



**NOS.MF.01  
FIRST EDITION**

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**NATIONAL OCCUPATIONAL STANDARD FOR METAL  
FABRICATOR**

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**ZAMBIA QUALIFICATIONS AUTHORITY**

## APPROVING AUTHORITY

This National Occupational Standard has been prepared and published under the authority of the Zambia Qualifications Authority Board on 15th February 2024.

## ZAMBIA QUALIFICATIONS AUTHORITY

The Zambia Qualifications Authority (ZAQA) 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; provide for the registration and accreditation of qualifications; establish the Zambia Qualifications Authority; 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 after **5 years**, or whenever necessary, by the issue of either amendments or of revised editions. It is important that users of NOS ascertain that they are in possession of the latest amendments or editions.

## NOS DEVELOPMENT TEAM RESPONSIBLE

This NOS was prepared by the Manufacturing National Occupational Standards Development Team, upon which the following organisations were represented:

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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)
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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

Metal Fabricators also known as Fabrication Technicians, are indispensable in the manufacturing, maintenance, welding and engineering sector. Metal Fabricators select and prepare metal stock for fabrication to make or repair metal structures such as boilers and pressure vessels. They study blueprints, drawings and specifications to determine job requirements. They also shape and bend metal sections and pipes using hand and machine tools.

Therefore, it is important that Metal Fabricators must be adequately and appropriately qualified to proficiently perform their assignments and apply concepts for design to obtain approval for final manufacturing, maintenance and welding.

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

## ACRONYMS AND ABBREVIATIONS

CS	Core Skill
DNOS	Draft National Occupational Standard
MF	Metal Fabricator
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
CAD	Computer Aided Design
CAM	Computer Aided Machining
MIG	Metal Inert Gas
MAG	Metal Active Gas

## 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:** A 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:** An overall statement about what the incumbent should be able to do.



## 1. OVERVIEW

This is an introductory section providing a brief summary and specific information or commentary about the content of the NOS and the targeted sector and occupation to help the user judge whether it is relevant to them.

<b>NOS Code</b>	NOS.MF.01
<b>Occupation</b>	Metal Fabrication
<b>Job Title</b>	Metal Fabricator
<b>Job Description</b>	Metal fabricators follow patterns and blueprints to create structures from raw metal. They are skilled craftspeople who assemble structural metal products such as frameworks or shells for machinery, ovens, tanks, stacks and metal parts for buildings and bridges. They prepare, cut, shape, machine and weld metal using complex hand tools and equipment such as blowtorches, shears, gauges, power saws and workshop presses.
<b>Job Purpose</b>	A Metal Fabricator carries out maintenance, manufacturing, welding and fabrication of a variety of engineering designs by using machines and tools such as welding machines, rivet guns, guillotines, benders etc.
<b>ZQF Level</b>	5
<b>Sector</b>	Manufacturing
<b>Sub sectors</b>	Construction and Mechanic Engineering
<b>Other Economic Sector(s) in which the Occupation is Practiced</b>	Construction, Energy, Mining and Mineral processing, Aviation/Aerospace, Telecommunication, Water and Sanitation, Government Ministries and Agencies, etc.
<b>Other Similar Jobs that can be performed by the Metal Fabricator</b>	Welder, Structural Steel Trades Worker, Boiler Maker, Brass Finisher, Sheet Metal Worker
<b>Minimum Educational Job Entry Qualification(s)</b>	Level 5 certificate
<b>Practicing License Requirements (if any)</b>	1.Membership with the Engineering Institution of Zambia (EIZ)
<b>Training/RPL</b>	<ol style="list-style-type: none"> <li>1. Awareness of the Industry Standards and Rules and Regulations and their application</li> <li>2. Use of AutoCAD /software and ICTs skills needed (Internet, Computer packages, email, Computer Software and Hardware necessary for the job, etc.)</li> <li>3. Quality Enhancement Methods</li> </ol>
<b>Minimum Job Entry Age</b>	21 years
<b>Prior Experience (Suggested)</b>	Minimum of 1 year internship
<b>Performance Criteria</b>	As described in the Units under Section 4

## **2. SCOPE**

This National Occupational Standard specifies the fundamental knowledge and understanding, skills and competences that Metal Fabricator must possess to be successful in their jobs.

## **3. PERSONAL ATTRIBUTES (VALUES, ETHICS AND ATTITUDES)**

This job requires an individual to possess ability to apply advanced mathematical principles and statistics to solve problems. He/she must possess experience in using Computer Aided Design (CAD), Computer Aided Machining (CAM) and software such as SolidWorks. The Individual must also demonstrate exceptional technical and problem-solving skills and analytical reasoning. He/she must have the ability to communicate effectively and clearly, plan and prioritise, as well as ability to use fingers, hands, and feet with ease to complete the assigned tasks (dexterity). Furthermore, the job holder must be self-motivated, creative, courteous, a great team player, quality conscious, occupational health and safety orientated and physically fit.

## **4. UNITS AND ELEMENTS**

This National Occupational Standard is divided into **5 Units** representing the tasks that a jobholder should undertake in his/her day-to-day work. The Units are further broken down into elements depicting the number of activities to be carried out for the successful execution of a particular task.

**UNIT 1** [This Unit covers the skills and knowledge required by a Metal Fabricator Occupation Health and safety].

<b>Unit No.</b>	<b>01</b>
<b>Unit Title</b>	<b>Occupation Health and Safety</b>
<b>Description</b>	This Unit describes the skills and knowledge required to demonstrate occupation health and safety to carry out fabrication work
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Complying with occupation and safety rules.</li> <li>• Safety management system.</li> <li>• Health and wellness programmes.</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Comply with occupation and safety rules</b>	To be competent, the individual must be able to: PC1. Carry out workplace safety and health inspections. PC2. Wear PPE during the process of carrying out fabrication works. PC3. Ensure flammable materials are not near where fabrication is being carried out. PC4. Ensure oxy-acetylene cylinders and hoses are coupled with fire arrestors. PC5. Carry out a risk assessment.
<b>Safety management system</b>	To be competent, the individual must be able to: PC6: Interpret elements of safety management system.
<b>Health and wellness programmes</b>	To be competent, the individual must be able to: PC7. Comply with health and wellness programmes. PC8. Understand health and wellness programmes. PC9. Identify possible hazards which exist in the workplace. PC10. Use tools and machines properly. PC11. Use Mechanical aids properly. PC12. Follow correct procedures and avoid shortcuts.
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the company/ organisation and its processes)</b>	The individual on the job must demonstrate knowledge and understanding of: OK1. Standard procedures with regard to safety. OK2. Lock out procedures (Permit to safety). OK3. Isolation procedures. OK4. Risk assessment and hazard identification. OK5. Health and wellness programmes.
<b>B. Technical Knowledge</b>	The individual on the job must demonstrate knowledge and understanding of: TK1. Guarding of all moving machinery. TK2. Designs of standard guards. TK3. Designs of safe work systems. TK4. Laws relating to occupation health and safety in Zambia.

<p><b>C. Regulatory context (knowledge of rules and regulation)</b></p>	<p>The individual on the job needs to know and Understand:</p> <ul style="list-style-type: none"> <li>RK1. Factories Act and Regulations.</li> <li>RK2. EIZ ACT.</li> <li>RK3. Mine Safety Act and Regulations.</li> <li>RK4. Occupational Health and Safety Act and Regulations.</li> <li>RK5. Pneumoconiosis Medical and Research Bureau Act.</li> <li>RK6. Workers' Compensation Act and Regulations.</li> <li>RK7. Explosives Act and Regulations.</li> <li>RK8. The Environmental Management Act and Regulations.</li> <li>RK9. The Employment Code Act and Regulations.</li> </ul>
<p><b>Skills (S)</b></p>	
<p><b>A. Core Skills/ Generic Skills</b></p>	<p><b>Writing Skills</b></p> <p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> <li>CS1. Write in English (at least working level) and/or have the means to give simple instructions in the local language used at the site.</li> <li>CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers.</li> <li>CS3. Complete a works order.</li> </ul> <p><b>Reading Skills</b></p> <p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> <li>CS4. Read English and/or have the means to give simple instructions in the local language used at the site.</li> <li>CS5. Read and interpret sketches, drawings or instructions provided for the required work.</li> <li>CS6. Interpret safety symbols.</li> </ul> <p><b>Oral Communication (Listening and Speaking skills)</b></p> <p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> <li>CS7. Listen attentively and interpret communication/instructions from the supervisor and other co-workers.</li> <li>CS8. Convey information clearly and concisely to co-workers.</li> </ul>
<p><b>B. Professional Skills</b></p>	<p><b>Decision Making</b></p> <p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> <li>PS1. Determine and report to the superior whether the working space is safe for working.</li> <li>PS2. Ensure a risk assessment is carried out.</li> <li>PS3. Report hazards and any unsafe situations noted.</li> </ul> <p><b>Plan and Organise</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>PS4. Plan work and organise required resources in coordination with team members and superiors.</li> <li>PS5. Plan and apply safe work systems.</li> <li>PS6. Ensure proper isolation of equipment has been carried out.</li> </ul> <p><b>Customer Centricity</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>PS7. Manage relationships with customer with intent to satisfying their project requirements.</li> <li>PS8. Ensure the work is completed in the required time and to Standard.</li> </ul>

	<b>Problem Solving</b>
	The individual on the job should be able to: PS9. Resolve any conflicts within the team. PS10. Engage supervisor for certain decisions. PS11. Solve any problems that may arise in the work place.
	<b>Analytical Thinking</b>
	The individual on the job should be able to: PS12. Analyse and convey to the superior and carry out remedial Action. PS13. Make decisions in an emergency in the absence of the supervisor.
	<b>Critical Thinking</b>
	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. Use common sense and judgement in day-to-day activities

**UNIT 2** [This Unit covers the skills and knowledge required by a Metal fabricator workshop processes and practices].

<b>Unit No.</b>	<b>02</b>
<b>Unit Title</b>	<b>Workshop Processes and Practices</b>
<b>Description</b>	This Unit describes the skills and knowledge required to perform correct workshop processes and practices
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Structural drawing</li> <li>• Workshop processes and practices</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Structural Drawing</b>	To be competent, the individual must be able to: PC1. Observe safety regulations. PC2. Set out and make templates. PC3. Use standard allowances to mark on different types of Sections. PC4. Identify different sections. PC5. Assemble structures by trial erection. PC6. Use CAD. PC7. Apply principles of theory of structures.
<b>Workshop Processes and practices</b>	To be competent, the individual must be able to: PC8. Identify tools. PC9. Apply methods of Joining metals. PC10. Apply methods of surface treatment of metals. PC11. Perform forging methods. PC12. Perform punching, drilling, rolling and cutting operations. PC13. Undertake various welding and cutting processes.
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the company/ organisation and its processes)</b>	The individual on the job must demonstrate knowledge and understanding of: OK1. Standard procedures. OK2. Measuring tools. OK3. Marking tools. OK4. Forging. OK5. Bending and folding. OK6. Gas cutting. OK7. Oxy-acetylene welding techniques. OK8. Identifying electrodes. OK9. Submerged arc welding. OK10. MIG/MAG welding. OK 11. Company code of conduct.
<b>B. Technical Knowledge</b>	The individual on the job must demonstrate knowledge and understanding of : TK1. Operation of Arc welding Machines.

	<p>TK2.Operation of submerged arc welding machine. TK3 Operation of spot-welding machine. TK4.Operation of MIG/MAG welding machines. TK5.Operation laser cutting machine. TK6 Operation of guillotine machine. TK7 Operation of bending machines. TK8 Operation of cropping machine. TK9 Operation of pipe bender machine.</p>
<b>C. Regulatory context (knowledge of rules and regulation)</b>	<p>The individual on the job needs to know and Understand: RK1. Factories Act and Regulations. RK2. EIZ Act. RK3. Mine Safety Act and Regulations. RK4. Occupational Health and Safety Act and Regulations. RK5. Pneumoconiosis Medical and Research Bureau Act. RK6. Workers' Compensation Act and Regulations. RK7. Explosives Act and Regulations. RK8. The Environmental Management Act and Regulations. RK9. The Employment Code Act and Regulations.</p>
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Writing Skills</b>
	<p>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 site. CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers. CS3. Complete a works order.</p>
	<b>Reading Skills</b>
	<p>The individual on the job must be able to: CS4. Read English and be able to or have the means to give simple instructions in the local language used at the site CS5. Read and interpret sketches, drawings or instructions provided for the required work CS6. Interpret safety symbols</p>
	<b>Oral Communication (Listening and Speaking skills)</b>
	<p>The individual on the job must be able to: CS7. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS8. Convey information clearly and concisely to co-workers.</p>
<b>B. Professional Skills</b>	<b>Decision Making</b>
	<p>The individual on the job must be able to:</p>

	<p>PS1. Determine and report to the superior whether the working space is safe for working.</p> <p>PS2. Conduct a risk assessment.</p> <p>PS3. Report hazards and any unsafe situations noted.</p>
	<p><b>Plan and Organise</b></p>
	<p>The individual on the job should be able to:</p> <p>PS4. Plan work and organise required resources in coordination with team members and superiors.</p> <p>PS5. Plan and apply safe work systems.</p> <p>PS6. Ensure proper isolation of equipment has been carried out.</p>
	<p><b>Customer Centricity</b></p>
	<p>The individual on the job should be able to:</p> <p>PS7. Manage relationships with customers with the intent to satisfying their project requirements.</p> <p>PS8. Ensure the work is completed in the required time and to Standard.</p>
	<p><b>Problem-Solving</b></p>
	<p>The individual on the job should be able to:</p> <p>PS9. Resolve any conflicts within the team.</p> <p>PS10. Engage supervisor for certain decisions.</p> <p>PS11. Solve any problems that may arise in the workplace.</p>
	<p><b>Analytical Thinking</b></p>
	<p>The individual on the job should be able to:</p> <p>PS12. Analyse and convey to the superior and carry out remedial action.</p> <p>PS13. Make decisions in an emergency in the absence of the supervisor.</p>
	<p><b>Critical Thinking</b></p>
	<p>The individual on the job should be able to:</p> <p>PS14. Identify and deal with or report violation of any safety norms which may lead to accidents.</p> <p>PS15. Use common sense and judgement in day-to-day activities.</p>



**UNIT 3** [This Unit covers the skills and knowledge required by a Metal fabricator drawing and pattern development].

<b>Unit No.</b>	<b>03</b>
<b>Unit Title</b>	<b>Drawing and Pattern Development</b>
<b>Description</b>	This Unit describes the skills and knowledge required to demonstrate draughting, exhibit skills in parallel line, radial line, and triangulation methods
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Draughting</li> <li>• Parallel line method</li> <li>• Radial line method</li> <li>• Triangulation method</li> <li>• Methods of cutting planes</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Draughting</b>	To be competent, the individual must be able to: PC1. Identify drawing instruments PC2. Draw workshop sketches PC3. Draw projections PC4. Read and interpret blueprint readings
<b>Parallel line method</b>	To be competent, the individual must be able to: PC5. Draw and develop the following: <ul style="list-style-type: none"> <li>- All uniform bodies (e.g. cylindrical, rectangular, square bodies)</li> <li>- Mixed branch pipes</li> <li>- Oblique rectangular branch on a cylindrical body</li> <li>- Right and oblique lobster back bend</li> <li>- Right and oblique gusset piece</li> <li>- Single and double projection</li> <li>- Right angled tee of equal diameter pipe</li> <li>- Right angled tee off center</li> </ul>
<b>Radial line method</b>	To be competent, the individual must be able to: PC6. Design the following: <ul style="list-style-type: none"> <li>- Right cone</li> <li>- Right conic frustum</li> <li>- Right conic frustum cut obliquely</li> <li>- Oblique conic frustum or smoke hood</li> <li>- Oblique conical hopper</li> <li>- Triple conical intersection</li> <li>- Common central sphere</li> <li>- Spout on rectangular cam</li> <li>- Rectangular pipe on conic base</li> </ul>

<b>Triangulation method</b>	<p>To be competent, the individual must be able to:</p> <p>PC7. Construct the following:</p> <ul style="list-style-type: none"> <li>- Square to circle transformer</li> <li>- Twisted square to square transformer</li> <li>- Off-center rectangle to circle transformer</li> <li>- Oval to circle transformer</li> <li>- Semi-circle to circle transformer</li> <li>- Rectangle, semi-circle to circle transformer</li> <li>- Hood with corner radii</li> <li>- Rectangle to circle with rectangle incline</li> <li>- Rectangle to circle transformer with circle incline</li> <li>- Hoppers with kinked sides</li> <li>- Tapered lobster back bend</li> </ul>
<b>Methods of cutting planes</b>	<p>To be competent, the individual must be able to:</p> <p>PC8. Construct the following:</p> <ul style="list-style-type: none"> <li>- Varying lines of intersection</li> <li>- Cone and cylinder tangential intersection</li> <li>- Intersection of Tallboy transformer and right cone</li> <li>- Conical spout on a conical body</li> <li>- Cone and sphere intersection</li> <li>- Conical base of an air filter</li> <li>- Cylinder penetrating transformer at an angle</li> <li>- Oblique conical hood intersecting vertical flue</li> </ul>
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the company/ organisation and its processes)</b>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <ul style="list-style-type: none"> <li>OK1. Drawing and pattern development</li> <li>OK2. Determining joint lines</li> <li>OK3. Manipulation of drawing instruments</li> <li>OK4. Correct application of lines</li> <li>OK5. Neatness</li> <li>OK6. Tolerances</li> <li>OK7. Management skills</li> <li>OK8. Managing survival and growth project</li> </ul>
<b>B. Technical Knowledge</b>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <ul style="list-style-type: none"> <li>TK1. Drawing as a language to communicate with others</li> <li>TK2. Tracing paper to make templates in readiness for fabrication</li> <li>TK3. Correct application of enterprise management skills</li> <li>TK4. Enterprise and Technology</li> </ul>
<b>C. Regulatory context (knowledge of rules and regulation)</b>	<p>The individual on the job needs to know and Understand:</p> <ul style="list-style-type: none"> <li>RK1. Factories Act and Regulations.</li> <li>RK2. EIZ Act</li> <li>RK3. Mine Safety Act and Regulations</li> <li>RK4. Occupational Health and Safety Act and Regulations</li> <li>RK5. Pneumoconiosis Medical and Research Bureau Act</li> <li>RK6. Workers' Compensation Act and Regulations</li> <li>RK7. Explosives Act and Regulations</li> <li>RK8. Environmental Management Act and Regulations</li> <li>RK9. Employment Code Act and Regulations</li> </ul>

<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Writing Skills</b>
	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 site. CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers CS3. Complete a works order
	<b>Reading Skills</b>
	The individual on the job must be able to: CS4. Read English and/or have the means to give simple instructions in the local language used at the site CS5. Read and interpret sketches, drawings or instructions provided for the required work. CS6. Interpret safety symbols
	<b>Oral Communication (Listening and Speaking skills)</b>
The individual on the job must be able to: CS7. Listen attentively and interpret communication/instructions from the supervisor and other co-workers. CS8. Convey information clearly and concisely to co-workers.	
<b>B. Professional Skills</b>	<b>Decision Making</b>
	The individual on the job must be able to: PS1. Determine and report to the superior whether the working space is safe for working PS2. Conduct a risk assessment PS3. Report hazards and any unsafe situations noted
	<b>Plan and organise</b>
	The individual on the job should be able to: PS4. Plan work and organise required resources in coordination with team members and superiors PS5. Plan and apply safe work systems PS6. Ensure proper isolation of equipment has been carried out
	<b>Customer Centricity</b>
The individual on the job should be able to: PS7. Manage relationships with customers with intent to satisfying their project requirements. PS8. Ensure the work is completed in the required time and to standard.	

	<b>Problem-Solving</b>
	The individual on the job should be able to:  PS9. Resolve any conflicts within the team. PS10. Engage supervisor for certain decisions. PS11. Solve any problems that may arise in the workplace.
	<b>Analytical Thinking</b>
	The individual on the job should be able to: PS12. Analyse and convey to the superior and carry out remedial action. PS13. Make decisions in an emergency in the absence of the Supervisor.
	<b>Critical Thinking</b>
	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. Use common sense and judgement in day-to-day activities.

**UNIT 4** [This unit covers the skills and knowledge required by a Metal fabricator Coded welding].

<b>Unit No.</b>	<b>04</b>
<b>Unit Title</b>	<b>Coded Welding</b>
<b>Description</b>	This Unit describes the skills and knowledge required in coded welding
<b>Scope</b>	<p>This Unit covers the following:</p> <ul style="list-style-type: none"> <li>• Safe Working Procedures</li> <li>• Welding positions interpretation</li> <li>• Electrode identification</li> <li>• Shielded metal arc welding</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Safe Working Procedures - PPE</b>	<p>To be competent, the individual must be able to:</p> <p><b>CONDUCT PRE-OPERATIONAL SAFETY CHECKS</b></p> <p>PC1. Locate and ensure you are familiar with all machine operations and controls</p> <p>PC2. Check workspaces and walkways to ensure no slip/trip hazards are present</p> <p>PC3. Ensure the work area is clean and clear of grease, oil and any flammable materials</p> <p>PC4. Keep the welding equipment, work area and gloves dry to avoid electric shocks</p> <p>PC5. Ensure electrode holder and work leads are in good working condition</p> <p>PC6. Start the fume extraction unit before beginning to weld</p> <p>PC7. Ensure other people are protected from flashes by closing the curtain to the welding bay or by erecting screens</p> <p><b>CONDUCT OPERATIONAL SAFETY CHECKS</b></p> <p>PC8. Keep welding leads as short as possible and coil them to minimise inductance</p> <p>PC9. Ensure work return earth cables make firm contact to provide a good electrical connection</p> <p>PC10. Ensure the electrode holder has no electrode in it before turning on the welding machine</p> <p>PC11. Ensure current is correctly set according to electrode selection</p> <p><b>CONDUCT ENDING OPERATIONS AND CLEANING UP</b></p> <p>PC12. Switch off the machine and fume extraction unit when work is completed</p> <p>PC13. Remove electrode stub from holder and switch off power source</p> <p>PC14. Hang up electrode holder and welding cables. Leave the work area in a safe, clean and tidy state</p>

<b>Welding Positions interpretation</b>	To be competent, the individual must be able to: PC15. Apply Fillet 1F, 2F, 3F, 4F, 5F and 6F PC16. Apply Butt 1G, 2G, 3G and 4G PC17. Apply Butt 6G
<b>Electrode identification</b>	To be competent, the individual must be able to: PC18. Identify Consumable Arc Welding Electrodes PC19. Identify Non-consumable Arc Welding Electrode PC20. Identify Stick Electrodes PC21. Identify Flat Wire Electrodes PC22. Identify Coated Electrodes PC23. Identify Pipeline Electrodes
<b>Shielded metal arc welding</b>	To be competent, the individual must be able to: PC24. Perform Shielded Metal Arc fillet and butt welding on carbon steel – single and three runs (plate to plate and pipe to pipe) without difficulties
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the company/ organisation and its processes)</b>	The individual on the job must demonstrate knowledge and understanding of: OK1. Safety rules and regulations OK2. Arc welding equipment OK3. Joint designs
<b>B. Technical Knowledge</b>	The individual on the job must demonstrate knowledge and understanding of: TK1. Different types of welding machines TK2. Preparation of materials TK3. Selection of correct type of electrodes TK4. Setting of correct current TK5. Dangers that exist with welding machines TK6. How to setup different types of welding machines
<b>C. Regulatory context (knowledge of rules and regulation)</b>	The individual on the job needs to know and Understand: RK1. Factories Act and Regulations RK2. EIZ Act RK3. Mine Safety Act and Regulations RK4. Occupational Health and Safety Act and Regulations RK5. Pneumoconiosis Medical and Research Bureau Act RK6. Workers' Compensation Act and Regulations RK7. Explosives Act and Regulations RK8. The Environmental Management Act and Regulations RK9. The Employment Act and Regulations
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Writing Skills</b>
	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 site CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers CS3. Complete a works order

	<b>Reading Skills</b>
	The individual on the job must be able to: CS4. Read English and/or have the means to give simple instructions in the local language used at the site CS5. Read and interpret sketches, drawings or instructions provided for the required work CS6. Interpret safety symbols
	<b>Oral Communication (Listening and Speaking skills)</b>
	The individual on the job must be able to: CS7. Listen attentively and interpret communication/instructions from the supervisor and other co-workers CS8. Convey information clearly and concisely to co-workers
<b>B. Professional Skills</b>	<b>Decision Making</b>
	The individual on the job must be able to: PS1. Determine and report to the superior whether the working space is safe for working PS2. Conduct a risk assessment PS3. Report hazards and any unsafe situations noted
	<b>Plan and Organise</b>
	The individual on the job should be able to: PS4. Plan work and organise required resources in coordination with team members and superiors PS5. Plan and apply safe work systems PS6. Ensure proper isolation of equipment has been carried out
	<b>Customer Centricity</b>
	The individual on the job should be able to: PS7. Manage relationships with customer with intent to satisfying their project requirements PS8. Ensure the work is completed in the required time and to Standard
	<b>Problem Solving</b>
	The individual on the job should be able to: PS9. Resolve any conflicts within the team PS10. Engage supervisor for certain decisions PS11. Solve any problems that may arise in the workplace
	<b>Analytical Thinking</b>
	The individual on the job should be able to: PS12. Analyse and convey to the superior and carry out remedial action PS13. Make decisions in an emergency in the absence of the supervisor
<b>Critical Thinking</b>	
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. Use common sense and judgement in day-to-day activities	

**UNIT 5** [This unit covers the skills and knowledge required to explore entrepreneurship in metal fabrication].

<b>Unit No.</b>	<b>05</b>
<b>Unit Title</b>	<b>Entrepreneurship in Metal Fabrication</b>
<b>Description</b>	This unit covers the skills and knowledge required to explore entrepreneurship in metal fabrication
<b>Scope</b>	This Unit covers the following: <ul style="list-style-type: none"> <li>• Entrepreneurship in metal fabrication</li> </ul>
<b>Performance Criteria (PC) with respect to the Scope</b>	
<b>Element</b>	<b>Performance Criteria (PC)</b>
<b>Entrepreneurship in metal fabrication</b>	To be competent, the individual must be able to: <ul style="list-style-type: none"> <li>PC1. Identify and explore a wide range of business opportunities available for metal fabricators</li> <li>PC2. Carry out procedures for establishing a business enterprise.</li> <li>PC3. Develop, organize and run a new business</li> <li>PC4. Apply correct enterprise management skills</li> <li>PC5. Assess the market and demand for the products</li> <li>PC6. Sustain the growth of a metal fabrication enterprise</li> </ul>
<b>Knowledge and Understanding (K)</b>	
<b>A. Organisational Context (Knowledge of the company/ organisation and its processes)</b>	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> <li>OK1. Business company roles, responsibilities, accountabilities, and authorities.</li> <li>OK2. Company Safety rules</li> </ul>
<b>B. Technical Knowledge</b>	The individual on the job must demonstrate knowledge and understanding of: <ul style="list-style-type: none"> <li>TK 1. Creating a business plan</li> <li>TK 2. Acquiring resources and financing for the new business</li> <li>TK 3. Hiring suitable labour for the business</li> <li>TK 4. Providing leadership and management for the business</li> </ul>
<b>C. Regulatory context (knowledge of rules and regulation)</b>	The individual on the job must demonstrate knowledge and understanding of Acts such as: <ul style="list-style-type: none"> <li>RK1. Patents and Companies Registration Agency (PACRA) Act</li> <li>RK2. Zambia Revenue Authority (ZRA) Act</li> <li>RK3. Zambia Development Agency (ZDA) Act</li> <li>RK4. Competition and Consumer Protection Commission (CCPC) Act</li> <li>RK5. Engineering Institution of Zambia (EIZ) Act</li> </ul>
<b>Skills (S)</b>	
<b>A. Core Skills/ Generic Skills</b>	<b>Writing Skills</b>
	The individual on the job must be able to: <ul style="list-style-type: none"> <li>CS1. Write in English (at least working level) and/or have the means to give simple instructions in the local language used at the site</li> <li>CS2. Prepare and provide clear and simple instructions, details and sketches to co-workers</li> <li>CS3. Complete a works order</li> </ul>



	<p><b>Reading Skills</b></p> <p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> <li>CS4. Read English and/or have the means to give simple instructions in the local language used at the site</li> <li>CS5. Read and interpret sketches, drawings or instructions provided for the required work</li> <li>CS6. Interpret safety symbols</li> </ul> <p><b>Oral Communication (Listening and Speaking skills)</b></p> <p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> <li>CS7. Listen attentively and interpret communication/instructions from the customers and other co-workers</li> <li>CS8. Convey information clearly and concisely to co-workers</li> <li>CS9. Manage meetings and discussions</li> <li>CS10. Give instructions to the team</li> </ul>
<p><b>B. Professional Skills</b></p>	<p><b>Decision Making</b></p> <p>The individual on the job must be able to:</p> <ul style="list-style-type: none"> <li>PS1. Determine the business plan</li> <li>PS2. Decide on products to produce</li> <li>PS3. Report hazards and any unsafe situations noted</li> </ul> <p><b>Plan and Organise</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>PS4. Plan work and organise required resources in coordination with team members</li> <li>PS5. Plan and apply safe work systems</li> <li>PS6. Ensure proper isolation of equipment has been carried out</li> </ul> <p><b>Customer Centricity</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>PS7. Manage relationships with customer with the intent to satisfying their project requirements</li> <li>PS8. Ensure the work is completed in the required time and to standard</li> </ul> <p><b>Problem-Solving</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>PS9. Resolve any conflicts within the business.</li> <li>PS10. Consult widely to identify possible remedies of complex challenges.</li> <li>PS11. Solve any problems that may arise in the workplace.</li> </ul> <p><b>Analytical Thinking</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>PS12. Analyse and carry out remedial action in the business.</li> <li>PS13. Make decisions over the management and products of the business.</li> <li>PS14. Assess the level of competencies of the subordinates.</li> </ul> <p><b>Critical Thinking</b></p> <p>The individual on the job should be able to:</p> <ul style="list-style-type: none"> <li>PS15. Identify and deal with or report violation of any safety norms which may lead to accidents.</li> <li>PS16. Use common sense and judgement in day-to-day activities.</li> </ul>

## **5. EQUIPMENT, TOOLS AND CONSUMABLE MATERIALS**

These include, but not limited to:

### **Equipment and Tools:**

Spanner, Hammer, Pliers, Chisel, Tongs, Cylinder key, Wire brush, Clamps, Angular grinder, Spark lighter, Try square, Tip cleaner, Files, Centre punch, Scale and weld-gauge, Steel tape, Machine shop equipment and tools, Guillotines, benders, cropping machines, pot welding machines, benders, grinders, gas cylinders, regulators, Personal protective equipment, etc.

### **Raw Materials and Consumables:**

Metal plates, sheet metal, electrodes, gases etc.

## **6. DILEMMAS/CHALLENGES AND COMPLEXITIES FOR A JOB HOLDER**

Metal Fabricators 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, climate change, cyber warfare, inconsistencies 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; identifying and recruitment or inclusion of engineering professionals in management teams, deployment of automation where feasible, provision of personal protective equipment, participate in lobbying and formulation of policies, allocation of adequate financial resources, etc.

## **7. WORKING CONDITIONS/ENVIRONMENT**

Metal Fabricators 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 and lifting materials. They also are expected to work in day or night shifts, areas that are noisy, dusty and 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, clients, suppliers, fellow engineers from other companies, labour unions, clients, students/interns, etc.

## **9. PHYSICAL DEMANDS ON THE 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);
- Etc.

## **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.

<b>NOS Code</b>	DNOS.MF.01		
<b>ZQF Level</b>	5	<b>Version Number</b>	01
<b>Sector</b>	Manufacturing	<b>Date of Approval</b>	
<b>Sub Sector</b>	Engineering food processing, textiles, leather and leather products, metals and non-metallic minerals	<b>Date of Last Review</b>	N/A
<b>Occupation</b>	Metal Fabricator	<b>Date of Next Review</b>	