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GENERATOR MECHANIC

TRAINER GUIDE

National Vocational Certificate Level 2

Version 1 - November, 2019

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Table of Contents

1. Introduction

Competence-based training helps to bridge the gap between what is taught in training and what tasks will be performed on the job. Training trainees to perform actual job functions helps to ensure that future front-line workers have the skills, knowledge and abilities required to perform their jobs properly, safely and effectively. In addition to competence-based training, assessment based on the performance of actual work competencies helps to ensure that:

- trainees are performing their work tasks as safely as possible
- performance gaps are recognized prior to serious incidents
- training can be implemented to improve competence.

There are significant benefits to competence-based training:

1.1. Cost effectiveness

Since training activities and assessments in a competence-based approach are goal-oriented, trainers focus on clearly defined areas of skills, knowledge and understanding that their own industry has defined in the competence standards. At the same time, trainees are more motivated to learn when they realize the benefits of improved performance.

1.2. Efficiency

The transfer gap between the training environment and working on the job is reduced substantially in a competence-based approach. This is because training and assessment are relevant to what needs to be done on the job. As a result, it takes less time for trainees to become competent in the required areas. This, in turn, contributes to improved efficiency where training and assessment are concerned.

1.3. Increased productivity

When trainees become competent in the competence standards that their own industry has defined, when they know what the performance expectations are and receive recognition for their abilities through successful assessments, they are likely to be more motivated and experience higher job satisfaction. The result is improved productivity for organizations. The communication and constructive feedback between future employers and employees will improve as a result of a competence-based approach, which can also increase productivity.

1.4. Reduced risk

Using a competence-based approach to training, development, and assessment, employers are able to create project teams of people with complementary skills. A trainee's record of the skills, knowledge and understanding relating to the competence standards they have achieved can be used by a future employer to identify and provide further relevant training and assessment for new skills areas. Competence standards can shape employee development and promotional paths within an organization and give employees the opportunity to learn more competencies beyond their roles. It can also provide organizations with greater ability to scale and flex as needed, thereby reducing the risk they face.

1.5. Increased customer satisfaction

Employees who have been trained and assessed using a competence-based approach are, by the definition of the relevant competence standards, able to perform the required tasks associated with a job. The knock-on effect is that, in service-related industries, they are able to provide high service levels, thereby increasing customer satisfaction. In production or manufacturing industries, they are able to work closely to industry standards in a more effective and efficient way.

2. Lesson plans

This manual provides a series of lesson plans that will guide delivery of each module for the Generator Mechanic Level 2 qualification. It is important for trainers to be flexible and be ready to adapt lesson plans to suit the context of the subject and the needs of their trainees.

Good teachers acknowledge that CBT means each and every trainee in the class learns at a different speed. The good teacher is prepared to throw aside the day's lesson plan and do something different (and unplanned) for the class even if it means 'writing' a lesson plan for each trainee to match their learning pace for that day or week.

Learning by doing is different from learning theory and then applying it. To learn to do something, trainees need someone looking over their shoulder saying 'it's not quite like that, it's like this', 'you do it like this because …', or even 'tell me why you chose to do it like this?'.

In this way, trainees learn that theoretical knowledge is meaningless if it is not seen in the context of what they are doing. In other words, if a trainee doesn't know why they do something, they will not do it competently (skills underpinned by knowledge = competent performer).

This is how a *Generator Mechanic* acquires a practical grasp of the standards expected. It's not by learning it in theory, but because those standards are acquired through correction by people who show what the standards are, and correct the trainee where they do not meet those standards, and where they repeat it correction until they have internalized those standards.

3. Demonstration of skill

Demonstration or modeling a skill is a powerful tool, which is used, in vocational training. The instructions for trainers for demonstration are as under:

a) Read the procedure mentioned in the Trainer Guide for the relevant Learning Unit before demonstration.
b) Arrange all tools, equipment and consumable material, which are required for demonstration of a skill.
c) Practice the skill before demonstration to trainees, if possible.
d) Introduce the skill to trainees clearly at the commencement of demonstration.
e) Explain how the skill relates to the skill(s) already acquired and describe the expected results or show the objects to trainees.
f) Carry out demonstration in a way that can be seen by all trainees.
g) Use the same tools and materials that the learner will be using.
h) Go through EACH of the steps involved in performing the skill.
i) Go SLOWLY - describe each step as it is completed.
j) Encourage the learners to move around and watch what you are doing from a number of different angles.
k) Identify critical or complex steps, or steps that involve safety precautions to be followed.
l) Explain theoretical knowledge where applicable and ask questions to trainees to test their understanding.
m) Try to involve the learners: Ask them questions about why they think the process may work that way.
n) Repeat critical steps in demonstration, if required.
o) Summarize the demonstration by asking questions to trainees.

Involvement in the process (actively seeing) is important at this stage. When you work on getting involved, getting people to participate, you make them a part of what is happening. Questions for clarification or explanation are important throughout the demonstration. It is up to the learners to ask questions about things they do not understand, but it is also important for trainers to seek out and elicit questions from learners. A trainer may need to do repeated demonstrations of difficult or complex skills.

4. Overview of the program

Course: *Generator Mechanic Level 2*	**Total Course Duration:** 310 Hours
Course Overview:	
In this training program trainee will learn and acquire specialized knowledge and particle skills required to function as a Generator mechanic both at domestic and commercial levels. Generator Mechanic will responsible to maintain safety, maintain tools & equipment, identification of faults, diagnose mechanical faults, repair/replace mechanical components, as per the procedures involved. The specific objectives of developing these qualifications are as under: • Improve the overall quality of training delivery and setting national benchmarks for training of generator mechanic in the country • Provide flexible pathways and progressions to learners enabling them to receive relevant, up-to-date and recent skills • Provide basis for competency-based assessment which is recognized and accepted by employers • Establish a standardized and sustainable system of training for generator mechanic in the country	

Module Title and Aim	**Learning Units**	**Theory Days/hours**	**Workplace Days/hours**	**Timeframe of Modules**
Module 1: Comply Personal Health and Safety Guidelines **Aim:** This Competency Standard identifies the competencies required to protect/apply occupational Safety, Health and Environment at workplace according to the industry's approved guidelines, procedures and interpret environmental rules/regulations. Trainee will be expected to identify and use Personal Protective Equipment (PPE) according to the work place requirements. The underpinning knowledge regarding Observe Occupational Safety and Health (OSH) will be sufficient to provide the basis for the job at workplace.	**LU1:** Identify Personal Hazard at work place **LU2:** Apply personal protective and safety equipment (PPE) **LU3:** Comply with occupational safety and health (OSH) **LU4:** Dispose of hazardous waste/materials from the designated area	**06**	**24**	**30**

Module 2: Communicate the Workplace Policy and Procedure **Aim:** This unit describes the performance outcomes, skills and knowledge required to develop communication skills in the workplace. It covers gathering, conveying and receiving information, along with completing assigned written information under direct supervision.	**LU1.** Identify workplace communication procedures **LU2.** Communicate at workplace **LU3.** Draft Written Information **LU4.** Review Documents	**04**	**16**	**20**
Module 3: **Perform Basic Communication (Specific)** **Aim:** This unit describes the skills and knowledge required to assist in the development of communication competence by providing information regarding different forms of communication and their appropriate use.	**LU1.** Communicate in a team to achieve intended outcomes **LU2.** Follow Supervisor's instructions as per organizational SOPs **LU3.** Develop Generic communication skills at workplace `	**06**	**24**	**30**
Module 4: **Perform Basic Computer Application (Specific)** **Aim:** This unit describes the skills and knowledge required to use spreadsheet to prepare a page of document, develops familiarity with Word, Excel, email, and computer graphics basics.	**LU1.** Create Word Documents **LU2.** Create Excel Documents **LU3.** Use internet for Browsing	**08**	**32**	**40**

Module 5: Identify General Fault **Aim:** After completing this learning module, the learner will be able to check physical conditions of Generator, take history of faulty generator, check battery, check self-starter, check self-starter, check alternator charger, check control panel, document fault for identifying generator fault.	**LU1:** Check physical condition of generator **LU2.** Take History of faulty generator **LU3.** Check battery **LU4.** Check self-starter **LU5.** Check Alternator charger **LU6.** Check control Panel **LU7**. Document fault	10	50	60
Module 6: Identify Mechanical fault **Aim:** After completing this learning module, the learner will be able to inspect/service lubrication system, inspect/service cooling system, inspect/service air intake system, inspect and service fuel system, inspect and service exhaust system, inspect safety equipment and service cam timing system for identifying mechanical fault in generator.	**LU1.** Inspect and service lubrication system **LU2**. Inspect and service cooling system **LU3.** Inspect and service air intake system **LU4.** Inspect and service fuel system **LU5.** Inspect and service exhaust system **LU6.** Inspect safety equipment	13	47	60

Module 7: Identify Electrical Fault **Aim:** After completing this learning module, the learner will be able to inspect and service ignition system, inspect and service alternator, inspect and service display panel, inspect and service governor /Actuator System, inspect and service charging system, inspect and service warning system, to diagnose electric fault (s) in generator.	**LU1.** Inspect and service Ignition system **LU2.** Inspect and service alternator **LU3**. Inspect and service display panel **LU4.** Inspect and service governor /Actuator System **LU5**. Inspect and service charging system **LU6.** Inspect and service warning system	10	60	70
	TOTAL	**57**	**253**	**310**

FORMAT FOR LESSON PLAN			
Module:			
Learning Unit>			
Learning Outcomes>			
Methods	Key Notes	Media	Time
	Introduction		
	State the Learning Objectives of the lesson. This allows the learners to organize their thoughts on what they will learn and to perform. Also state some questions to recall prior knowledge of learners to arouse their interest and motivation		
	Main Body		
	Present the new information or material that is to be learned. Demonstration of a skill relevant with the Learning Unit is also stated here. Also mention the teaching and learning methods for each leaning element from *Trainer Guidelines*, the relevant media including handouts, power-point slides, videos, white board and time duration for each activity in the relevant columns		
	Conclusion		
	List the strategies used for summarizing and reviewing the lesson delivered. Also mention the strategies for formative assessment to ensure that the transfer of knowledge and skill has been achieved		
	Assessment How this lesson will be assessed?		
			Total time:

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Module 5: Identify Fault

Learning Unit	Suggested Teaching / Learning Activities	Delivery Context	Media
LU1: Check physical condition of generator	Begin this session with an illustrated presentation on Checking physical condition of generator. Ensure that the presentation addresses the following points, including demonstrations of equipment for arranging tools and equipment where appropriate: • Checking foundation and balance of generator • Checking earthing of generator • Checking canopy and exhaust of generator • Checking power cable connections and circuit breaker • Checking leakage of lubricants, coolant and fuel Prepare either: • A flip chart / A PowerPoint slide / A handout …showing the key topics about Checking physical condition of generator. Go through all the key topics briefly and then allocate **one key topic** to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic**. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for checking physical conditions of generator. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to Checking physical conditions of generator in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Spirit Level

LU2: Take History of faulty generator	Lead a discussion about how to take history of faulty generator. Use real examples to support the discussion and ensure the discussion considers: • Examining log book. • Seeking information from operator. • Preparing report of the faults. Display a slide or flip chart with a key question relating to taking history of faulty generator. **Step 1 – Think** Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. **Step 2 – Pair** For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. **Step 3 – Share** The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to taking history of faulty generator. Learners must be able to practice and develop their knowledge and skills relating to taking history of faulty generator in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Log book Report format

LU3: Check battery	Lead a discussion about Checking battery while identifying fault of a generator. Use real examples to support the discussion and ensure the discussion considers: • Checking charge of battery • Checking battery electrolyte and terminals • Checking battery leads Prepare either: • A flip chart • A PowerPoint slides • A handout …showing key topics for checking battery. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify **three main points** that related to **each key topic**. After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic for checking battery. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to Checking Battery in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Hydrometer Multimeter

LU4: Check self-starter	Lead a brainstorm on checking self-starter of a generator. Use ideas from the brainstorm to explain the following key points: • Checking physical conditions of self- starter. • Checking connections of self-starter. • Checking battery voltage on self – starter terminals Prepare either: • A flip chart • A PowerPoint slides • A handout …showing the key topics about Checking self-starter. Go through all the key topics briefly and then allocate **one key topic** to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic**. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for checking self-starter. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to checking self-starter of a generator in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Multimeter

LU5: Check Alternator charger	Lead a discussion about how to Check alternator charger. Use real examples to support the discussion and ensure the discussion considers: • Check charging generator belt. • Check generator wires Display a slide or flip chart with a key question relating to checking alternator charger. **Step 1 – Think** Working on their own, each learner **thinks** about the question and makes notes of their responses or key points which they believe to be important. **Step 2 – Pair** For the next step, each learner **pairs** up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. **Step 3 – Share** The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to checking alternator charger. Learners must be able to practice and develop their knowledge and skills relating to checking alternator charger in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Multimeter

LU6: Check control Panel	Lead a discussion about how to check control panel. Use real examples to support the discussion and ensure the discussion considers: • Checking AC/DC supply. • Checking fuses/breakers. • Checking parameters and wiring. Prepare either: • A flip chart • A PowerPoint slides • A handout …showing key topics for Checking control panel. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify **three main points** that related to **each key topic**. After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic checking control panel. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified. Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Learners must be able to practice and develop their knowledge and skills relating to Checking control panel in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Multimeter Fuses Breakers Electric Wires

LU7: Document fault	Lead a discussion about Documenting fault of a generator. Use real examples to support the discussion and ensure the discussion considers: • Noting the fault in log book. • Reporting to supervisor. Display a flip chart showing the following key question: *'How to document fault of a generator?'* Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to documenting faults of a generator in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Log book

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Module 6: Identify Mechanical fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU1: Inspect and service lubrication system	Deliver an illustrated presentation on Inspecting and servicing lubrication system. Ensure you address the importance of the following points: • Locating lubricant filling cap and drainage plug • Checking oil level of engine • Adjusting oil level • Identifying leakage and report to supervisor Prepare either: • A flip chart / A PowerPoint slide / A handout …showing the key topics about inspecting and servicing lubrication system. Go through all the key topics briefly and then allocate **one key topic** to each group. Learners need to work in their small groups discussing the key topic that has been allocated to their group. Each group should use a sheet of flip chart paper to record **three main points** from their discussions that relate to **their key topic**. After the discussion, begin the feedback session. Ask one group to come to the front of the class with their flipchart. Put up the flipchart where it can be easily seen by other learners. Ask the group to share the main points they have recorded for their key topic for inspecting and servicing lubrication system. Discuss these main points briefly with the whole group. Learners should make additional notes **on the flip chart** to record additional points their group had not identified. Then ask the next group to share their flipchart showing the main points they have recorded for the next key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Photograph or scan all the flipcharts and use these to create a handout to distribute to all learners. Learners must be able to practice and develop their knowledge and skills relating to Inspecting and servicing lubrication system in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Lubricant

Module 6: Identify Mechanical fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU2: Inspect and service cooling system	Lead a brainstorm on Inspecting and servicing cooling system. Use ideas from the brainstorm to explain the following key points • Adopting appropriate safety measures • Ensuring unobstructed air flow of radiator • Maintaining coolant level • Replacing fan belts and hose pipe Display a slide or flip chart with a key question relating to inspecting and servicing cooling system. **Step 1 – Think** Working on their own, each learner **thinks** about the question and makes notes of their responses or key points which they believe to be important. **Step 2 – Pair** For the next step, each learner **pairs** up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. **Step 3 – Share** The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to inspecting and servicing cooling system. Learners must be able to practice and develop their knowledge and skills relating to inspecting and servicing cooling system in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Classroom and Workshop or Workplace	Coolant Radiator fan Fan belt Water body

Module 6: Identify Mechanical fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU3: Inspect and service air intake system	Lead a discussion about inspecting and servicing air intake system. Use real examples to support the discussion and ensure the discussion considers: • Locating components to be inspected • Checking air service indicator • Selecting appropriate tools/equipment • Cleaning primary air filter • Replacing intake hoses and clamps Learners need to devise 10 quiz questions with answers based on how to inspect and service air intake system. They must make sure their questions cover key topics for how to develop and use communication skills in a hospitality setting. Issue each learner with 10 blank cards. Each learner should number the cards and write their name on one side with a question about how to inspect and service air intake system. On the reverse of the card, they should write an appropriate answer to their question. For the quiz, arrange learners in two equal teams. Ask one learner to keep score using a suitable score-card. Player 1 for Team A asks one of their questions to Player 1 of Team B, who needs to answer the question. Discuss the answer with the group and ask the group to determine if the answer is correct. Player 1 of Team A then confirms the answer they had devised. (You need to correct answers if the learner's answer was not wholly correct.) The scorekeeper records 1 mark for a correct answer under the appropriate team's score column. Play then passes to Player 1 of Team B, who asks their question to Player 1 of Team A, and so on. Total the scores at the end of the quiz to see which team won. After the quiz, collect learners' question/answer cards and check that answers provided were correct. Return any incorrect answers to learners and ask them to change their answer to the correct one. Learners must be able to practice and develop their knowledge and skills relating to inspecting and servicing air intake system in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Air filter Air intake indicator Hoses and clamps

Module 6: Identify Mechanical fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU4: Inspect and service fuel system	Lead a discussion about inspecting and servicing fuel system. Use real examples to support the discussion and ensure the discussion considers: • Locating components to be inspected • Identifying fuel gauges and level indicators • Selecting appropriate tools • Performing basic maintenance such as cleaning of fuel stain/fuel tank/carburetor • Identifying service need defect and hazardous condition through visuals/physical inception • Reporting fuel leakage and faults Display a flip chart showing the following key question: *'What are the steps to inspect and service fuel system?'* Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence. At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to inspecting and servicing fuel system in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Fuel gauge Carburetor Fuel stain Fuel tank Fuel pump Fuel filter

Module 6: Identify Mechanical fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU5: Inspect and service exhaust system	Lead a brainstorm on Inspecting and servicing exhaust system. Use ideas from the brainstorm to explain the following key points • Locating components to be inspected • Checking silencer shield • Checking blockage & leakage of silencer • Dismantling silencer Display a slide or flip chart with a key question relating to inspecting and servicing exhaust system. **Step 1 – Think** Working on their own, each learner **thinks** about the question and makes notes of their responses or key points which they believe to be important. **Step 2 – Pair** For the next step, each learner **pairs** up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. **Step 3 – Share** The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to inspecting and servicing exhaust system. Learners must be able to practice and develop their knowledge and skills relating to inspecting and servicing exhaust system in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Silencer and silencer shield . Silencer seal Exhaust gas analyzer Socket box

Module 6: Identify Mechanical fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU6: Inspect safety equipment	Lead a discussion about inspecting safety equipment. Use real examples to support the discussion and ensure the discussion considers: • Checking and clean heat sensor • Checking oil pressure sensor • Checking and clean air sensor • Checking and clean RPM sensor Prepare either: • A flip chart • A PowerPoint slides • A handout …showing key topics for inspecting safety equipment. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify **three main points** that related to **each key topic**. After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic for inspecting safety equipment. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified. Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Learners must be able to practice and develop their knowledge and skills relating to inspecting safety equipment in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Heat sensor Pressure sensor Air sensor RPM sensor Tachometer Engine analyzer

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Module 7: Identify Electrical Fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU1: Inspect and service Ignition system	Begin this session with an illustrated presentation on Inspecting and servicing ignition system. Ensure that the presentation addresses the following points, including demonstrations of equipment for arranging tools and equipment where appropriate: • Identifying the tools and equipment • Checking Direct Current (DC) power supply of ignition coil and distributor • Checking High Tension (HT) leads • Checking spark plug Display a flip chart showing the following key question related to Inspecting and servicing ignition system: *'What are the steps involved in inspecting and servicing of ignition system?'* Give each learner a sheet of paper and asked them to write their name at the top. Explain to learners that they will be sharing their work with other learners. Ask learners to write silently for 3-5 minutes answering the question displayed on the flip chart. When learners have completed writing, instruct them to pass their paper to the learner on their left. Each learner will read what their partner has passed to them and write a response. This will also be done silently. After another 2-3 minutes, instruct the learners to pass the paper to their left a second time. Repeat the same procedure, also done in silence At the end of the activity, ask the learners to return the paper to the original writer. Allow learners a few moments to read over the responses to their writing. Ask learners to work in pairs to reflect on and discuss the responses to the question on the flip chart. When this activity is concluded, collect the papers and make copies for each learner. Learners must be able to practice and develop their knowledge and skills relating to Inspecting and servicing ignition system in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Ignition coil Distributor High Tension (HT) leads Spark plug Tool kit

Module 7: Identify Electrical Fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU2: Inspect and service alternator	Lead a brainstorm on inspecting and servicing alternator. Use ideas from the brainstorm to explain the following key points: • Identifying the tools and equipment • Checking DC output voltage • Checking belt • Connections of alternator Display a slide or flip chart with a key question relating to inspecting and servicing of alternator. **Step 1 – Think** Working on their own, each learner thinks about the question and makes notes of their responses or key points which they believe to be important. **Step 2 – Pair** For the next step, each learner pairs up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. **Step 3 – Share** The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to inspecting and servicing of alternator. Learners must be able to practice and develop their knowledge and skills relating to inspecting and servicing alternator in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Alternator Belt Tool kit

Module 7: Identify Electrical Fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU3: Inspect and service display panel	Lead a discussion about inspecting and servicing display panel. Use real examples to support the discussion and ensure the discussion considers: • Identifying tools and equipment • Checking gauges as per standard parameters • Checking circuit breakers as per standard parameters • Checking Relays as per standard parameters • Checking Wiring as per standard parameters Prepare either: • A flip chart / A PowerPoint slide / A handout …showing key topics for inspecting and servicing display panel. Learners need to work in small groups discussing the key topics. Each group should make notes from their discussions that identify **three main points** that related to **each key topic**. After the discussion, begin the feedback session. Ask one group to share the main points they have recorded for the first key topic for inspecting and servicing display panel. Discuss these main points briefly with the whole group. Learners should make additional notes to record additional points their group had not identified. Then ask the next group to share the main points they have recorded for the second key topic. Repeat the discussion process. Continue until you have covered all the key topics. End the group discussion activity with a summary. Learners must be able to practice and develop their knowledge and skills relating to inspecting and servicing display panel in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Gauges Circuit breakers Relays and harness wires Toolkit

Module 7: Identify Electrical Fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU4: Inspect and service governor /Actuator System	Deliver an illustrated presentation on inspecting and servicing governor/Actuator system. Ensure you address the importance of the following points: • Identifying the tools and equipment • Checking Actuator card supply • Checking magnetic pick up sensor • Checking power supply on Actuator/Governor Display a slide or flip chart with a key question relating to inspecting and servicing governor/Actuator system. **Step 1 – Think** Working on their own, each learner **thinks** about the question and makes notes of their responses or key points which they believe to be important. **Step 2 – Pair** For the next step, each learner **pairs** up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. **Step 3 – Share** The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to inspecting and servicing governor/Actuator system. Learners must be able to practice and develop their knowledge and skills relating to inspecting and servicing governor/Actuator system in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Class room with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	Actuator card supply Magnetic pick up sensor Actuator/Governor Tool kit

Module 7: Identify Electrical Fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU5: Inspect and service charging system	Begin this session with an illustrated presentation on inspecting and servicing charging system. Ensure that the presentation addresses the following points, including demonstrations of equipment, preparation and cooking methods where appropriate: • Identifying the tools and equipment • Checking battery power leads • Checking charging circuit of alternator Arrange a question and answer session to clarify trainee understanding. To prepare for practical sessions, divide the trainees in small groups. Provide each group with a task such as identifying tools and equipment, checking battery power leads, and Checking charging circuit of alternator. Check that each trainee understands their task. Trainees need to practice their skills in identifying basic tools and supplies associated with generator in a real or realistic environment.	Class room with multimedia aid, audio-visual facilities and flip charts	Battery leads Charging alternator Charging IC Tool kit
LU6: Inspect and service warning system	Deliver an illustrated presentation on inspecting and servicing warning system. Ensure you address the importance of the following points: • Identifying tools and equipment • Checking oil sensor • Checking temperature sensor • Checking fuel sensor • Checking over/under load module Display a slide or flip chart with a key question relating to inspecting and servicing warning system. **Step 1 – Think** Working on their own, each learner **thinks** about the question and makes notes of	Class room with multimedia aid, audio-visual facilities and flip charts	oil sensor Temperature sensor Fuel sensor Over/under load module Tool kit

Module 7: Identify Electrical Fault			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
	their responses or key points which they believe to be important. **Step 2 – Pair** For the next step, each learner **pairs** up with a partner. The two learners exchange their ideas and make further notes to add clarity to their own ideas. **Step 3 – Share** The final step is for you to invite different pairs to share the ideas they have discussed in response to the key question relating to inspecting and servicing warning system. Learners must be able to practice and develop their knowledge and skills relating to inspecting and servicing warning system in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Workshop or Workplace	

Frequently Asked Questions

1. What is Competency Based Training (CBT) and how is it different from currently offered trainings in institutes?	Competency-based training (CBT) is an approach to vocational education and training that places emphasis on what a person can do in the workplace as a result of completing a program of training. Compared to conventional programs, the competency-based training is not primarily content based; it rather focuses on the competence requirement of the envisaged job role. The whole qualification refers to certain industry standard criterion and is modularized in nature rather than being course oriented.
2. What is the passing criterion for CBT certificate?	You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
3. What are the entry requirements for this course?	The entry requirement for this course is 8th Grade or equivalent.
4. How can I progress in my educational career after attaining	You shall be eligible to take admission in the National Vocational Certificate Level-3 in Leather Products Development Technician (Pattern Maker). You shall be able to

this certificate?	progress further to National Vocational Certificate Level-4 in Heavy Construction Machinery Operator Course; and take admission in a level-5, DAE or equivalent course (if applicable). In certain case, you may be required to attain an equivalence certificate from The Inter Board Committee of Chairmen (IBCC).
5. If I have the experience and skills mentioned in the competency standards, do I still need to attend the course to attain this certificate?	You can opt to take part in the Recognition of Prior Learning (RPL) program by contacting the relevant training institute and getting assessed by providing the required evidences.
6. What is the entry requirement for Recognition of Prior Learning program (RPL)?	There is no general entry requirement. The institute shall assess you, identify your competence gaps and offer you courses to cover the gaps; after which you can take up the final assessment.
7. Is there any age restriction for entry in this course or Recognition of Prior Learning program (RPL)?	There are no age restrictions to enter this course or take up the Recognition of Prior Learning program
8. What is the duration of this course?	The duration of the course work is 1,510 hrs. (11 months)
9. What are the class timings?	The classes are normally offered 25 days a month from 08:00am to 01:30pm. These may vary according to the practices of certain institutes.
10. What is equivalence of this certificate with other qualifications?	As per the national vocational qualification's framework, the level-4 certificate is equivalent to Matriculation. The equivalence certificate can be obtained from The Inter Board Committee of Chairmen (IBCC).
11. What is the importance of this certificate in National and International job market?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTC). These standards are also recognized worldwide as all the standards are coded using international methodology and are accessible to the employers worldwide through NAVTTC website.
12. Which jobs can I get after attaining this certificate? Are there job for this certificate in public sector as well?	You shall be able to take up jobs in the local or overseas construction companies in heavy machinery operator job profile.

13. What are possible career progressions in industry after attaining this certificate?	You shall be able to progress up to the level of supervisor after attaining sufficient experience, knowledge and skills during the job. Attaining additional relevant qualifications may aid your career advancement to even higher levels.
14. Is this certificate recognized by any competent authority in Pakistan?	This certificate is based on the nationally standardized and notified competency standards by National Vocational and Technical Training Commission (NAVTTC). The official certificates shall be awarded by the relevant certificate awarding body.
15. Is on-the-job training mandatory for this certificate? If yes, what is the duration of on-the-job training?	On-the-job training is not a requirement for final / summative assessment of this certificate. However, taking up on-the-job training after or during the course work may add your chances to get a job afterwards.
16. How much salary can I get on job after attaining this certificate?	The minimum wages announced by the Government of Pakistan in 2019 are PKR 17,500. This may vary in subsequent years and different regions of the country. Progressive employers may pay more than the mentioned amount. The heavy Machinery Operator normally earns 20,000 to 25,000 in the start.
17. Are there any alternative certificates which I can take up?	There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field.
18. What is the teaching language of this course?	The leaching language of this course is Urdu and English.
19. Is it possible to switch to other certificate programs during the course?	There are some short courses offered by some training institutes on this subject. Some institutes may still be offering conventional certificate courses in the field.
20. What is the examination / assessment system in this program?	Competency based assessments are organized by training institutes during the course which serve the purpose of assessing the progress and preparedness of each student. Final / summative assessments are organized by the relevant qualification awarding bodies at the end of the certificate program. You shall be required to be declared “Competent” in the summative assessment to attain the certificate.
21. Does this certificate enable me to work as freelancer?	You can start your small business by purchasing your own heavy construction machine and can start earning 50,000 per month. You may need additional skills on
	entrepreneurship to support your initiative.

Test Yourself (Multiple Choice Questions)

MODULE	**5**	Identify General Fault	
Question	**1**	A circuit breaker is	A Power factor correcting device B A device to neutralize the effects of transients C A waveform correcting device D A **current interrupting device**
Question	**2**	The capacity of a battery is expressed in terms of	A Current rating B Voltage rating C **Ampere hour rating** D Ampere-ampere rating

Question 3 Fuses work only

A In a day light

B Twice

C **Once**

D In moonlight

Question 4 Circuit breaker work

A **Constantly**

B Only once

C When there is resistance

D When there is magnetic field

Question 5 During charging the specific gravity of the electrolyte of a lead acid battery

A Decreases

B **Increases**

C Remain same

D First increases then decreases

MODULE	**6**	Identify Mechanical fault	
Question	**1**	Why is lubrication system important in the engine?	A To improve fuel efficiency
			B To provide cooling
			C To **reduce the disturbance**
			D To help move the fuel easy
Question	**2**	Why is oil cleaning necessary in the engine?	A For **continuous reliable operation**
			B To cool down the oil
			C To reduce the viscosity of oil
			D To increase thickness of oil

Question 3 The use of pressure cap on the radiator _____ within the cooling system.

A **Increase air pressure**

B Decrease air pressure

C Keeps air pressure same

D Do nothing with the pressure

Question 4 The cooling fan is

A Fitted between the engine and radiator

B Driven by belt and pulleys

C Driven from the camshaft

D **All of the above**

Question 5 What is used in engines to reduce the noise at the exhaust?

A Noise dampers

B Baffles

C **Silencers**

D Composite foam

MODULE 7	Identify Electrical Fault		
Question 1	The distributor serves the following purposes In the ignition system	A	It operates break and make mechanism
		B	It distributes high tension current to spark plug at correct time.
		C	Both A and B
		D	None of the above
Question 2	The device in an ignition system that creates a spark to light the fuel in a cylinder :	A	P-lead
		B	Flash over
		C	Spark plug
		D	Magneto
Question 3	The purpose of a _____ is to provide automatic control of the idling and maximum speeds to the engine	A	Governor
		B	Nozzle
		C	Throttle
		D	Spark plug

Question 4 In battery ignition system, the energy required for producing spark is obtained from a _____ battery

A 6v to 12v.

B 12v to 24v

C 24v to 30v

D 32v to 38v

Question 5 . In battery coil ignition system, the correct sequence of flow of current is :

A Battery- Ammeter-ignition coil-Distributor- Spark plug

B Battery – Ignition coil – Ammeter – Distributor – Spark plug

C Battery – Ammeter – Distributor – Ignition coil – Spark plug

D Battery – Distributor – Ammeter – Ignition coil – Spark plug

Answer Key

MODULE 5: Q1.d Q2.c Q3.c Q4.a Q5.b

MODULE 6: Q1.c Q2.a Q3.a Q4.d Q5.c

MODULE 7: Q1.c Q2.c Q3.a Q4.a Q5.a

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