Co-funded by the European Union

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Norwegian Embassy
Islamabad

GENERATOR MECHANIC

TRAINER GUIDE

National Vocational Certificate Level 4

Version 1 - November, 2019

NAVTTC

Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Published by
National Vocational and Technical Training Commission
Government of Pakistan

Headquarter
Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
www.navttc.org

Responsible
Director General Skills Standard and Curricula, National Vocational and Technical Training Commission
National Deputy Head, TVET Sector Support Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Layout & design
SAP Communications

Photo Credits
TVET Sector Support Programme

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This document has been produced with the technical assistance of the TVET Sector Support Programme, which is funded by the European Union, the Federal Republic of Germany and the Royal Norwegian Embassy and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the National Vocational and Technical Training Commission (NAVTTC) as well as provincial Technical Education and Vocational Training Authorities (TEVTAs), Punjab Vocational Training Council (PVTC), Qualification Awarding Bodies (QABs)s and private sector organizations.

Document Version
November, 2019
Islamabad, Pakistan

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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 4* 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 level 4* 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 4*	**Total Course Duration:** 490 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, electrical AC Installation, diagnose electrical fault, 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: **Contribute to Work Related Health and Safety (WHS) Initiatives** **Aim:** This unit describes the skills and knowledge required to manage the identification, review, development, implementation and evaluation of effective participation and consultation processes as an integral part of managing work health and safety (WHS).	**LU1.** Contribute to initiate work-related health and safety measures **LU2.** Contribute to establish work-related health and safety measures **LU3.** Contribute to ensure legal requirements of WHS measures **LU4.** Contribute to review WHS measures **LU5.** Evaluate the organization's WHS system	**06**	**24**	**30**

Module 2: **Analyze with Workplace Policy and Procedures** **Aim:** This unit describes the skills and knowledge required to implement a workplace policy & procedures and to modify the policy to suit changed circumstances. It applies to individuals with managerial responsibilities who undertake work developing approaches to create, monitor and improve strategies and policies within workplaces and engage with a range of relevant stakeholders and specialists.	**LU1.** Manage work timeframes **LU2.** Manage to convene meeting **LU3.** Decision making at workplace **LU4.** Set and meet own work priorities at instant **LU5.** Develop and maintain professional competence **LU6.** Follow and implement work safety requirements	**06**	**24**	**30**
Module 3: **Perform Advanced Communication** Aim: This unit describes the performance outcomes, skills and knowledge required to develop communication skills used professionally. It covers plan and organize work and conduct trainings at workplace, along with demonstrating professional skills independently	**LU1.** Demonstrate professional skills **LU2.** Plan and Organize work **LU3.** Provide trainings at workplace	**06**	**24**	**30**
Module 4: **Develop Advance Computer Application Skills** **Aim:** This unit provides an overview of Microsoft Office programs to create personal, academic and business documents following current professional and/or industry standards, i.e. Data Entry, Power Point Presentation and managing data base and graphics for Design. It applies to individuals employed in a range of work environments who	**LU1.** Manage Information System to complete a task **LU2.** Prepare Presentation using computers **LU3.** Use Microsoft Access to manage database **LU4.** Develop graphics for Design	**08**	**32**	**40**

need to be able to present a set range of data in a simple and direct forms				
Module 5: **Manage Human Resource Services** **Aim:** This unit describes the skills and knowledge required to plan, manage and evaluate delivery of human resource services, integrating business ethics. It applies to individuals with responsibility for coordinating a range of human resource services across an organization. They may have staff reporting to them.	**LU1.** Determine strategies for delivery of human resource services **LU2.** Manage the delivery of human resource services **LU3.** Evaluate human resource service delivery **LU4.** Manage integration of business ethics in human resource practices	**04**	**16**	**20**
Module 6: **Develop Entrepreneurial Skills** **Aim:** This Competency Standard identifies the competencies required to develop entrepreneurial skills, in accordance with the organization's approved guidelines and procedures. You will be expected to develop a business plan, collect information regarding funding sources, develop a marketing plan and develop basic business communication skills. Your underpinning knowledge regarding entrepreneurial skills will be sufficient to provide you the basis for your work.	**LU1.** Develop a business plan **LU2.** Collect information regarding funding sources **LU3.** Develop a marketing plan **LU4.** Develop basic business communication skills	**06**	**24**	**30**
Module 7: **Perform Winding** **Aim:** After completing this learning module, the learner will be able to make winding, perform paper insulation, insert coils relevant slots, connect coils, perform varnishing as per standard and perform winding continuity Test.	**LU1**. Make winding Coils **LU2**.Perform paper insulation **LU3.** Insert coils in relevant slots **LU4.**Connect coils **LU5.**Perform varnishing as per standard **LU6.** Perform winding continuity Test	38	152	190

Module 8: **Perform tests as per specification** **Aim:** After completing this learning module, the learner will be able to perform voltage testing, perform frequency testing procedure, test heat testing procedure, observe speed testing procedure and write test load report for record.	LU1.Perform test on full load **LU2.** Record Voltage **LU3**.Record Ampere **LU4.** Record frequency **LU5.** Record Temperature **LU6.** Record Engine Speed **LU7.** Compile all the Test result	10	40	50
Module 9: Plan Work **Aim:** After completing this learning module, the learner will be able to ensure all paperwork is filled out in a clear, legible and accurate format, and completed with required information. Also ensure all required information is documented in accordance with SOP's.	**LU1**. Assess site hazards **LU2**. Ensure work procedures **LU3**. Follow symbols **LU4.** Ensure drawing parameters **LU5.** Ensure environmental concerns	16	54	70
	TOTAL	**180**	**390**	**490**

5. Lesson Plan

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		
	<u>Assessment</u> How this lesson will be assessed?		
			Total time:

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Module 7: Perform Winding

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Make winding Coils	Deliver an illustrated presentation on making winding coils. Ensure you address the importance of the following points: • Selecting wire as per required gauge • Making coils as per specifications Prepare either: • A flip chart / A PowerPoint slide / A handout …showing the key topics about making winding coils. 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 making winding coils. 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 making winding coils 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	• Laminated core • Enameled copper wire of different SWG • Wire gauge • Winding coil firms • Tool kit

Module 7: Perform Winding			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU2: Perform paper insulation	Lead a brainstorm on performing paper insulation. Use ideas from the brainstorm to explain the following key points: • Selecting insulation paper • Cutting insulation paper as per slot size • Inserting insulation paper in stator /rotor slots Display a slide or flip chart with a key question relating to performing paper insulation. **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 performing paper insulation. Learners must be able to practice and develop their knowledge and skills relating to performing paper insulation 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	• Laminated core • Insulated paper of different SWG • Steel foot rule • Scissor

Module 7: Perform Winding

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU3: Insert coils in relevant slots	Lead a discussion about inserting coils in relevant slots. Use real examples to support the discussion and ensure the discussion considers: • Inserting coil in internal slot as per pitch • Inserting coil in external slot as per pitch • Inserting wedge/insulation paper Learners need to devise 10 quiz questions with answers based on inserting coils in relevant slots. 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 inserting coils in relevant slots. 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 inserting coils in relevant slots in an appropriate practical setting. Ensure that learners have the opportunity to ask questions to support their understanding.	Classroom with multimedia aid, audio-visual facilities and flip charts Workshop or Workplace	• Laminated core • Winding coils • Insulating paper • Rawhide mallet • Fiber stick

Module 7: Perform Winding			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU4: Connect coils	Lead a discussion about connecting coils. Use real examples to support the discussion and ensure the discussion considers: • Inter connecting coil as per circuit diagram • Performing lacing of coils Display a flip chart showing the following key question: *'What are the steps to connect coils?'* 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 connecting coils 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	• Winded laminated core • Sleeves of different sizes • Cotton tap • Tool kit.

Module 7: Perform Winding			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU5: Perform varnishing as per standard	Lead a brainstorm on performing varnishing as per standard. Use ideas from the brainstorm to explain the following key points: • Selecting varnish grade as per standard • Applying varnish to coil • Drying varnish Display a slide or flip chart with a key question relating to performing varnishing as per standard. **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 performing varnishing as per standard. Learners must be able to practice and develop their knowledge and skills relating to performing varnishing as per standard 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	• Winded laminated core • Varnish • Heat gun • Steel tray

Module 7: Perform Winding			
Learning Unit	**Suggested Teaching/ Learning Activities**	**Delivery Context**	**Media**
LU6: Perform winding continuity Test	Lead a discussion about performing winding continuity test. Use real examples to support the discussion and ensure the discussion considers: • Adjusting test parameters of test bench as per requirement • Performing continuity test • Performing high voltage test • Performing power input test • Recording warning indication and follow as per SOPs Prepare either: • A flip chart • A PowerPoint slides • A handout …showing key topics for performing winding continuity test. 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 performing winding continuity test. 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 performing winding continuity test 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	• Winded laminated core. • Clamp on meter • Multimeter • Series test lamp • electrical tool kit

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Module 8: Perform tests as per specification			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU1: Perform test on full load	Begin this session with an illustrated presentation on performing test on full load. Ensure that the presentation addresses the following points, including demonstrations of equipment for arranging tools and equipment where appropriate: • Identifying full load as per manufacturer • Connecting load bank with generator • Selecting full load of load bank Display a flip chart showing the following key question related to performing test on full load: *'What are the steps involved in performing test on full load?'* 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 performing test on full load 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	• Clamp on mater • Load bank • Electrical toolkit

Module 8: Perform tests as per specification			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU2: Record Voltage	Lead a brainstorm on ways to record voltage. Use ideas from the brainstorm to explain the following key points: • Recording start time • Recording fluctuation in voltage • Repeating the process up to 3-time intervals • Documenting the average Voltage Display a slide or flip chart with a key question relating to recording voltage. **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 recording voltage. Learners must be able to practice and develop their knowledge and skills relating to recording voltage 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

Module 8: Perform tests as per specification			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU3: Record Ampere	Lead a discussion about how to record ampere(current). Use real examples to support the discussion and ensure the discussion considers: • Recording start time • Recording fluctuation in Current • Repeating the process up to 3-time intervals • Documenting the average Ampere Prepare either: • A flip chart • A PowerPoint slides • A handout …showing key topics for recording ampere. 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 recording ampere. 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 recording ampere 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	• Clamp on meter

Module 8: Perform tests as per specification			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU4: Record frequency	Deliver an illustrated presentation on recording frequency. Ensure you address the importance of the following points: • Recording start time • Recording fluctuation in Frequency • Repeating the process up to 3-time intervals • Documenting the average Frequency Display a slide or flip chart with a key question relating to recording frequency. **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 recording frequency. Learners must be able to practice and develop their knowledge and skills relating to recording frequency 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	• Hertz meter • Connecting wires

Module 8: Perform tests as per specification			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU5: Record Temperature	Deliver an illustrated presentation on how to record temperature. Ensure you address the importance of the following points: • Recording start time • Recording fluctuation in Temperature • Repeating the process up to 3-time intervals • Documenting the average Temperature Prepare either: • A flip chart • A PowerPoint slides • A handout …showing the key topics about recording temperature. 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 recording temperature 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 recording temperature 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	• Temperature gauge

Module 8: Perform tests as per specification			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU6: Record Engine Speed	Deliver an illustrated presentation on recording engine speed of generator. Ensure you address the importance of the following points: • Recording start time • Recording fluctuation in record per minute (RPM) • Repeating the process up to 3-time intervals • Documenting the average Speed Display a slide or flip chart with a key question relating to recording engine speed of 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 recording engine speed of generator. Learners must be able to practice and develop their knowledge and skills relating to recording engine speed 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	• Taco meter

Module 8: Perform tests as per specification			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU7: Compile all the Test result	Lead a discussion about compiling all the test results of a generator. Use real examples to support the discussion and ensure the discussion considers: • Preparing table • Entering all the average data in the table • Taking signatures on the document from the customer and expert Display a flip chart showing the following key question: *'What are the steps involved in compiling* all the test results 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 compiling all the test results 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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Version 1 - November, 2019

Module 9: Plan Work			
Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU1: Assess site hazards	Deliver an illustrated presentation on assessing site hazards at workplace. Ensure you address the importance of the following points: • Inspecting site visually • Identifying actual and potential hazards • Communicating with site supervisor/customer/supplier Prepare either: • A flip chart • A PowerPoint slides • A handout …showing the key topics about assessing site hazards. 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 assessing site hazards. 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 assessing site hazards 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	safety Instructions chart

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LU2: Ensure work procedures	Lead a brainstorm on how to ensure work procedures. Use ideas from the brainstorm to explain the following key points • Identifying Tools & equipment • Preparing job sheet /job card/work order • Following job sequence • Demonstrating or co-coordinating activities with others Display a slide or flip chart with a key question relating to ensuring work procedures. **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 ensuring work procedures Learners must be able to practice and develop their knowledge and skills relating to ensuring work procedures 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	Job card/Job sheet/work order

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LU3: Follow symbols	Lead a discussion about importance of following symbols. Use real examples to support the discussion and ensure the discussion considers: • Following warning symbols • Following electrical symbols • Following mechanical symbols Display a flip chart showing the following key question: *'What is the importance of various symbols shown in the symbol chart?'* 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 following symbols 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	Warning symbols chart

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LU4: Ensure drawing parameters	Lead a discussion about how to ensure drawing parameters. Use real examples to support the discussion and ensure the discussion considers: • Following metric and imperial measurements • Adopting inter-conversion of metric and imperial measurement • Distinguishing between plan, side view and section Display a slide or flip chart with a key question relating to Ensuring drawing parameters. **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 ensuring drawing parameters Learners must be able to practice and develop their knowledge and skills relating to ensuring drawing parameters 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	• Ruler set • measurement set • Sufficient Paper • Drawing material . cutting set

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Learning Unit	**Suggested Teaching / Learning Activities**	**Delivery Context**	**Media**
LU5: Ensure environmental concerns	Lead a discussion about ensuring environmental concerns. Use real examples to support the discussion and ensure the discussion considers: • Identifying actual and potential environmental concerns (proximity to water courses, noise levels, fuel leaks and hazardous materials) • Reviewing environment concerns • Reviewing work plan as per standard • Communicating report to site supervisor Prepare either: • A flip chart • A PowerPoint slides • A handout …showing key topics for ensuring environmental concerns. 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 ensuring environmental concerns. 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 ensuring environmental concerns 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	Writing materials on environment concerns (proximity to water courses, noise levels, fuel leaks and hazardous materials)

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 this certificate?	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 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	**7**	Perform Winding		
Question	**1**	What type of winding is generally used for the stators?	A	Double layer wave winding
			B	Double layer lap winding
			C	Single layer wave winding
			D	Single layer lap winding
Question	**2**	When coil sides are pole pitch apart, the DC armature winding is called as	A	Multiplex
			B	Fractional pitch
			C	Full pitch
			D	Pole pitch

Question 3 What does S.W.S stands for ?

A Standard western gauge

B Swiss wire gauge

C Swiss western gauge

D Standard Wire Gauge

Question 4 Resins and varnisher are commonly used in

A Generators and Motors

B Cables

C Transformers

D Circuit breakers

Question 5 The advantage of a short pitch winding is

A Low noise

B Increased inductance

C Suppression of harmonics

D Reduced eddy currents

MODULE	**8**	Perform Test As per Specifications		
Question	**1**	A device that is used to measure current without opening the circuit is :	A	Megger test
			B	Clamp probe
			C	Ammeter
			D	multimeter
Question	**2**	A multimeter is a device that measures:	A	Voltage
			B	Current
			C	Resistance
			D	All of these.

Question 3	Frequency can be measured by :	A	Hertz meter
		B	Ammeter
		C	Voltmeter
		D	Multimeter
Question 4	Voltage is always measured in :	A	Series
		B	Parallel
		C	Combination of series and parallel
		D	None of these
Question 5	A device used to indicate the temperature of an item being monitored is known as :	A	Tachometer
		B	Temperature gauge
		C	Multimeter
		D	Frequency meter

MODULE 9 Plan Work

Question 1 A hazard is....

A The likelihood of a substance person, activity or process to cause harm.

B The probability of a substance person, activity or process to cause harm

C The potential of a substance person, activity or process to cause harm

D The prospect of a substance person, activity or process to cause harm.

Question 2 What is the appropriate text for this safety sign?

A Humpty-Dumpty Lives Here

B Watch out for Pills with Wings

C Charlie Chaplin Studio

D Hard Hat Area

Question 3 What is the appropriate text for this safety sign?

A You are challenged to a duel

B Mr. Clean says Hello

C Use your other left

D Wear your gloves

Question 4 What is the appropriate text for this safety sign?

A Sunglasses are mandatory.

B Eye checkup area begins

C Safety Goggles are mandatory

D Wear prescription glasses

Question 5 What is the appropriate text for this safety sign?

A Personal headphones may be worn

B Hearing protection must be worn

C Personnel with hearing disability only.

D Eye checkup area begins

Answer Keys

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

MODULE 8: Q1.b Q2.d Q3.a Q4.b Q5.b

MODULE 9: Q1.c Q2.d Q3.d Q4.c Q5.b

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