.3 Mechanical/electrical tools and test instruments</p> <p>4.4 Coolant, diesel fuel, lube oil and cleaning materials</p> <p>4.5 Diesel Power Plant Operation Manual</p>
<p>5. Method of Assessment</p>	<p>5.1 Written</p> <p>5.2 Direct observation with oral questioning</p> <p>5.3 Third party report</p> <p>5.4 Portfolio</p> <p>5.5 Interview</p> <p>5.6 Demonstration with oral questioning</p>
<p>6. Context of Assessment</p>	<p>6.1 Competency may be assessed on the job or simulated environment</p> <p>6.2 The assessment of practical skills may take place after a period of supervised practice and repetitive experience</p>

UNIT OF COMPETENCY : **OPERATE DIESEL POWER PLANT**

UNIT CODE : **UTL723207**

UNIT DESCRIPTOR: This unit covers the performance required to operate diesel power plant in power generation.

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b> <i>Italicized</i> terms are elaborated in the Range of Variables
1. Run the unit	1.1. Confirmation that line is ready from distribution utility is undertaken in accordance with enterprise protocol. 1.2. <b>Unit</b> is started after ensuring that the <b>initial conditions</b> are achieved. 1.3. Unit conditions are monitored based on <b>indicating parameters</b> . 1.4. Main circuit breaker is switched ON after <b>all unit requirements</b> are attained.
2. Perform parallel operation of the unit	2.1. Synchronization of units is performed in accordance with established procedure. 2.2. Generator voltage and frequency are adjusted in accordance with system voltage and frequency requirements. 2.3. Load sharing adjustments are set according to load demand and unit dependable capability.
3. Monitor and tend the unit	3.1. Control panel parameters are recorded in accordance with enterprise procedure. 3.2. <b>Abnormalities</b> are responded to in accordance with enterprise policy.
4. Shut down the unit	4.1. <b>Indicator</b> readings are recorded in accordance with enterprise policy. 4.2. Load transfer procedure is performed in accordance with unit's dependable capacity and in accordance with manufacturer's shutdown instruction. 4.3. Shutdown procedure is performed following manufacturer's instruction and corporate policies. 4.4. <b>Result of operation</b> are computed and reported in accordance with enterprise policy.

## RANGE OF VARIABLES

1. Unit	May include but not limited to: 1.1. 15 kW ≈ 750 kW generating set 1.2. 1.2 MW generating set	
2. Initial conditions	May include but not limited to: 2.1. Main Circuit Breaker are in OPEN position 2.2. Alternator is preheated 2.3. All system are ready for operation	
3. Indicating parameters	May include but not limited to: 3.1. Voltage 3.2. Frequency 3.3. Current 3.4. Power factor 3.5. Power 3.6. Energy 3.7. Reactive power 3.8. Running hours 3.9. Other observable parameters like sound, vibration, odor and visual	
4. Abnormalities	This may include but not limited to: 4.1. Over/Under voltage 4.2. Over/under frequency 4.3. Unbalanced load current 4.4. Earth-leakage fault 4.5. Reverse power 4.6. Leading/low lagging power factor 4.7. Charge failure 4.8. High engine temperature 4.9. Low oil pressure 4.10. High oil temperature 4.11. Abnormal sound/Knocking sound 4.12. Excessive vibration 4.13. Erratic speed/hunting 4.14. Burnt odor 4.15. Smokes, sparks, leaks and hot spots	
5. Unit requirements	May include but not limited to: 5.1. Engine temperature requirement 5.2. Oil pressure requirement 5.3. Voltage and frequency requirements	
6. Indicator	May include but not limited to: 6.1. Volt meter 6.2. Ammeter 6.3. Kilowatt meter 6.4. Power factor meter	6.5. Kilowatt hour meter 6.6. Running hours meter 6.7. Frequency meter 6.8. kVAR meter
7. Result of operation	May include but not limited to: 7.1. Energy generated (gross/net) 7.2. Fuel, lube oil and water & inhibitor consumption 7.3. Accumulated running hours 7.4. Station used	

## EVIDENCE GUIDE

<p>1. Critical Aspect of Competency</p>	<p>Assessment requires that the candidate:</p> <ul style="list-style-type: none"> <li>1.1. Ran the unit</li> <li>1.2. Performed parallel operation of units</li> <li>1.3. Monitored and tended the unit</li> <li>1.4. Shut down the unit</li> <li>1.5. Recorded power plant operation</li> </ul>
<p>2. Underpinning Knowledge</p>	<ul style="list-style-type: none"> <li>2.1. Diesel Power Plant Operation               <ul style="list-style-type: none"> <li>2.1.1. duties and responsibilities</li> <li>2.1.2. pre-operation activities</li> <li>2.1.3. operation activities</li> <li>2.1.4. post-operation activities</li> </ul> </li> <li>2.2. Plant Safety procedures and environmental awareness</li> </ul>
<p>3. Underpinning Skills</p>	<ul style="list-style-type: none"> <li>3.1. Meter reading</li> <li>3.2. Voltage adjustment</li> <li>3.3. Load adjustment</li> <li>3.4. Power factor adjustment</li> <li>3.5. Frequency adjustment</li> <li>3.6. Opening, closing and resetting of breakers</li> <li>3.7. Synchronizing and desynchronizing the unit with single and parallel operation</li> <li>3.8. Communication skills</li> </ul>
<p>4. Resource Implications</p>	<ul style="list-style-type: none"> <li>4.1. Diesel power plant units</li> <li>4.2. PPE</li> <li>4.3. Mechanical/electrical tools and test instruments</li> <li>4.4. Diesel Power Plant Operation Manual</li> <li>4.5. Log sheet/log book</li> </ul>
<p>5. Method of Assessment</p>	<ul style="list-style-type: none"> <li>5.1. Written</li> <li>5.2. Direct observation with oral questioning</li> <li>5.3. Third party report</li> <li>5.4. Portfolio</li> <li>5.5. Interview</li> <li>5.6. Demonstration with oral questioning</li> </ul>
<p>6. Context of Assessment</p>	<ul style="list-style-type: none"> <li>6.1. Competency may be assessed on the job or simulated environment</li> <li>6.2. The assessment of practical skills may take place after a period of supervised practice and repetitive experience</li> </ul>

UNIT OF COMPETENCY: **MAINTAIN AND REPAIR DIESEL ENGINE SYSTEMS AND ALTERNATOR**

UNIT CODE : **UTL723208**

UNIT DESCRIPTOR: This unit identifies the competence required to maintain and service the diesel engine systems and alternator. This includes servicing aspiration system, lube oil system, cooling system, fuel system as well as performing minor servicing of alternator unit.

ELEMENT	PERFORMANCE CRITERIA <i>Italicized</i> terms are elaborated in the Range of Variables
1. Service Aspiration (intake and exhaust) System	1.1. Turbocharger is maintained based on <b>PMS</b> 1.2. Cleaning or replacement of air filter is done as indicated by air restriction indicator 1.3. Air filter casing is cleaned and freed of dust or foreign particles as cleaning or replacement of filter occurs.
2. Service Lube Oil System	2.1. Oil cooler assembly is uninstalled and installed in accordance with the manufacturer's instruction 2.2. Oil cooler assembly are disassembled and assembled without causing damage to the fins, oil cooler tubes and oil seals (o-rings) and in accordance with manufacturer's instruction. 2.3. Oil cooler tubes are cleaned and freed of scale or restrictions. 2.4. Change oil is performed according to SOP
3. Service of Cooling System	3.1. <b>Cooling System</b> is checked for leaks visually. 3.2. Radiator is serviced following enterprise policy 3.3. Thermostat is checked in accordance with its <b>operating temperature</b> . 3.4. Replace or repair system components based on <b>test result</b> . 3.5. Coolant is refilled in accordance to the manufacturer's instruction. 3.6. Maintain coolant pump in accordance with PMS.
4. Service Fuel System	4.1. Fuel filter is replaced in accordance with manufacturer's instruction and PMS. 4.2. Fuel oil/water separator is drained to ensure that the system is free from <b>foreign elements</b> . 4.3. Servicing and calibration of fuel injector is recommended in accordance with enterprise policy.
5. Check condition of alternator	5.1. Loose connections are remedied and restored to normal conditions in accordance with manufacturer's instructions. 5.2. Insulation and <b>winding</b> resistance are checked in accordance with manufacturer's manual. 5.3. Revolving diodes and bridge rectifiers are checked in accordance with manufacturer's manual. 5.4. AVR functionality is tested based on enterprise policy. 5.5. <b>Air gap clearances</b> are checked in accordance with manufacturer's manual. 5.6. Service report is prepared and submitted in accordance with enterprise policy.

## RANGE OF VARIABLES

1. PMS	Preventive Maintenance schedules can be: 1.1 400 RH 1.2 1200 RH 1.3 2400 RH 1.4 4800 RH 1.5 9600 RH 1.6 20000 RH 1.7 other schedules indicated on the manual or enterprise policy
2. Cooling System	Cooling system may consists of the following: 2.1 Radiator Assembly 2.2 Oil Cooler Assembly 2.3 Coolant Pump Assembly 2.4 Coolant Rail & Thermostat 2.5 Water Jackets 2.6 Charged Air Cooler Assembly 2.7 Cooling Fan
3. Operating Temperature	3.1 The first thermostatic valve opens at 78 – 79 °C 3.2 The second thermostatic valve opens at 80 – 84 °C 3.3 The third thermostatic valve fully opens at 92 – 98 °C
4. Test Result	4.1 Operating Temperature of Thermostat 4.2 Axial/Radial Test of Coolant Pump Shaft 4.3 Visual Leak Test/Hydro Test
5. Foreign Elements	May include but not limited to: 5.1 Dirt 5.2 Rust 5.3 Grease/Oil 5.4 Water
6. Winding	6.1 Potential transformer windings 6.2 Current transformer windings 6.3 Main stator windings 6.4 Main rotor windings 6.5 Exciter-rotor windings 6.6 Exciter-stator windings 6.7 Auxiliary windings 6.8 Compounding transformer windings
7. Air gap clearances	7.1 Exciter rotor-stator air gap clearance 7.2 Compounding transformer air gap clearance

## EVIDENCE GUIDE

<p>1. Critical Aspect of Competency</p>	<p>Assessment requires that the candidate serviced the following system :</p> <ol style="list-style-type: none"> <li>1.1. Cooling system</li> <li>1.2. Lube oil system</li> <li>1.3. Fuel system</li> <li>1.4. Aspiration</li> <li>1.5. Alternator</li> </ol>
<p>2. Underpinning Knowledge</p>	<ol style="list-style-type: none"> <li>2.1. Interpreting manufacturers manual &amp; preparations of reports</li> <li>2.2. Diesel engine components operation</li> <li>2.3. Diesel engine systems operation</li> <li>2.4. Parts &amp; assembly of diesel engine components</li> <li>2.5. Specifications of diesel engine components</li> <li>2.6. Parts of alternator</li> <li>2.7. Specifications of alternator and components</li> <li>2.8. Safety &amp; environmental procedures related to servicing of diesel engine components and alternator</li> </ol>
<p>3. Underpinning Skills</p>	<ol style="list-style-type: none"> <li>3.1. Handling of tools &amp; equipment</li> <li>3.2. Handling of precision measuring tools &amp; equipment</li> <li>3.3. Taking component measurements</li> <li>3.4. Analysis of acquired data</li> <li>3.5. Non-destructive testing such as visual inspection and dye-penetrant testing</li> <li>3.6. Communication skills</li> </ol>
<p>4. Resource Implication</p>	<ol style="list-style-type: none"> <li>4.1. Mechanical Tools</li> <li>4.2. Precision measuring tools</li> <li>4.3. Special tools</li> <li>4.4. Lubricants &amp; coolant</li> <li>4.5. Gaskets &amp; Sealants</li> <li>4.6. Dye penetrate, developer &amp; solvent</li> <li>4.7. Cleaning tools &amp; materials</li> <li>4.8. PPE</li> <li>4.9. Diesel engine with complete sub-assemblies</li> <li>4.10. Alternator</li> </ol>
<p>5. Method of Assessment</p>	<ol style="list-style-type: none"> <li>5.1. Written</li> <li>5.2. Direct Observation w/ oral questioning</li> <li>5.3. Third party report</li> <li>5.4. Portfolio</li> <li>5.5. Interview</li> <li>5.6. Demonstration with oral questioning</li> </ol>

6. Context of Assessment	6.1. Competency may be assessed on the job or simulated environment 6.2. The assessment of practical skills may take place after a period of supervised practice and repetitive experience
--------------------------	---

## SECTION 3 TRAINING STANDARDS

These standards are set to provide technical and vocational education and training (TVET) providers with information and other important requirements to consider when designing training programs for Diesel Power Plant Operation and Maintenance NCIII.

### 3.1 CURRICULUM DESIGN

Course Title: **DIESEL POWER PLANT OPERATION AND MAINTENANCE** NC Level: **NC III**

Nominal Training Duration: **302 Hours**

Course Description:

This course is designed to enhance the knowledge, skills and attitudes of a trainee/student in tending diesel engine operation, operating diesel power plant, maintaining and repairing diesel engine system and alternator.

This course also includes participating in workplace communication, working in a team environment, practicing career professionalism, practicing occupational health and safety procedures and reading manuals.

### BASIC COMPETENCIES

(56 Hours)

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Lead workplace communication	1.1 Communicate information about workplace processes. 1.2 Lead workplace discussions. 1.3 Identify and communicate issues arising in the workplace	<ul style="list-style-type: none"> <li>• Group discussion</li> <li>• Role Play</li> <li>• Brainstorming</li> </ul>	<ul style="list-style-type: none"> <li>• Observation</li> <li>• Interviews</li> </ul>
2. Lead small teams	2.1 Provide team leadership. 2.2 Assign responsibilities among members. 2.3 Set performance expectation for team members. 2.4 Supervise team performance	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Demonstration</li> <li>• Self-paced (modular)</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration</li> <li>• Case studies</li> </ul>
3. Develop and practice negotiation skills	3.3 Identify relevant information in planning negotiations 3.4 Participate in negotiations 3.5 Document areas for agreement	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Simulation/role playing</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Practical/performance test</li> </ul>
4. Solve workplace problem related to work activities	4.1 Explain the analytical techniques. 4.2 Identify the problem. 4.3 Determine the possible cause/s of the problem.	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Simulation/role playing</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Practical/performance test</li> </ul>

5. Use mathematical concepts and techniques	5.1 Identify mathematical tools and techniques to solve problem 5.2 Apply mathematical procedures/solution 5.3 Analyze results	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Simulation/role playing</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Practical/performance test</li> </ul>
6. Use relevant technologies	1.1 Identify appropriate technology 1.2 Apply relevant technology 1.3 Maintain/enhance relevant technology	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Simulation/role playing</li> <li>• Case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Practical/performance test</li> </ul>

## COMMON COMPETENCIES

(80 Hours)

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Perform mensuration and calculation  <i>16 hours</i>	1.1 Select measuring instrument and carry out measurement and calculations 1.2 Carry out measurement and calculation 1.3 Maintain measuring instruments	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Oral questioning</li> <li>• Direct observation</li> <li>• Interview</li> </ul>
2. Read, interpret and apply specifications and manual  <i>16 hours</i>	2.1 Identify/access manuals and interpret data and specification 2.2 Apply information accessed in manual 2.3 Store manual	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Oral questioning</li> <li>• Direct observation</li> <li>• Interview</li> </ul>
3. Perform shop maintenance  <i>8 hours</i>	3.1 Inspect/clean tools and work area 3.2 Store/arrange tools and shop equipment 3.3 Dispose waste/used lubricants 3.4 Report damaged tools/equipment	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Oral questioning</li> <li>• Direct observation</li> <li>• Interview</li> </ul>
4. Perform basic bench work  <i>24 hours</i>	4.1. Prepare supplies, materials, tools, and equipment 4.2. Layout necessary dimensions 4.3. Perform grinding, cutting, filing, drilling and boring	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Interview</li> <li>• Demonstration</li> <li>• Direct Observation</li> </ul>
5. Perform basic electrical works  <i>16 hours</i>	5.1. Test power supply and electrical components 5.2. Perform basic repairs and installation	<ul style="list-style-type: none"> <li>• Lecture</li> <li>• Discussion</li> <li>• Demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Written test</li> <li>• Oral questioning</li> <li>• Direct observation</li> <li>• Interview</li> </ul>

## CORE COMPETENCIES

(166 Hours)

Unit of Competency	Learning Outcomes	Methodology	Assessment Approach
1. Tend diesel engine	1.1 Perform pre-operation check of diesel engine and auxiliary equipment 1.2 Tend diesel engine	<ul style="list-style-type: none"> <li>• Lecture/ Discussion</li> <li>• Demonstration</li> <li>• Practical application</li> <li>• Practicum</li> </ul>	<ul style="list-style-type: none"> <li>• Written examination</li> <li>• Demonstration of practical skills</li> <li>• Interview</li> </ul>
2. Operate diesel power plant	2.1 Operate the unit 2.2 Respond to operation abnormalities	<ul style="list-style-type: none"> <li>• Lecture/ Discussion</li> <li>• Demonstration</li> <li>• Practical application</li> <li>• Practicum</li> </ul>	<ul style="list-style-type: none"> <li>• Written examination</li> <li>• Demonstration of practical skills</li> <li>• Interview</li> </ul>
3. Maintain and repair diesel engine systems and alternator	3.1. Service aspiration system 3.2. Service lube oil system 3.3. Service cooling system 3.4. Service fuel system 3.5. Check condition of alternator	<ul style="list-style-type: none"> <li>• Lecture/ Discussion</li> <li>• Demonstration</li> <li>• Practical application</li> <li>• Practicum</li> </ul>	<ul style="list-style-type: none"> <li>• Written examination</li> <li>• Demonstration of practical skills</li> <li>• Interview</li> </ul>

## 3.2 TRAINING DELIVERY

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

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

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

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

### 3.3 TRAINEE ENTRY REQUIREMENTS

Trainees or students should possess the following requirements:

- can communicate both oral and written;
- physically and mentally fit;
- with good moral character; and
- can perform basic mathematical computation.

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

### 3.4 LIST OF TOOLS, EQUIPMENT AND MATERIALS DIESEL ENGINE POWER PLANT OPERATION AND MAINTENANCE – NC III

Recommended list of tools, equipment and materials for the training in Diesel Power Plant Operation and Maintenance – NC III

TOOLS		EQUIPMENT		MATERIALS	
QTY		QTY		QTY	
2 sets	Pail and Funnel	2 units	Diesel generating set 163 KW	1 set	Turbo charger repair kit
1	Lube oil pump	1 set	PPE	1 pc	Bearing
1 unit	Fuel pump	1 unit	Injector calibrating equipment	10 sets	O-rings and washers
1 set	Combination wrench (8-32)	1 unit	Air compressor with spray gun	1 set	Coolant pump repair kit
1 set	Pliers and screw driver	1 set	Insulation tester	100 ltrs.	Lube oil
1 set	Micrometer 150mm (inside and outside)	2 set	Hydraulic jack at least 3 tonner	420 ltrs.	Diesel Fuel
1 pc	Vernier Caliper 150 mm	1 set	Multi tester	30 kg	Rags
1 pc	Hydrometer	1 pc	Chain block	2 pcs	Scrubbing pad
1 unit	Magnetic dial gauge			1 set	Log sheet/ Log book and writing tools
1 set	Pail and dipper			5 ltr	Inhibitor
1	Bench vise			500 ltr	Soft water
1	Bearing Puller			4 units	Automotive Battery, 12 V, 21-plates
1 set	Socket wrench (8-32")			3 ltr	Distilled water
1 set	Allen wrench			4 pcs	Lube filter
1 set	Feeler gauge			2 pcs	Fuel filter
1 set	A-frame			2 pc	Air filter
2 set	Slings			2 kg	Grease
2 set	Eye bolts and shackles			2 kg	Hi temp grease
2 set	Wooden blocks			2 set	Battery terminal lugs and clamps
2 set	Heater			20 pc	Terminal lugs, ½" dia,
1	Bearing Puller			2 m.	Battery cable
1 unit	Bearing heater			10 m.	Automotive wire, no. 12 AWG

TOOLS		EQUIPMENT		MATERIALS	
QTY		QTY		QTY	
1 set	Hacksaw			1 can	Battery terminal cleaner 16 oz
1 set	Electric hand drill with bits			1 can	Contact cleaner
2 set	Slings			3 can	Penetrating oil
2 set	Wooden blocks			1 gal	Rust remover
1 set	Crimping tool			1 gal	Carbon remover
2 set	Soldering set			1 roll	Foam
1 unit	Torque wrench, 0-300 ft-lb. , ½-drive, click-type			1 gal	Carbon remover
1 unit	Torque wrench, 0-500 ft-lb., ¾-drive, click-type			2 gal	Descaler
				10 pc	Steel brush
				3 set	Paint Brush, asstd. sizes
				1 pc	Plastic brush
				6 pcs	Nozzles
				20 ltr	Safety Solvent
				15 cans	Insulating varnish, aerosol type
				8 ltr	Electrical enamel
				10 roll	Electrical tapes
				10 roll	Rubber tapes
				3 roll	Cotton tapes
				5 m	Spaghetti tube, 10 mm
				1 kit	Wire marker
				24 pc	Cable ties 6"
					<b>OTHER MATERIALS</b>
					o manufacturing specifications
					o repair manual
					o maintenance manual
					o periodic maintenance manual
					<b>INSTRUCTIONAL MATERIALS</b>
					o reference books
					o professional emergency
					o learning guides
					o modules
					o CD's, VHS tapes, transparencies

### 3.5 TRAINING FACILITIES

#### DIESEL POWER PLANT OPERATION AND MAINTENANCE – NC III

The workshop must be made of reinforced concrete or steel structure. The size must be suited on the requirements of the competencies. The facility should accommodate a maximum of 20 students/trainees.

SPACE REQUIREMENT	SIZE IN METERS	AREA IN SQ. METERS	TOTAL AREA IN SQ. METERS
<b>Workshop Component Areas</b>			
• Laboratory/Workshop Area	-	-	100.00
• Lecture Room	6.00 x 5.00	30.00	30.00
• Tool, Supply & Storage Room	4.00 X 5.00	20.00	20.00
• Learning Resource Center	4.00 x 5.00	20.00	20.00
• Wash Room and Toilet	2.00 X 5.00	10.00	10.00
Total (Workshop Component)			180.00
• Circulation Area (30% of Workshop Component Space)			54.00
<b>Grand Total (Building Space)</b>			<b>234.00</b>

*Note: The entries in the size in meters column are recommendations only. The grand total (building space) is the minimum space requirement for registration.*

### 3.6 TRAINERS' QUALIFICATION UTILITIES SECTOR

#### DIESEL POWER PLANT OPERATION AND MAINTENANCE – NC III

##### TRAINER QUALIFICATION (TQ III)

- Must be a holder of Diesel Power Plant Operation and Maintenance NC III or equivalent
- Must have undergone training on Training Methodology III (TM III)
- Must be computer literate
- Must be physically and mentally fit
- Must have at least 2 years job/industry experience related to Diesel Power Plant Operation and Maintenance specifically in generating set servicing
- Must be a civil service eligible (for government position or appropriate professional license issued by the Professional Regulatory Commission)

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 Diesel Power Plant Operation and Maintenance NC III, the candidate must demonstrate competence in all the units of competency listed in Section 1. Successful candidates shall be awarded a National Certificate signed by the TESDA Director General.
- 4.2 Individual aspiring to be awarded the qualification of Diesel Power Plant Operation and Maintenance NC III must acquire Certificate of Competency in all the following core units of the qualification. Candidates may apply for assessment in any accredited assessment center.
  - 4.2.1 Tend Diesel Engine
  - 4.2.2 Operate Diesel Power Plant
    - 4.2.2.1 Tend Diesel Engine
    - 4.2.2.2 Operate Diesel Power Plant
  - 4.2.3 Maintain and Repair Diesel Engine Systems and Alternator
    - 4.2.3.1 Tend Diesel Engine
    - 4.2.3.2 Maintain and Repair Diesel Engine Systems and Alternator

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

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

## ANNEX A - COMPETENCY MAP – DIESEL POWER PLANT OPERATION AND MAINTENANCE NC III

### BASIC COMPETENCIES

Receive and Respond to Workplace Communication	Work with Others	Demonstrate work values	Practice basic housekeeping procedures	Participate in Workplace Communication
Work in a Team Environment	Practice career professionalism	Practice occupational health and safety procedures	<b>Lead Workplace Communication</b>	<b>Lead Small Team</b>
<b>Develop and practice negotiation skills</b>	<b>Solve Problems Related to Work Activities</b>	<b>Use mathematical concepts and techniques</b>	<b>Use relevant technologies</b>	Utilize Specialist Communication Skills
Develop Team and Individuals	Apply Problem Solving Techniques in the Workplace	Collect, analyze and organize information	Plan and Organize Work	Promote environmental protection

### COMMON COMPETENCIES

<b>Apply Appropriate Sealant/Adhesive</b>	<b>Perform Mensuration and Calculation</b>	<b>Read, Interpret and Apply Specifications and Manuals</b>	<b>Use and Apply Lubricants/Coolants</b>	<b>Perform Shop Maintenance</b>
<b>Perform Basic Bench Works</b>	<b>Perform Basic Electrical Works</b>			

### CORE COMPETENCIES

<b>Tender Diesel Engine</b>	<b>Operate Diesel Power plant</b>	Service Alternator/ Generator	<b>Maintain and Repair Diesel Engine Systems and Alternator</b>	Diagnose and Repair Diesel Engine
Diagnose and Repair Electrical System	Overhaul Diesel Engine			

## DEFINITION OF TERMS

### GENERAL

- 1) **Certification** - is the process of verifying and validating the competencies of a person through assessment
- 2) **Certificate of Competency (COC)** – is a certification issued to individuals who pass the assessment for a single unit or cluster of units of competency
- 3) **Common Competencies** - are the skills and knowledge needed by all people working in a particular industry
- 4) **Competency** - is the possession and application of knowledge, skills and attitudes to perform work activities to the standard expected in the workplace
- 5) **Competency Assessment** - is the process of collecting evidence and making judgments on whether competency has been achieved
- 6) **Competency Standard (CS)** - is the industry-determined specification of competencies required for effective work performance
- 7) **Context of Assessment** - refers to the place where assessment is to be conducted or carried out
- 8) **Core Competencies** - are the specific skills and knowledge needed in a particular area of work - industry sector/occupation/job role
- 9) **Critical aspects of competency** - refers to the evidence that is essential for successful performance of the unit of competency
- 10) **Elective Competencies** - are the additional skills and knowledge required by the individual or enterprise for work
- 11) **Elements** - are the building blocks of a unit of competency. They describe in outcome terms the functions that a person performs in the workplace.
- 12) **Evidence Guide** - is a component of the unit of competency that defines or identifies the evidences required to determine the competence of the individual. It provides information on critical aspects of competency, underpinning knowledge, underpinning skills, resource implications, assessment method and context of assessment
- 13) **Level** - refers to the category of skills and knowledge required to do a job
- 14) **Method of Assessment** - refers to the ways of collecting evidence and when, evidence should be collected
- 15) **National Certificate (NC)** – is a certification issued to individuals who achieve all the required units of competency for a national qualification defined under the Training Regulations. NCs are aligned to specific levels within the PTQF
- 16) **Performance Criteria** - are evaluative statements that specify what is to be assessed and the required level of performance

- 17) **Qualification** - is a cluster of units of competencies that meets job roles and is significant in the workplace. It is also a certification awarded to a person on successful completion of a course in recognition of having demonstrated competencies in an industry sector
- 18) **Range of Variables** - describes the circumstances or context in which the work is to be performed
- 19) **Recognition of Prior Learning (RPL)** – is the acknowledgement of an individual’s skills, knowledge and attitudes gained from life and work experiences outside registered training programs
- 20) **Resource Implications** - refers to the resources needed for the successful performance of the work activity described in the unit of competency. It includes work environment and conditions, materials, tools and equipment
- 21) **Basic Competencies** - are the skills and knowledge that everyone needs for work
- 22) **Training Regulations (TR)** – refers to the document promulgated and issued by TESDA consisting of competency standards, national qualifications and training guidelines for specific sectors/occupations. The TR serves as basis for establishment of qualification and certification under the PTQF. It also serves as guide for development of competency-based curricula and instructional materials including registration of TVET programs offered by TVET providers
- 23) **Underpinning Knowledge** - refers to the competency that involves in applying knowledge to perform work activities. It includes specific knowledge that is essential to the performance of the competency
- 24) **Underpinning Skills** - refers to the list of the skills needed to achieve the elements and performance criteria in the unit of competency. It includes generic and industry specific skills
- 25) **Unit of Competency** – is a component of the competency standards stating a specific key function or role in a particular job or occupation; it is the smallest component of achievement that can be assessed and certified under the PTQF

## SECTOR SPECIFIC

1. **Cooling system**      A closed system of the generator set that provides a continuous flow of coolant (soft water with 0-40 ppm hardness) primarily to reduce the heat at the cylinder heads and liners. It also reduces the heat from the lubricating oil.
2. **Lube oil system**      A closed system of the generator set that provides a continuous flow of lubricating oil that reduces heat and friction to all moving parts of the engine.
3. **Fuel system**      An open system of the generator set that provides a continuous flow of clean, high pressure and atomized fuel to the combustion chamber.

- 4. Aspiration system** An open system of the generator set that provides clean, high density compressed air to the combustion chamber by utilizing the exhaust gas to drive the turbocharger.
- 5. DC system** A system of the generator set that supplies 12, 24 or 110 volts DC power to the various DC equipment, protections and controls.
- 6. Alternator** A system of the generator set that converts mechanical energy into electrical energy. It includes the exciter component and main windings.
- 7. Speed regulating system** A system of the generator set that maintains the rated speed of the engine at various load.
- 8. Enterprise policy** Also refer as corporate policy
- 9. PMS** refers as preventive maintenance schedule
- 10. coolants** Refers to the cooling medium of the cooling system which is the soft water with a hardness of 0-40 ppm.
- 11. indicating parameters** Also refers to as engine and control panel parameters
- 12. SOP** Refers to the plant system normal operating procedure

## ACKNOWLEDGEMENTS

The Technical Education and Skills Development Authority (TESDA) wishes to extend thanks and appreciation to the many representatives of business, industry, academe and government agencies who donated their time and expertise to the development and validation of this Training Regulation.

### THE TECHNICAL EXPERTS PANEL

#### FROM NAPOCOR

**HILARIO S. AÑO**

Principal Engineer C  
Patnanungan DPP

**TEOFE C. CADIZ**

Superintendent  
Southern Palawan S/S & 69 KV TL

**LEO G. CINCO**

Principal Engineer C  
Tingloy DPP

**LOUIE C. LIBARRA**

Superintendent, Busuanga DPP

**EUGENE WILLY G. FRANCISCO**

Principal Engineer C  
Banton DPP

**LARRY I. SABELLINA**

Superintendent  
Puerto Princesa DPP

**JESUS J. MENDOZA**

Plant Superintendent  
Kabugao DPP

**NORBERTO R. ESPINO III**

Principal Engineer A  
WMTSD

**RICKY M. UMBAN**

Plant Superintendent  
Romblon DPP

**CESAR C. FERNANDO**

Training Specialist A  
TTMSD-TDD

**PAQUITO G. ALMENDRAL**

Principal Engineer C  
Taytay DPP

**CLEMENTE J. CORDERO**

Senior Engineer  
TTMSD-TDD

<b>THE PARTICIPANTS IN THE NATIONAL VALIDATION OF THIS TRAINING REGULATION</b>	
<p><b>ARTEMIO C. DIFUNTORUM, JR.</b> Balut DPP, NPC – SPUG Mindanao</p>	<p><b>FELIPE F. GONZALES</b> Camotes DPP, NPC – SPUG - Visayas</p>
<p><b>JEROME C. TIMBANG</b> Palimbang DPP, NPC – SPUG-EMOD</p>	<p><b>CARLOS C. SUMAGANG</b> Siquijor DPP, NPC – SPUG - Visayas</p>
<p><b>JEFFREY N. LAHAMAN</b> Tandubas DPP, NPC – SPUG - WMOD</p>	<p><b>FERNAN Q. ISAW</b> Sto Niño Mini Grid, NPC–SPUG-Visayas</p>
<p><b>JIMMY T. HAGONoy</b> Balimbing DPP, NPC – SPUG - WMOD</p>	<p><b>ALLAN T. NAZARIO</b> Caluya DPP, NPC – SPUG - Visayas</p>
<p><b>SALI A. DIMAN</b> Sibutu DPP, NPC – SPUG - WMOD</p>	<p><b>REMIGIO A. MARIGOMEN</b> Power Barge 113, NPC–SPUG-Visayas</p>

**THE PARTICIPANTS IN THE NATIONAL VALIDATION OF THIS TRAINING REGULATION  
(cont.)**

<b>NICOLAS M. ARCENA</b> OM, NPC – SPUG - Mindanao	<b>HIPOLITO T. TO-ONG</b> Power Barge 116, NPC–SPUG-Visayas
<b>JOB C. CANSANCIO</b> Hikdop DPP, NPC – SPUG- EMOD	<b>VIVENCIO B. CORTES</b> Bantayan DPP, NPC – SPUG - Visayas
<b>MARVIE L. CASTROVERDE</b> Kalamansig DPP, NPC–SPUG-EMOD	<b>NATHANIEL G. GUERRA</b> Sto. Niño DPP, NPC – SPUG - Visayas
<b>RUEL R. JUGALBOT</b> VMTS, NPC – SPUG - Visayas	<b>ERICK R. SARINO</b> NPC–SPUG– Eastern Visayas Optn. Division
<b>ELVIS P. SABETE</b> Zumarraga DPP, NPC – SPUG - Visayas	<b>EDUARDO P. VILLEGAS</b> VMTS, NPC – SPUG - Visayas
<b>PERFECTO G. LUMAUAG</b> Gigantes DPP, NPC – SPUG - Visayas	<b>DEOGRACIAS D. BURLAS, JR.</b> Biri DPP, NPC – SPUG - Visayas

**MEMBERS OF THE TESDA BOARD – Standards Setting and Systems Development  
Committee**

**THE MANAGEMENT AND STAFF OF THE TESDA SECRETARIAT**

- **Qualifications and Standards Office**
  - **Competency Standards Division**
  - **Curriculum and Training Aids Division**

## List of Published Training Regulations

- Animal Production NC II
- Aquaculture NC II
- Automotive Body Painting/Finishing NC II
- Automotive Body Repair NC II
- Auto Engine Rebuilding NC II
- Automotive Servicing NC II
- Bartending NC II
- Building Wiring Installation NC II
- Carpentry NC II
- Commercial Cooking NC II
- Computer Hardware Servicing NC II
- Deck Seafaring NC II
- Dressmaking NC II
- Diesel Power Plant Operation & Maintenance NC II
- Diesel Power Plant Operation & Maintenance NC III**
- Diesel Power Plant Maintenance NC III
- Driving NC II
- Engine Seafaring NC II
- Food and Beverage Services NC II
- Footwear Making NC II
- Heavy Equipment Operation NC II
- Horticulture NC II
- Household Services NC II
- Housekeeping NC II
- Machining NC II
- Masonry NC II
- Motorcycle and Small Engine Servicing NC II
- Plumbing NC II
- Pyrotechnics NC II
- RAC Servicing NC I
- RAC Servicing NC II
- Security Services NC II
- Tailoring NC II
- Tour Guiding Services NC II
- Transport RAC Servicing NC II
- Travel Services NC II
- Welding NC II

*These materials are available in both printed and electronic copies.*

*For more information please contact:*

**Technical Education and Skills Development Authority (TESDA)**

*Telephone Nos.: 893-8303, 893-2139; 817-4076 to 82 loc. 615 to 617*

*or visit our website: [www.tesda.gov.ph](http://www.tesda.gov.ph)*