



**NOS.MT.01
FIRST EDITION**

**NATIONAL OCCUPATIONAL STANDARD FOR
MAINTENANCE TECHNICIAN**

ZAMBIA QUALIFICATIONS AUTHORITY

APPROVING AUTHORITY

This National Occupational Standard has been approved and officially published by the Zambia Qualifications Authority Board on 15th February 2024.

ZAMBIA QUALIFICATIONS AUTHORITY

The Zambia Qualifications Authority Act No. 13 of 2011 was enacted by the Government of the Republic of Zambia to ***“provide for the development and implementation of a national qualifications framework; establish the Zambia Qualifications Authority; provide for the registration and accreditation of qualifications; provide measures to ensure that standards and registered qualifications are internationally comparable; and provide for matters connected with, or incidental to the foregoing”***. Among other functions, ZAQA is responsible for ***determining national standards for any occupation***, through various sector specific National Occupational Standards Development Teams (NOSDTs).

REVISION OF NATIONAL OCCUPATIONAL STANDARDS

National Occupational Standards (NOS) shall be revised every **5 years**, or whenever necessary, by the issue of either amendments or revised editions. It is important that users of the NOS ascertain that they are in possession of the latest amendments or editions.

NOS DEVELOPMENT TEAM RESPONSIBLE

This National Occupational Standard was prepared by the Manufacturing National Occupational Standards Development Team with representation from the following organisations;

1. Biomedical Society of Zambia (BMSZ)
2. Copperbelt University (CBU)
3. Engineering Institution of Zambia (EIZ)
4. Good Time Steel Company Zambia Limited (GTS)
5. Lusaka Vocational and Technical College (LVTC)
6. Makeni Ecumenical Centre (MEC)
7. Ministry of Commerce, Trade and Industry (MCTI)
8. Ministry of Health (MoH)
9. National Institute for Scientific and Industrial Research (NISIR)
10. Northern Technical College (NORTEC)
11. University of Lusaka (UNILUS)
12. University of Zambia (UNZA)
13. Zambia Association of Manufacturers (ZAM)
14. Zambia Forestry College (ZFC)
15. Zambia Qualifications Authority (ZAQA)– Secretariat

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FOREWORD

The Zambia Qualifications Authority (ZAQA) is a statutory body under the Ministry of Education established by ZAQA Act No. 13 of 2011 to “**develop and implement a national qualifications framework; register and accredit qualifications; and ensure that standards and registered qualifications are internationally comparable**”.

Among other functions, ZAQA is responsible for “**determining national standards for any occupation**”, through various sector specific National Occupational Standards Development Teams (NOSDTs) of experts composed of representation from appropriate authorities, government departments, industry, academia, regulators, consumer associations and non-governmental organisations, etc.

This National Occupational Standard (NOS) has been developed by the Manufacturing National Occupational Standards Development Team in accordance with the procedures and guidelines of ZAQA. All users should ensure that they have the latest edition of this publication as NOS are revised from time to time.

This NOS shall be used by, among others, industry, employers, quality assurance bodies, awarding and professional bodies and education and training institutions, as a benchmark to identify training needs, develop job profiles/descriptions, develop curricula and learning programmes, in various sectors where the occupation exists. In the Manufacturing sector, demonstration of competence against this NOS may be required in order to run a business or practice a craft or profession.

JUSTIFICATION

A Maintenance Technician is critical in the promotion of safety, longevity and reliability of equipment in the workplace. His/her role is to oversee, maintain and ensure overall effectiveness and efficiency of equipment and/or tools under their care.

Following the growth in the manufacturing sector and the heavy investments going into the acquisition of various equipment, it has become imperative that such investments are not wasted due to lack of proper maintenance. Maintenance Technicians play a critical role in the sector by not only ensuring the equipment is effective and efficient through routine and preventive maintenance, but is also safe to operate and quality output is assured.

This National Occupational Standard highlights core knowledge, skills, competences and personal attributes that Maintenance Technicians must possess to be successful in their jobs.

ACRONYMS AND ABBREVIATIONS

CS	Core Skill
NOS	National Occupational Standard
MT	Maintenance Technician
NOS	National Occupational Standard
NOSDT	National Occupational Standards Development Team
OK	Organisational Knowledge
PC	Performance Criteria
PS	Professional Skill
RK	Regulatory Knowledge
RPL	Recognition of Prior Learning
TK	Technical Knowledge
ZAQA	Zambia Qualifications Authority
ZQF	Zambia Qualifications Framework

GLOSSARY OF TERMS

For the purposes of this NOS, the following terms and definitions shall apply:

Core Skills/Generic Skills: A group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the NOS, these include communication related skills that are applicable to most job roles.

Function: An activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of NOS.

Job Title: A unique set of functions that together form a unique employment opportunity in an organisation.

Knowledge and Understanding: Statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

National Occupational Standards (NOS): Statements of the standards of performance individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding. They are precise descriptions of what an individual is expected to be able to do in his/her work role.

National Occupational Standards (NOS) Code: A unique reference code that identifies a NOS.

National Occupational Standards Development Team (NOSDT): An established group of national stakeholders/experts responsible for the development of National Occupational Standards within a specific economic sector or occupation.

Occupation: A set of job roles, which perform similar/related set of functions in an industry.

Organisational Context: the manner in which the organisation is structured and how it operates, including the extent of operative knowledge that managers have in their relevant areas of responsibility.

Performance Criteria: Statements that together specify the standard of performance required when carrying out a task.

Scope: The set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on the quality of performance required.

Sector: A conglomeration of different business operations having similar businesses and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.

Sub-Sector: A further breakdown of the sector based on the characteristics and interests of its components.

Technical Knowledge: The specific knowledge needed to accomplish specific designated responsibilities.

Unit Title: A clear overall statement about what the incumbent should be able to do.

1. OVERVIEW

This is an introductory section providing summary and specific information or commentary on the content of the NOS, the targeted sector and occupation to help industry users.

NOS Code	NOS.MT.01
Occupation	Maintenance Technician
Job Title	Maintenance Technician
Job Description	A Maintenance Technician is responsible for assembling, installing and maintaining equipment in the organisation. He/she must be able to read, interpret and follow instructions and operation manuals, troubleshoot equipment and schedule maintenance activities in the organisation in the form of preventive maintenance.
Job Purpose	Maintenance Technicians work in a variety of industries and ensure equipment is properly assembled, installed and maintained for optimum output.
ZQF Level	5
Sector	Manufacturing
Sub sectors	Food and Beverage Processing, Petroleum Products Processing, Wood and wood products Processing, Metal and metal products Processing, Soaps and Detergents Processing, Glass Processing, Fertiliser Manufacturing, Automotive Manufacturing, Consumer Electronics, Chemical Manufacturing etc
Other Economic Sector(s) in which the Occupation is Practiced	Mining and Mineral Processing; Aviation/Aerospace; Telecommunication; Water and Sanitation, Government Ministries and Agencies, etc.
Other Similar Jobs That Can Be performed by the Maintenance Technician	Maintenance Specialist, Service Technician, Industrial Maintenance Technician, Equipment Maintenance Technician, Manufacturing Maintenance Technician etc
Minimum Educational Job Entry Qualification(s)	Level 5 Certificate
Practicing License Requirements (if any)	Engineering Institution of Zambia
Training/RPL	<ol style="list-style-type: none"> 1. Awareness of the Industry Standards and Rules and Regulations and their application 2. Use of ICTs (Internet, Computer packages, email, Computer Software and Hardware necessary for the job, etc.). 3. Quality Enhancement Methods 4. Workshop Safety 5. System Maintenance

Minimum Job Entry Age	21 years
Prior Experience (Suggested)	Minimum of 6 months internship
Performance Criteria	As described in the Units under Section 4

2. SCOPE

This NOS specifies the fundamental knowledge and understanding, skills and competences that Maintenance Technicians must possess to be successful in their jobs.

3. PERSONAL ATTRIBUTES (VALUES, ETHICS AND ATTITUDES)

This job requires an individual to possess exceptional technical and problem-solving skills. He/she must have ability to communicate effectively and clearly, plan and prioritise, and reason logically. The individual must be quality conscious, occupational health and safety orientated, physically fit, innovative, computer literate, as well as able to use fingers, hands and feet with ease to complete the assigned task (dexterity). He/she must have the ability to handle various tools and materials related to maintenance work. The Individual is also expected to be self-motivated and a great team player.

4. UNITS AND ELEMENTS

This National Occupational Standard is divided into **6 units** representing the tasks that a jobholder should undertake in his/her day to day work. The unit is further broken down into elements depicting the number of activities to be carried out for the successful execution of a particular tas

UNIT 1 [This Unit covers the skills and knowledge required by a Maintenance Technician for reading and interpreting blueprints, referring and adhering to the instructions provided].

Unit No.	01
Unit Title	Read and interpret blueprints and refer and adhere to the instructions provided
Description	This Unit describes the skills and knowledge required to read and interpret blueprints, refer and adhere to the instructions provided.
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Read and interpret blueprints • Refer and adhere to the instructions provided
Performance Criteria (PC) with respect to the Scope	
Element	Performance Criteria (PC)
Read and Interpret Blueprints	<p>To be competent, the individual must be able to:</p> <p>PC1. Review the title and cover page to get the preliminary information needed to make sense of the rest of the plans</p> <p>PC2. Analyse the key and legend as this is the explanation for the decoding and understanding basic symbols in the drawings</p> <p>PC3. Determine the scale as each unit of measure on a blueprint represents a specific larger unit. The individual must keep in mind that a scale can change from page to page within the same set of prints.</p> <p>PC4. Identify a compass symbol that establishes the drawings orientation</p> <p>PC5. Recognise any additional notes as sometimes specific blueprints include information about the task at hand</p> <p>PC6. Determine which drawings will be needed first, for example, if one is completing electrical works, they may need to look for the mechanical sections.</p>
Refer and Adhere to the Instructions Provided	<p>To be competent, the individual must be able to:</p> <p>PC7. Interpret information blocks in order to understand: <ul style="list-style-type: none"> - surface texture and intended usage, - blueprint number, - part number that corresponds to the component, - specific location of the parts and scale information provided. </p> <p>PC8. Identify the material list and components and equipment needed to properly build each component.</p> <p>PC9. Interpret the key or legend provided.</p> <p>PC10. Interpret the scale at which plans are made and the symbols and acronyms used.</p> <p>PC11. Analyse the plans as a whole.</p>

Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: OK1. Standard Procedures for reading blueprints and instructions OK2. Safety rules and regulations for handling equipment and tools in the workshop OK3. Personal protection including the use of related safety gear and equipment OK4. Reporting procedures
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1. How to read and interpret blueprints TK2. Standards and Codes of practice applicable to Manufacturing TK3. Manufacturers guidelines/specifications for use of equipment and tools TK4. Basic computer knowledge to update computerised logging systems as well as work within any company specific programming
C. Regulatory Context (Knowledge of Rules and Regulations)	The individual on the job must demonstrate knowledge and understanding of Acts relevant to the Manufacturing sector such as: RK1. Factories Act RK2. The National Technical Regulation Act RK3. Engineering Institution of Zambia Act RK4. Occupational Health and Safety Act RK5. Worker's Compensation Act
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The individual on the job must be able to: CS1. Write in English (at least working level) and/or have the means to give simple instructions in the local language used at the workshop CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers
	Reading Skills
	The individual on the job must be able to: CS3. Read English and/or have the means to give simple instructions in the local language used at the workshop CS4. Read and interpret blueprints or instructions provided for the required work
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers

B. Professional Skills	Decision Making
	The individual on the job must be able to: PS1. Determine and report to the superior, presence of possible errors in the blueprint PS2. Determine and report to the superior, a need to customize instructions
	Plan and Organise
	The individual on the job should be able to: PS3. Plan work and organise required resources in coordination with team members and superiors PS4. Prepare a safe working environment for maintenance works PS5. Schedule daily works as per the maintenance requirements
	Customer Centricity
	The individual on the job should be able to: PS6. Support the organisation's commitment to customer expectation of quality output by ensuring adherence to maintenance requirements
	Problem Solving
	The individual on the job should be able to: PS7. Resolve any conflicts within the team PS8. Propose changes to increase efficiency of the equipment
Analytical Thinking	
The individual on the job should be able to: PS9. Analyse and convey to the superior any equipment Malfunction and carry out remedial action PS10. Evaluate the state of equipment PS11. Recognize trends in equipment failure or malfunction	
Critical Thinking	
The individual on the job should be able to: PS12. Identify and deal with or report violation of any safety norms which may lead to accidents. PS13. Justify a maintenance schedule that is customised to the specific conditions of the equipment and environment in which it operates PS14. Question information that is presented without evidence and be willing to change their viewpoint when presented with new evidence	

UNIT 2 [This Unit covers the skills and knowledge required by a Maintenance Technician for troubleshooting and diagnosing equipment problems].

Unit No.	02
Unit Title	Troubleshoot and diagnose equipment problems
Description	This Unit describes the skills and knowledge required to troubleshoot and diagnose equipment problems.
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Troubleshoot equipment • Diagnose equipment problems
Performance Criteria (PC) with respect to the Scope	
Element	Performance Criteria (PC)
Troubleshoot Equipment	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC1. Identify the problem PC2. Examine a theory of probable cause PC3. Test the theory to determine the cause PC4. Formulate a plan of action to resolve the problem PC5. Implement the solution PC6. Evaluate full system functionality PC7. Propose preventive measures
Diagnose Equipment Problems	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC8. Analyze equipment operating conditions: <ul style="list-style-type: none"> - Performance fluctuations - Error codes - Detection of leakages etc In order to produce a list of possible failure modes PC9. Use subjective evidence (analogy) based on previous experience to further isolate the specific cause of a problem using: <ul style="list-style-type: none"> - Sight - Sound - Smell - Repair history and/or - Adjacent system data PC10. Apply fault estimation techniques to determine the magnitude and severity of the fault
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> OK1. Standard procedures for troubleshooting equipment OK2. Safety rules and regulations for handling equipment and tools in the workshop OK3. Personal protection including the use of related safety gear and equipment OK4. Reporting procedures

<p>B. Technical Knowledge</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <ul style="list-style-type: none"> TK1. Troubleshooting techniques and procedures TK2. Standards and Codes of practice applicable to Manufacturing TK3. Manufacturers guidelines/specifications for use of equipment and tools TK4. Basic computer knowledge to update computerised logging systems as well as work within any company specific programming TK5. Information gathering TK6. Assessment of the effectiveness of a proposed solution TK7. Documentation of the incident
<p>C. Regulatory Context (Knowledge of Rules and Regulations)</p>	<p>The individual on the job must demonstrate knowledge and understanding of Acts relevant to the Manufacturing sector such as:</p> <ul style="list-style-type: none"> RK1. Factories Act RK2. The National Technical Regulation Act RK3. Engineering Institution of Zambia Act RK4. Occupational Health and Safety Act RK5. Worker’s Compensation Act
<p>Skills (S)</p>	
<p>A. Core Skills/ Generic Skills</p>	<p>Writing Skills</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS1. Write in English (at least working level) and/or have the means to give simple instructions in the local language used at the workshop CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers
	<p>Reading Skills</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS3. Read English and/or have the means to give simple instructions in the local language used at the workshop CS4. Read and interpret instructions provided for the required Work
<p>Oral Communication (Listening and Speaking skills)</p>	
<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers 	
<p>B. Professional Skills</p>	<p>Decision Making</p>
<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> PS1. Determine and report to the superior presence of possible errors in the equipment PS2. Determine and report to the superior a need to isolate an affected component 	

	Plan and Organise
	The individual on the job should be able to: PS3. Plan work and organise required resources in coordination with team members and superiors PS4. Prepare a safe working environment for the maintenance works PS5. Schedule daily works as per the maintenance requirements
	Customer Centricity
	The individual on the job should be able to: PS6. Support the organisation's commitment to customer expectation of quality output by ensuring adherence to maintenance requirements
	Problem Solving
	The individual on the job should be able to: PS7. Resolve any conflicts within the team PS8. Estimate the magnitude and severity of the fault PS9. Identify required tools to fix identified fault PS10. Propose changes to increase efficiency of the equipment
	Analytical Thinking
	The individual on the job should be able to: PS11. Evaluate the state of equipment PS12. Analyse and convey to the superior any equipment malfunction and carry out remedial action PS13. Recognize trends in equipment failure or malfunction
Critical Thinking	
The individual on the job should be able to: PS14. Identify and deal with or report violation of any safety norms which may lead to accidents PS15. Question information that is presented without evidence and be willing to change their viewpoint when presented with new evidence	

UNIT 3 [This unit covers the skills and knowledge required by a Maintenance Technician for repairing or replacing broken or malfunctioning parts and conducting tests to ensure that repairs are satisfactory].

Unit No.	03
Unit Title	Repair or replace broken or malfunctioning parts and conduct tests to ensure that repairs are satisfactory
Description	This Unit defines the skills and knowledge required to repair or replace broken or malfunctioning parts and conducting tests to ensure repairs are satisfactory.
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Repair or replacement of broken or malfunctioning parts • Conduct tests to ensure repairs are satisfactory
Performance Criteria (PC) with respect to the Scope	
Element	Performance Criteria (PC)
Repair or Replacement of Broken or Malfunctioning Parts	To be competent, the individual must be able to: PC1. Identify the failure (it may be an equipment component or equipment item) PC2. Diagnose the problem PC3. Eliminate the part causing the failure PC4. Recommend a repair or replace decision when failure occurs and troubleshooting procedures have been followed PC5. Order the replacement (internally or externally) of the part should the decision be a replacement or else repair the failed part PC6. Install ordered or repaired part
Conduct Tests to Ensure Repairs are Satisfactory	To be competent, the individual must be able to: PC7. Test functionality of the system after repair or replacement of affected part PC8. Assess continuation of use in the system
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: OK1. Standard procedures for conducting maintenance procedures OK2. Safety rules and regulations for handling equipment and tools in the workshop OK3. Personal protection including the use of related safety gear and equipment OK4. Reporting procedures
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1. Installation of various equipment relevant to the organisation TK2. Standards and Codes of practice applicable to maintenance in the Manufacturing sector

	<p>TK3. Maintenance guidelines/specifications for use of equipment and tools</p> <p>TK4. Basic computer knowledge to update computerised logging systems as well as work within any company specific programming</p> <p>TK5. Repairing techniques relevant to the equipment in the organisation</p>
C. Regulatory Context (Knowledge of Rules and Regulations)	<p>The individual on the job must demonstrate knowledge and understanding of Acts relevant to the Manufacturing sector such as:</p> <p>RK1. Factories Act</p> <p>RK2. The National Technical Regulation Act</p> <p>RK3. Engineering Institution of Zambia Act</p> <p>RK4. Occupational Health and Safety Act</p> <p>RK5. Worker's Compensation Act</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The individual on the job must be able to:</p> <p>CS1. Write in English (at least working level) and/or have the means to give simple instructions in the local language used at the workshop</p> <p>CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers</p>
	Reading Skills
	<p>The individual on the job must be able to:</p> <p>CS3. Read English and/or have the means to give simple instructions in the local language used at the workshop</p> <p>CS4. Read and interpret maintenance instructions provided for the required work</p>
	Oral Communication (Listening and Speaking skills)
	<p>The individual on the job must be able to:</p> <p>CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers.</p> <p>CS6. Convey information clearly and concisely to co-workers</p>
B. Professional Skills	Decision Making
	<p>The individual on the job must be able to:</p> <p>PS1. Determine and report to the superior need to eliminate malfunctioned parts.</p> <p>PS2. Determine and report to the superior repair or replacement decision on malfunctioned parts.</p>
	Plan and Organise
	<p>The individual on the job should be able to:</p> <p>PS3. Plan work and organise required resources in coordination with team members and superiors</p> <p>PS4. Prepare a safe working environment for the maintenance works</p> <p>PS5. Schedule daily works as per the maintenance requirements</p>

	Customer Centricity
	The individual on the job should be able to: PS6. Support the organisation’s commitment to customer expectation of quality output by ensuring adherence to maintenance requirements.
	Problem Solving
	The individual on the job should be able to: PS7. Resolve any conflicts within the team PS8. Estimate the magnitude and severity of the fault PS9. Identify required tools to fix identified fault PS10. Propose changes to increase efficiency of the equipment PS11. Identify potential safety hazards to avoid injuries
	Analytical Thinking
The individual on the job should be able to: PS12. Analyse and convey to the superior any equipment malfunction and carry out remedial action PS13. Evaluate the state of equipment PS14. Recognize trends in equipment failure or malfunction	
Critical Thinking	
The individual on the job should be able to: PS15. Identify and deal with or report violation of any safety norms which may lead to accidents PS16. Justify a maintenance schedule that is customised to the specific conditions of the equipment and environment in which it operates PS17. Question information that is presented without evidence and be willing to change their viewpoint when presented with new evidence	

UNIT 4 [This Part covers the skills and knowledge required by a Maintenance Technician for performing installations and adjustments].

Unit No.	04
Unit Title	Perform installations and adjustments
Description	This Unit describes the skills and knowledge required to perform installations and adjustments.
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Perform installations. • Perform adjustments.
Performance Criteria (PC) with respect to the Scope	
Element	Performance Criteria (PC)
Perform Installations	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC1. Plan and prepare for installation which includes site evaluation, assessment of equipment needs and obtaining necessary permits and approvals PC2. Create a detailed installation plan outlining the steps to take during the installation process PC3. Arrange equipment delivery, unloading and inspection of equipment for damage or defects PC4. Organise when the equipment will be installed and who will be responsible for the installation PC5. Schedule the duration of the installation process PC6. Assemble the equipment according to the installation plan PC7. Test the equipment to ensure proper function PC8. Conclude the installation process and recommend commissioning the equipment to superiors
Perform Adjustments	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC9. Test equipment after installation to ensure proper function PC10. Identify and resolve performance issues that arise during testing PC11. Propose reconfiguration to accommodate changes in the manufacturing process for already running equipment PC12. Perform adjustments in accordance with the manufacturer's guidelines during maintenance to prolong lifespan of the equipment.
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> OK1. Standard procedures for conducting maintenance procedures OK2. Safety rules and regulations for handling equipment and tools in the workshop OK3. Personal protection including the use of related safety gear and equipment OK4. Reporting procedures

<p>B. Technical Knowledge</p>	<p>The individual on the job must demonstrate knowledge and understanding of local Manufacturing codes and mandatory standards below:</p> <ul style="list-style-type: none"> TK1. Installation of various equipment relevant to the organisation TK2. Standards and Codes of practice applicable to maintenance in the Manufacturing sector TK3. Installation and maintenance guidelines/specifications for use of equipment and tools TK4. Basic computer knowledge to update computerised logging systems as well as work within any company specific programming TK5. Repairing techniques relevant to the equipment in the organisation
<p>C. Regulatory Context (Knowledge of Rules and Regulations)</p>	<p>The individual on the job must demonstrate knowledge and understanding of Acts relevant to the Manufacturing sector such as:</p> <ul style="list-style-type: none"> RK1. Factories Act RK2. The National Technical Regulation Act RK3. Engineering Institution of Zambia Act RK4. Occupational Health and Safety Act RK5. Worker’s Compensation Act
<p>Skills (S)</p>	
<p>A. Core Skills/ Generic Skills</p>	<p>Writing Skills</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS1. Write in English (at least working level) and/or have the means to give simple instructions in the local language used at the workshop CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers
	<p>Reading Skills</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS3. Read English and/or have the means to give simple instructions in the local language used at the workshop CS4. Read and interpret installation and maintenance instructions provided for the required work
<p>Oral Communication (Listening and Speaking skills)</p>	
<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers 	
<p>B. Professional Skills</p>	<p>Decision Making</p>
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> PS1. Determine and report to the superior need to commission installed equipment PS2. Determine and report to the superior adjustment decision on installed parts PS3. Determine and report to the superior reconfiguration decision on installed and running equipment

	Plan and Organise
	The individual on the job should be able to: PS3. Plan work and organise required resources in coordination with team members and superiors PS4. Prepare a safe working environment for the maintenance works PS5. Schedule daily works as per the maintenance requirements
	Customer Centricity
	The individual on the job should be able to: PS6. Support the organisation's commitment to customer expectation of quality output by ensuring adherence to maintenance requirements
	Problem Solving
	The individual on the job should be able to: PS7. Resolve any conflicts within the team PS8. Justify suitability of job site PS9. Identify damage or defects by inspecting equipment due for installation PS10. Propose changes to increase efficiency of the equipment PS11. Identify potential safety hazards to avoid injuries
	Analytical Thinking
The individual on the job should be able to: PS12. Analyse and convey to the superior any equipment Malfunction and carry out remedial action PS13. Evaluate the state of equipment PS14. Recognize trends in equipment failure or malfunction	
Critical Thinking	
The individual on the job should be able to: PS15. Identify and deal with or report violation of any safety norms which may lead to accidents PS16. Justify a maintenance schedule that is customised to the specific conditions of the equipment and environment in which it operates PS17. Question information that is presented without evidence and be willing to change their viewpoint when presented with new evidence	

UNIT 5 [This Part covers the skills and knowledge required by a Maintenance Technician in monitoring performance of machinery and equipment].

Unit No.	05
Unit Title	Monitor performance of machinery and equipment
Description	This Unit describes the skills and knowledge required to monitor performance of machinery and equipment
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Monitor performance of machinery and equipment
Performance Criteria (PC) with respect to the Scope	
Element	Performance Criteria (PC)
Monitor Performance of Machinery and Equipment	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC1. Interpret different alarms and their status variations PC2. Operate various monitoring and measuring devices simultaneously PC3. Differentiate monitoring techniques depending on affected equipment or system type PC4. Assess the condition of various equipment simultaneously PC5. Compare data of an entire manufacturing process
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> OK1. Monitoring techniques OK2. Safety rules and regulations for handling equipment and tools in the workshop OK3. Personal protection including the use of related safety gear and equipment OK4. Reporting procedures
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of local Manufacturing codes and mandatory standards below: <ul style="list-style-type: none"> TK1. Interpretation of various alarms TK2. Standards and Codes of practice applicable to the Manufacturing sector TK4. Basic computer knowledge to update computerised logging systems as well as work within any company specific programming TK5. Monitoring techniques relevant to the equipment in the Organisation
C. Regulatory Context (Knowledge of Rules and Regulations)	The individual on the job must demonstrate knowledge and understanding of Acts relevant to the Manufacturing sector such as: <ul style="list-style-type: none"> RK1. Factories Act RK2. The National Technical Regulation Act RK3. Engineering Institution of Zambia Act RK4. Occupational Health and Safety Act RK5. Worker’s Compensation Act

Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	The individual on the job must be able to: CS1. Write in English (at least working level) and be able to or have the means to give simple instructions in the local language used at the workshop CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers
	Reading Skills
	The individual on the job must be able to: CS3. Read English and be able to or have the means to give simple instructions in the local language used at the workshop CS4. Read and interpret monitoring instructions provided for the required work
B. Professional Skills	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers
	Decision Making
	The individual on the job must be able to: PS1. Determine and report to the superior persistent alarms PS2. Determine and report to the superior adjustment decision on alarm calibration
B. Professional Skills	Plan and Organise
	The individual on the job should be able to: PS3. Plan work and organise required resources in coordination with team members and superiors PS4. Prepare a safe working environment for the maintenance works PS5. Schedule daily works as per the monitoring requirements
	Customer Centricity
	The individual on the job should be able to: PS6. Support the organisation's commitment to customer expectation of quality output by ensuring adherence to monitoring requirements
	Problem Solving
	The individual on the job should be able to: PS7. Resolve any conflicts within the team PS9. Identify defective monitoring equipment PS10. Propose changes to increase efficiency of the equipment PS11. Identify potential safety hazards to avoid injuries
	Analytical Thinking
The individual on the job should be able to: PS12. Analyse and convey to the superior any equipment malfunction and carry out remedial action PS13. Evaluate the state of monitoring equipment PS14. Recognize trends in equipment failure or malfunction	

	Critical Thinking
	<p>The individual on the job should be able to:</p> <ul style="list-style-type: none">PS15. Identify and deal with or report violation of any safety norms which may lead to accidents.PS16. Justify a maintenance schedule that is customised to the specific conditions of the equipment and environment in which it operates.

UNIT 6 [This Part covers the skills and knowledge required by a Maintenance Technician in maintaining a preventive maintenance schedule for inspecting, servicing and testing equipment].

Unit No.	06
Unit Title	Maintain a preventive maintenance schedule for inspecting, servicing and testing equipment
Description	This Unit describes the skills and knowledge required to maintain a preventive maintenance schedule for inspecting, servicing and testing equipment.
Scope	This Unit covers the following: <ul style="list-style-type: none"> Preventive maintenance scheduling for: Inspection, Servicing and Testing
Performance Criteria (PC) with respect to the Scope	
Element	Performance Criteria (PC)
Preventive Maintenance Scheduling for Inspection, Servicing and Testing	To be competent, the individual must be able to: <ul style="list-style-type: none"> PC1. Create an inventory of the organisation assets PC2. Arrange maintenance priorities PC3. Identify appropriate maintenance intervals PC4. Schedule recurring inspections and tasks PC5. Evaluate progress and keep fine-tuning
Knowledge and Understanding (K)	
A. Organisational Context (Knowledge of the company/ organisation and its processes)	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> OK1. Standard procedures for conducting preventive maintenance OK2. Safety rules and regulations for handling equipment and tools in the workshop OK3. Personal protection including the use of related safety gear and equipment OK4. Reporting procedures
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of local Manufacturing codes, mandatory standards and skills below: <ul style="list-style-type: none"> TK1. Standards and Codes of practice applicable to preventive maintenance in the Manufacturing sector TK2. Installation and maintenance guidelines/specifications for use of equipment and tools TK3. Basic computer knowledge to update computerised logging systems as well as work within any company specific programming. TK4. Basic inventory management knowledge TK5. Preventive maintenance techniques relevant to the equipment in the organisation

C. Regulatory Context (Knowledge of Rules and Regulations)	<p>The individual on the job must demonstrate knowledge and understanding of Acts relevant to the Manufacturing sector such as:</p> <ul style="list-style-type: none"> RK1. Factories Act RK2. The National Technical Regulation Act RK3. Engineering Institution of Zambia Act RK4. Occupational Health and Safety Act RK5. Worker's Compensation Act
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS1. Write in English (at least working level) and/or have the means to give simple instructions in the local language used at the workshop CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers
	Reading Skills
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS3. Read English and/or have the means to give simple instructions in the local language used at the workshop CS4. Read and interpret installation and maintenance instructions provided for the required work
B. Professional Skills	Oral Communication (Listening and Speaking skills)
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> CS5. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS6. Convey information clearly and concisely to co-workers
	Decision Making
	<p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> PS1. Determine and report to the superior prioritised preventive maintenance schedule PS2. Determine and report to the superior adjustment decision on installed parts PS3. Determine and report to the superior reconfiguration decision on installed and running equipment
	Plan and Organise
	<p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> PS3. Plan work and organise required resources in coordination with team members and superiors PS4. Prepare a safe working environment for the maintenance works PS5. Schedule daily works as per the maintenance requirements
	Customer Centricity
	<p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> PS6. Support the organisation's commitment to customer expectation of quality output by ensuring adherence to maintenance requirements

	Problem Solving
	The individual on the job should be able to: PS7. Resolve any conflicts within the team PS8. Change damaged or defective components or parts identified from equipment inspection PS9. Identify potential safety hazards to avoid injuries
	Analytical Thinking
	The individual on the job should be able to: PS10. Analyse and convey to the superior any equipment malfunction and carry out remedial action PS11. Evaluate the state of equipment PS12. Recognize trends in equipment failure or malfunction
	Critical Thinking
	The individual on the job should be able to: PS13. Identify and deal with or report violation of any safety norms which may lead to accidents PS14. Justify a maintenance schedule that is customised to the specific conditions of the equipment and environment in which it operates

5. EQUIPMENT, TOOLS AND CONSUMABLE MATERIALS

These include, but not limited to:

Equipment and Tools:

- Computer software applications
- Machine shop equipment and tools
- Fabrication shop equipment and tools
- Electrical equipment
- Testing equipment and tools
- Personal protective equipment
- Lifting equipment
- Climbing ladders
- Safety warning and information signs
- Incident/accident reporting templates
- Company standard operating procedures
- First Aid kit
- Safety tools and equipment such as fire extinguishers and barricades
- Company's safety policy/procedure
- Zambia Standards and recognised Codes of Practice applicable to the Manufacturing sector

Raw Materials and Consumables:

Textile, Leather, Wood, Paper, Chemicals, Rubber, Plastics, Non-metallic minerals, Basic metals, Lubricants, Spare parts and components, etc.

6. DILEMMAS/CHALLENGES AND COMPLEXITIES FOR A JOB HOLDER

Maintenance Technicians face challenges such as obsolete and/or inappropriate equipment and tools, budgetary constraints, inadequate product costing skills, poor technical skill base, bureaucracy in procurement procedures, lack of appreciation of preventive maintenance by non-engineering management staff, labour intensive nature of the work, rapid change of technology and materials, lack of personal protective equipment, inconsistency in company and government policies and regulations, etc.

6.1 Alternative Choices (Solutions) to Dilemmas and Complexities

Solutions to challenges include: selecting and procuring appropriate equipment and tools for the job; supporting capacity building through training; recruitment or inclusion of engineering professionals in management teams, deployment of automation where feasible, provision of personal protective equipment, participation in lobbying and formulation of policies, allocation of adequate financial resources, etc.

7. WORKING CONDITIONS/ENVIRONMENT

Maintenance Technicians work with a variety of machinery, toxic substances and volatile materials, their work environment is susceptible to fires, explosions, structural failures and equipment malfunctions. Working conditions include cold, hot and wet conditions, climbing heights, standing and/or walking for long hours, lifting materials, working in day or night shifts, working in areas that are noisy and dusty as well as areas with limited lighting and ventilation, etc.

8. PARTIES INVOLVED/INTERACTING WITH THE JOB HOLDER OR TRAINEE

8.1 Internal/Within the Organisation

Management, supervisors, subordinates and other section members, etc.

8.2 External/Outside the Organisation

Government regulators, professional bodies, suppliers, fellow engineers from other companies, labour unions, students/interns, etc.

9. DEMANDS ON THE PHYSICAL BODY

- Physique to sustain strenuous conditions;
- Be able to walk and stand for long periods of time;
- Bend, stretch, twist, or reach out;
- Be able to lift relatively heavy materials, tools and equipment;
- Be able to use fingers, hands and feet with ease to complete the assigned task (dexterity);

ANNEX A

Criteria for Assessments based on this NOS

A.1 Guidelines for Assessment

A.1.1 Criteria for assessment for curricula and learning programmes based on this NOS will be created by curricula and programmes developers. Each Performance Criteria (PC) will be assigned marks proportional to its importance in the NOS. Curricula and programmes developers will also lay down proportion of marks for theory and practical skills for each performance criteria, giving more weight to practical skills.

There shall be allocated the 'Total Mark', which will be the sum of all marks in each Unit, distributed across the number of PCs in that particular Unit. The 'out of' mark will be the mark allocated to each PC, which will be shared between theory and skills practical assessments.

A.1.2 Individual awarding/assessment bodies or institutions and other users of the NOS will create unique question papers for the theory part and evaluations for skill practical part for their respective candidates.

ANNEX B NOS Version Control

This Annex gives details necessary for the tracking of the NOS versions based on the number of revisions.

NOS Code	NOS.MT.01		
ZQF Level	5	Version Number	01
Sector	Manufacturing	Date of Approval	February 2024
Sub Sector		Date of Last Review	N/A
Occupation	Maintenance Technician	Date of Next Review	February 2029