



**NATIONAL OCCUPATIONAL
STANDARD FOR METAL
FABRICATOR**

APPROVING AUTHORITY

This National Occupational Standard has been prepared and published under the authority of the Zambia Qualifications Authority Board on 25th February 2021.

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 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 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 National Occupational Standards (NOS) should ascertain that they are in possession of the latest amendments or editions.

NOS DEVELOPMENT TEAM RESPONSIBLE

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

1. Association of Building and Civil Engineering Contractors
2. Association of Consulting Engineers of Zambia
3. Copperbelt University
4. Department of Public Infrastructure/ Ministry of Housing and Infrastructure Development
5. Engineering Institution of Zambia
6. Ministry of Housing and Infrastructure Development
7. National Council for Construction
8. Road Development Agency
9. Surveyors Institute of Zambia
10. Technical Education, Vocational and Entrepreneurship Training Authority
11. Thorn Park Construction Training Centre
12. University of Zambia
13. Zambia Institute of Architects
14. Zambia Qualifications Authority – Secretariat
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FOREWORD

The Zambia Qualifications Authority (ZAQA) is a statutory body under the Ministry of Higher Education established by ZAQA Act No. 13 of 2011 to “**provide for the development and implementation of a national qualifications framework; 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) 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 Construction 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 National Occupational Standards 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 Construction sector, demonstration of competence against this NOS may be required in order to run a business or practice a craft or profession.

JUSTIFICATION

The Construction industry has evolved significantly and with it, many new and improved methods of Construction including fabrication. If you think about skyscrapers, warehouses and shopping malls, almost every aspect in Construction consists of structural steel. Steel framed structures are common across many Construction projects including garages, residential properties and short-term temporary structures.

Today, the Construction sector excessively relies on structural steel fabrication to create various structural steel products. Metal Fabrication is a process of bending, cutting, and moulding steel structures to create beams, columns, and steel members. Accordingly, Metal Fabricators are central to the sector as they erect and provide quality, fabricated steel components and structures. Metal Fabricators work closely with designers, architects, shop workers, project managers, detailers, equipment operators, inspectors, and engineers to create steel structures for building reliable structures.

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

ACRONYMS AND ABBREVIATIONS

CS	Core Skill
MF	Metal Fabricator
NOS	National Occupational Standard
NOSDT	National Occupational Standards Development Team
OK	Organisational Knowledge
PC	Performance Criteria
PS	Professional Skill
RPL	Recognition of Prior Learning
TK	Technical Knowledge
ZAQA	Zambia Qualifications Authority
ZQF	Zambia Qualifications Framework
OSHE	Occupational Safety, Health and Environment

GLOSSARY OF TERMS

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

Core Skills/Generic Skills: are 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: is 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: defines a unique set of functions that together form a unique employment opportunity in an organisation.

Knowledge and Understanding: are 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): are statements of the standards of performance individuals should be able to 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: is a unique reference code that identifies a NOS.

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

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

Organisational Context: includes the way 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: are statements that together specify the standard of performance required when carrying out a task.

Scope: is 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: is 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: is derived from a further breakdown based on the characteristics and interests of its components.

Technical Knowledge: is the specific knowledge needed to accomplish specific designated responsibilities.

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

Disability: Physical or mental impairment that substantially limits one or more major life activities.

Engineer: A person with tertiary education trained to analyse problem, design solution and convert design into product suitable for use.

Heat number: or **heat lot** is an identification **number** that is stamped on a material plate to prove it meets industry quality standards, which require materials to be tested by the manufacturer.

Scalloping: to embroider, cut, or edge with half-circles

Jig: a large brace that keeps a welding project stable in the face of pressure, heat, motion and force

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.

NOS Code	NOS.MF.01
Occupation	Metal Fabrication
Job Title	Metal Fabricator
Job Description	The Metal Fabricator is responsible for fabrication of steel assemblies and erection of final products
Job Purpose	A Metal Fabricator carries out and oversees fabrication activities and erects structural steel assemblies. He/she also performs inspections on fabrication materials and finalised metal works for quality
ZQF Level	6
Sector	Construction, Manufacturing, Mining, Energy Agriculture, Telecommunications, Tourism, etc.
Other Economic Sector(s) in which the Occupation is Practiced	Various
Other Similar Jobs that can be Performed in the Occupation	Structural Steel Trades Worker, Boiler Maker, Brass Finisher, Welder, Sheet Metal Worker, Metal Template Maker, etc.
Minimum Educational Job Entry Qualification(s)	Level 5 Certificate
Practicing License Requirements (if any)	No. (But Membership with the Engineering Institution of Zambia is highly recommended).
Training/RPL (Suggested)	1. Use of ICTs (Internet, Computer packages, Email, Computer Software and Hardware necessary for the job, etc.) 2. How to sketch manually and transfer to CAD drawing 3. Quality Enhancement Methods
Minimum Job Entry Age	20 years
Prior Experience (Recommended)	3 years industrial experience as a certified Assistant Metal Fabricator
Performance Criteria	As described in the Units under Section 4

2. SCOPE

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

3. PERSONAL ATTRIBUTES (VALUES, ETHICS AND ATTITUDES)

This job requires ability to plan and prioritise, ability to work in a team, physique to sustain strenuous conditions, high precision, ability to handle various equipment, tools and materials, sensitivity towards safety for self, others and equipment, willingness to work across various locations in ongoing metalwork environment while working at the site, be well versed with tasks, functions, standards, specifications, codes of practice and safety norms applicable to metal works, be honest and results oriented, ability to lead teams, etc.

4. UNITS AND ELEMENTS

This National Occupational Standard is divided into 6 Units representing the tasks that a job holder should undertake in his/her day to day work. Each unit is 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 to be proficient in carrying out inspection and checking of fabrication materials and their preparation].

Unit No.	01
Unit Title	Inspect and check the fabrication materials and their preparation
Description	This Unit describes the skills and knowledge required to inspect and check fabrication materials and their preparation
Scope	This Unit covers the following: <ul style="list-style-type: none"> Identify, sort and shift proper materials Oversee surface preparations of identified materials
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Identify, sort and shift proper materials	To be competent, the individual must be able to: PC1. locate and identify correct sections/pieces for processing as per requirement PC2. check the stampings on the sections/pieces to confirm its dimensions PC3. confirm that quality inspection has been conducted for required materials PC4. check the materials for any physical damage like distortion, bending, cracks, etc. PC5. notify superiors in case of any damaged materials PC6. ensure that material sorting and shifting is done safely and following standard practices
Oversee surface preparations of identified materials	To be competent, the individual must be able to: PC7. inspect the surface of the material to identify the types of impurities on it PC8. obtain approval for employing different methods of cleaning from concerned authority PC9. identify the materials required for cleaning and estimate their quantities PC10. initiate indent procedures by informing the superior of the need for materials PC11. oversee the application of procedures like heating, chemical cleaning, scrubbing, water, jet, etc. as per requirements PC12. ensure that correct identification is marked on the section/piece as per organisational norms PC13. oversee the measuring and marking of the sections as per technical details or instructions and standard procedures PC14. inspect instruments visually to ascertain their working conditions PC15. check the markings prior to commencing edge preparation PC16. identify the method for scalloping and bevelling such as Punch and Nibble Method, Peeling and Shearing Method or Milling and Routing Method as required PC17. identify the method for drilling as required

	<p>PC18. identify the consumables, tools and equipment required for edge preparation, estimate their quantities and confirm the availability of the same</p> <p>PC19. confirm the orientation of sections/pieces before commencing the edge preparation activities</p> <p>PC20. confirm the compliance of prepared surface with technical details or instructions</p> <p>PC21. ensure that safety norms are being followed by subordinates</p> <p>PC22. ensure that work is completed in proper sequence with required quality within specified time limit</p>
Knowledge and Understanding (K)	
<p>A. Organisational Context (Knowledge of the company/ organisation and its processes)</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>OK1. standard procedures for fabrication work</p> <p>OK2. safety rules and regulations for handling and storing relevant tools, equipment and materials for fabrication works</p> <p>OK3. personal protection including the use of the related safety gears and equipment</p> <p>OK4. precautions and measures required in the lifting and movement of heavy components and materials</p> <p>OK5. service request procedures for tools, materials and equipments</p> <p>OK6. statutory compliance requirements related to working at height</p>
<p>B. Technical Knowledge</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>TK1. concept of a heat number, its significance and use</p> <p>TK2. methods of storing and stacking of sections in stock yard</p> <p>TK3. numeracy and basic calculations</p> <p>TK4. how to identify distortions and methods of measuring distortion</p> <p>TK5. organisational procedures relating to inspection of incoming materials</p> <p>TK6. different types of superficial damages occurring on the sections</p> <p>TK7. different equipment used in load lifting</p> <p>TK8. purpose and area of application of each Load lifting equipment</p> <p>TK9. range of operation of common equipment</p> <p>TK10. different accessories of load lifting equipment</p> <p>TK11. safety parameters while working near an equipment</p> <p>TK12. different load lifting apparatus like slings, hooks, belts, chains etc. and their area of applications</p> <p>TK13. different types of impurities</p> <p>TK14. different procedures for cleaning the surface of the materials, their applications, their effects on metal both chemical and physical</p> <p>TK15. different types of heating equipment, their accessories, range of operation and area of application</p>

	<p>TK16. different chemicals that can be used for cleaning, reactions involved in chemical cleaning, application procedures and area of application</p> <p>TK17. different materials used in different types of cleaning, general coverage per unit of materials and how to roughly estimate the quantity of the same</p> <p>TK18. organisational procedures for obtaining approvals and indent of materials</p> <p>TK19. organisational procedures for nomenclature of components of assemblies their marking of the same</p> <p>TK20. how to read and interpret technical details like drawings, specifications, charts, checklists etc.</p> <p>TK21. different instruments used for measuring the dimensions of the components, their least count, area of application and method of use</p> <p>TK22. different instruments used for marking the dimensions of the components, area of application and method of use</p> <p>TK23. need and importance of scalloping</p> <p>TK24. different procedures for scalloping and drilling the materials, equipment required for these procedures, their range of operations, various makes and accessories of the same, area of application and method of use</p> <p>TK25. safety parameters while working with the equipments employed for abrasion activities</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 be able to or have the means to give simple instructions in the local language used at the site</p> <p>CS2. prepare and provide clear and simple instructions, details and sketches to subordinate</p>
	Reading Skills
	<p>The individual on the job must be able to:</p> <p>CS3. read English (at least working level) and be able to or have the means to give simple instructions in the local language used at the site</p> <p>CS4. read and interpret sketches, drawings or instructions provided for the required work</p> <p>CS5. read and interpret various safety and general signage, safety rules and tags, etc., provided at the workplace, including directions for exit routes during emergencies</p>
	Oral Communication (Listening and Speaking skills)
<p>The individual on the job must be able to:</p> <p>CS6. speak 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 site</p> <p>CS7. listen attentively and interpret communication/instructions from the supervisor and other co-workers</p> <p>CS8. convey information clearly and concisely to co-workers</p>	

	CS9. effectively communicate information from sketches, drawings or instructions provided for scaffolding work
B. Professional Skills	Decision Making
	The individual on the job must be able to: PS1. decide whether the work place is safe for working and also that a particular task is not creating hazardous conditions for others PS2. decide on manpower, tools, materials and equipment for a particular task PS3. determine the correct sections/pieces of materials for processing PS4. determine whether the surface prepared is compliant with technical requirements PS5. decide on the appropriate method of scalloping or bevelling, as per requirements
	Plan and Organise
	The individual on the job must be able to: PS6. plan work and organise required resources in coordination with team members and superiors PS7. prioritise daily works as per the project requirements
	Customer Centricity
	The individual on the job must be able to: PS8. complete work as per agreed time schedule and quality
	Problem Solving
	The individual on the job must be able to: PS9. resolve any conflicts within the team PS10. resolve concerns raised by the fabrication crew PS11. check for damaged materials and notify superiors accordingly PS12. check for impurities on the surface of materials
	Analytical Thinking
	The individual on the job must be able to: PS13. correlate the sequence of fabrication works with respect to other proceeding activities of other teams at the site PS14. optimise resources relating to fabrication works PS15. minimise material wastage
	Critical Thinking
	The individual on the job must be able to: PS16. evaluate the complexity of the task and seek assistance and support whenever required PS17. identify and deal with or record and report violation of any safety norms which may lead to accidents

UNIT 2 [This Unit covers the skills and knowledge required by a Metal Fabricator to be proficient in overseeing the fabrication activities].

Unit No.	02
Unit Title	Oversee fabrication activities
Description	This Unit describes the skills and knowledge required to oversee fabrication activities
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Oversee joint preparation activities • Repair fabricated components
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Oversee joint preparation activities	To be competent, the individual must be able to: PC1. identify the components of the assemblies as per drawings or instructions PC2. customise suitable jigs and fixtures for smooth execution of work PC3. inspect instruments, consumables, tools and equipment visually for their working conditions PC4. inspect materials before placing on fabrication platform for any distortions or deformities PC5. perform calculations for computation of dimensions from drawings if required PC6. ensure that allowance for shrinkage is maintained for joints that are to be welded PC7. measure the sections to identify the locations fixtures PC8. identify the locations for clamping the sections to the bed in order to restrict their movement during the process PC9. inspect the clamping and anchoring arrangements PC10. inspect the root gaps of the joints as required PC11. identify the locations for tack welding PC12. oversee cleaning of joints to remove any irregularities or impurities before further operations PC13. offer the prepared joints for inspections by superiors PC14. ensure that joints for connections of different components of assemblies are complying with the specifications and drawings
Repair fabricated components	To be competent, the individual must be able to: PC15. inspect the proposed component/ assemblies for distortions, change in dimensions or other defects PC16. identify the most suitable method for correcting the defects encountered PC17. estimate the time required for competing the repair activity PC18. estimate roughly the quantity and type of manpower, materials, consumables, tools and equipment required for completing the repair work PC19. confirm the availability of required materials and tools PC20. acquire approval from superiors for carrying out repairs with estimated resources PC21. allocate work and work targets to subordinates as per requirement

	<p>PC22. oversee the operations like grinding, welding, heating, jacking etc. as per the requirement of identified process of corrections</p> <p>PC23. recheck the repaired work prior to submitting the same for quality inspections</p> <p>PC24. motivate the subordinates to participate in the tool box talks and other safety related activities organised at site</p> <p>PC25. ensure that the work is completed within estimated time without compromising the safety of workman</p> <p>PC26. ensure that the tools and equipment are correctly used, maintained and stored</p> <p>PC27. identify other defects caused by welding and their remedy</p>
Knowledge and Understanding (K)	
<p>A. Organisational Context (Knowledge of the company/ organisation and its processes)</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>OK1. standard procedures for fabrication work</p> <p>OK2. safety rules and regulations for handling and storing relevant tools, equipment and materials for fabrication works</p> <p>OK3. personal protection including the use of the related safety gears and equipment</p> <p>OK4. precautions and measures required in the lifting and movement of heavy components and materials</p> <p>OK5. service request procedures for tools, materials and equipments</p> <p>OK6. statutory compliance requirements related to working at height</p>
<p>B. Technical Knowledge</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>TK1. welding terminologies like arc, flux, slag, etc.</p> <p>TK2. different types of steel sections, plates etc.</p> <p>TK3. different materials used in fabrication</p> <p>TK4. different welding parameters</p> <p>TK5. importance of cleaning the surface of the material prior to welding</p> <p>TK6. importance of proper joint finishing</p> <p>TK7. how to read and interpret fabrication shop drawings</p> <p>TK8. how to read and interpret various welding specifications from charts and tables</p> <p>TK9. basics of welding process</p> <p>TK10. standard operating procedures</p> <p>TK11. correct handling and storage of gas cylinders for welding purposes</p> <p>TK12. components of welding gun, equipment and their functions</p> <p>TK13. effects of welding fumes</p> <p>TK14. fire protection and prevention methods, equipments and their use</p> <p>TK15. selection of consumables for different purposes</p> <p>TK16. different types of shielding gases and their uses in different conditions</p> <p>TK17. positions of welding</p>

	<p>TK18. patterns of welding and their application TK19. different defects arising in the fabricated section, their causes and effects TK20. different methods employed for correction of defects, the sequence of activities involved in it, ideal time for completion of each activity, tools, equipment and consumables required for completion of such processes TK21. identification and disposal of waste and scrap materials at workplace TK22. basic maintenance of different tools, tackles and equipment TK23. different hazards associated with fabrication activities TK24. types of fires and different fire safety equipment used TK25. safety evacuation points TK26. safety guidelines for working in a fabrication yard TK27. identification and disposal of waste and scrap materials at the workplace</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>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 site CS2. prepare and provide clear and simple instructions, details and sketches to subordinates.</p>
	Reading Skills
	<p>The individual on the job must be able to: CS3. read English (at least working level) and be able to or have the means to give simple instructions in the local language used at the site CS4. read and interpret sketches, drawings or instructions provided for the required work CS5. read and interpret various safety and general signage, safety rules and tags, etc., provided at the workplace, including directions for exit routes during emergencies</p>
B. Professional Skills	Oral Communication (Listening and Speaking skills)
	<p>The individual on the job must be able to: CS6. speak in English (at least working level) and the local language used at the site CS7. listen attentively and interpret communication/instructions from the supervisor and other co-workers CS8. convey information clearly and concisely to co-workers CS9. effectively communicate information on sketches, drawings or instructions provided for scaffolding work</p>
B. Professional Skills	Decision Making
	<p>The individual on the job must be able to: PS1. decide whether the work place is safe for working and also that a particular task is not creating hazardous conditions for others PS2. decide on manpower, tools, materials and equipment for a particular task</p>

	PS3. determine the most appropriate method of correcting defects encountered while making necessary repairs or new works
	Plan and Organise
	The individual on the job must be able to: PS4. roughly make an estimation of manpower, tools, materials equipment and other consumables required PS5. plan work and organise required resources in coordination with team members and superiors PS6. prioritise daily works as per the project requirements
	Customer Centricity
	The individual on the job must be able to: PS7. complete work as per agreed time schedule and quality
	Problem Solving
	The individual on the job must be able to: PS8. resolve any conflicts within the team PS9. resolve concerns raised by the fabrication crew PS10. identify and locate defects and determine their remedies PS11. ensure that all irregularities/ impurities are removed from joints
	Analytical Thinking
	The individual on the job must be able to: PS12. compute dimensions by carrying out required calculations based on drawings PS13. correlate the sequence of fabrication works with respect to other proceeding activities of other teams at the site PS14. optimise resources relating to fabrication works PS15. minimise material wastage
	Critical Thinking
The individual on the job must be able to: PS16. evaluate the complexity of the task and seek assistance and support whenever required PS17. identify and deal with or record and report violation of any safety norms which may lead to accidents	

UNIT 3 [This Unit covers the skills and knowledge required by a Metal Fabricator to be proficient in erecting structural steel assemblies at sites].

Unit No.	03
Unit Title	Erect structural steel assemblies at sites
Description	This Unit describes the skills and knowledge required to erect structural steel assemblies at sites
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Check and ensure that preparatory works are completed as per work requirement prior to erection • Erect structural steel assemblies as per the drawing
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Check and ensure that preparatory works are completed as per work requirement prior to erection	To be competent, the individual must be able to: PC1. check that proper access is available to the erection site PC2. check for survey marks and reference points and carry out necessary measurements to ascertain exact location of erection PC3. check that base plates or other level correction provisions are available at the base of erection as per requirement PC4. check for provisions for bolting, welding, post-tensioning connections as per drawing PC5. ensure that designed area of bearing in the platform or support is available for efficient erection of the components PC6. check the area of erection for desired accessibility of load lifting equipments
Erect structural steel assemblies as per the drawing	To be competent, the individual must be able to: PC7. check for hazardous situations at erection site, such as presence of live electric cables, absence of proper barricading, excessive wind speed and report to the concerned authority promptly as per requirement PC8. check availability of all materials and support equipment (identified by the seniors and required to proceed with the work) and report any shortfalls PC9. install shoring, bracing and guying materials as directed by the foreman/ supervisor or specified by erection drawings and details considering local conditions PC10. pull, push and hold suspended structural steel assemblies/ components approximately to their exact location by hand or suitable means during lowering of the load PC11. communicate efficiently to the signalman or operator for precise movements required to place the object at an accurate location PC12. supervise and monitor activities by subordinates in order to guide the units to their locations PC13. place the steel assemblies/ components to their accurate locations efficiently and make required adjustments as per erection requirement PC14. ensure proper alignment of the erected steel assembly/ component by carrying out required measurements and checks using appropriate measuring tools and instruments

	<p>PC15. confirm orientation of the erected assembly/ component as per instructions or drawings</p> <p>PC16. ensure installation of temporary connections using appropriate tools prior to final positioning of precast units</p> <p>PC17. check temporary supports and connections to ensure stabilisation of units in their positions until final connections are made</p> <p>PC18. tighten bolted connections to the specified tolerance and torque using appropriate torque wrench wherever required</p> <p>PC19. check bolt tightness in case of units having slotted connections</p> <p>PC20. install special steel washers to ensure that the specified tension has been developed in the bolt</p> <p>PC21. check location of shims and bearing pads for their proper positioning</p> <p>PC22. install expansion bolts using prescribed installation procedures and quality control specifications</p> <p>PC23. report to the superior on completion of work or on difficulties faced promptly and efficiently</p> <p>PC24. report to the concerned authority promptly in case of any safety violations</p> <p>PC25. ensure adherence to applicable safety practices by subordinates at the workplace</p>
Knowledge and Understanding (K)	
<p>A. Organisational Context (Knowledge of the company/ organisation and its processes)</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>OK1. standard procedures for rigging work</p> <p>OK2. safety rules and regulations for handling and storing relevant tools, equipment and materials for fabrication works</p> <p>OK3. personal protection including the correct use of the related safety gears and equipment</p> <p>OK4. precautions and measures required in the lifting and movement of heavy components and materials</p> <p>OK5. service request procedures for tools, materials and equipments</p> <p>OK6. statutory compliance and safety measures requirements related to working at height</p>
<p>B. Technical Knowledge</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>TK1. basic sketches/ schematic working drawing relevant to rigging works</p> <p>TK2. basic principles of measurement, geometry and arithmetic calculations</p> <p>TK3. conversion of units of linear, areal and volumetric measurements</p> <p>TK4. how to interpret lifting plans and schedules</p> <p>TK5. applicable tolerance to respective erection jobs</p> <p>TK6. sequence of erection works as per proposed work method statement</p>

	<p>TK7. checks to be carried out to ensure readiness of base of erections TK8. how to check alignment of erected elements using measuring tools and instruments TK9. techniques of positioning elements in their locations within tolerance limits TK10. how to fill up check lists and permits applicable to erection operations</p>
Skills (S)	
A. Core Skills/ Generic Skills	Writing Skills
	<p>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 site CS2. prepare and provide clear and simple instructions, details and sketches to subordinates</p>
	Reading Skills
	<p>The individual on the job must be able to: CS3. read English (at least working level) and be able to or have the means to give simple instructions in the local language used at the site CS4. read and interpret sketches, drawings or instructions provided for the required work CS5. read and interpret various safety and general signage, safety rules and tags, etc., provided at the workplace, including directions for exit routes during emergencies</p>
	Oral Communication (Listening and Speaking skills)
<p>The individual on the job must be able to: CS6. speak 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 site CS7. listen attentively and interpret communication/instructions from the supervisor and other co-workers CS8. convey information clearly and concisely to co-workers CS9. effectively communicate about sketches, drawings or instructions provided for scaffolding work</p>	
B. Professional Skills	Decision Making
	<p>The individual on the job must be able to: PS1. decide whether the work place is safe for working and also that a particular task is not creating hazardous conditions for others PS2. decide on manpower, tools, materials and equipment for a particular task PS3. decide whether the alignment and orientation of the object to be erected is as per instruction or drawings</p>
	Plan and Organise
<p>The individual on the job must be able to: PS4. roughly make an estimation of manpower, tools, materials equipment and other consumables required</p>	

	<p>PS5. plan work and organise required resources in coordination with team members and superiors</p> <p>PS6. prioritise daily works as per the project requirements</p>
	<p>Customer Centricity</p>
	<p>The individual on the job must be able to:</p> <p>PS7. complete work as per agreed time schedule and quality</p>
	<p>Problem Solving</p>
	<p>The individual on the job must be able to:</p> <p>PS8. resolve and record any conflicts within the team</p> <p>PS9. resolve and record concerns raised by the rigging crew</p> <p>PS10. record and report to superiors efficiently on arising of unsafe conditions and safety violations related to erection works</p> <p>PS11. measure and report to the concerned authority in case the area for erection is not within the range of lifting equipment</p>
	<p>Analytical Thinking</p>
	<p>The individual on the job must be able to:</p> <p>PS12. compute dimensions by carrying out required calculations based on drawings</p> <p>PS13. correlate the sequence of fabrication works with respect to other proceeding activities of other teams at the site</p> <p>PS14. optimise resources relating to fabrication works</p> <p>PS15. minimise material wastage</p> <p>PS16. carry out the required measurements and checks for ensuring the alignment of objects</p>
	<p>Critical Thinking</p>
<p>The individual on the job must be able to:</p> <p>PS17. evaluate the complexity of the task and seek assistance and support whenever required</p> <p>PS18. identify and deal with or report violation of any safety norms which may lead to accidents</p>	

UNIT 4 [This Unit covers the skills and knowledge required by a Metal Fabricator to work effectively within a team to achieve the desired results].

Unit No.	04
Unit Title	Work effectively in a team to deliver desired results at the workplace
Description	This Unit describes the skills and knowledge required to work effectively within a team to achieve the desired results
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Interact and communicate effectively with co-workers, superiors and subordinates across different teams • Support co-workers, superiors and sub-ordinates within the team and across interfacing teams to ensure effective execution of assigned tasks
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Interact and communicate in an effective and conclusive manner	To be competent, the individual must be able to: PC1. pass on work related information/requirements clearly to team members PC2. inform co-workers and superiors about any kind of deviations from work related requirements and procedures PC3. address work related problems effectively, and appropriately report to the immediate supervisor, if necessary PC4. receive instructions clearly from superiors, execute them and respond effectively PC5. communicate to team members/subordinates on the appropriate work technique or method PC6. seek clarification and advice whenever necessary
Support co-workers to ensure effective execution of assigned tasks	To be competent, the individual must be able to: PC7. hand over the required materials, tools, equipment and work fronts timely to interfacing teams in line with company procedure PC8. work together with co-workers in a synchronised manner
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. own roles and responsibilities OK2. importance of effective communication and establishing strong working relationships with co-workers OK3. risks associated with a breakdown in teamwork, in terms of effects on project outcomes, timelines, safety at the site, etc. OK4. different modes of communication and their appropriate usage OK5. importance of creating healthy and cooperative work environment within and among teams

<p>B. Technical Knowledge</p>	<p>The individual on the job must demonstrate knowledge and understanding of:</p> <p>TK1. different activities within his/her work area where interaction with other workers is required</p> <p>TK2. applicable techniques of work, properties of materials used, tools used, safety standards that co-workers might need as per the requirement</p> <p>TK3. importance of proper and effective communication and the expected adverse effects that can result from failure relating to quality, timelines, safety and risks at the site</p> <p>TK4. importance and need to support co-workers facing problems for smooth workflow</p>
<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> <p>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 site</p>
	<p>Reading Skills</p>
	<p>The individual on the job must be able to:</p> <p>CS2. read English (at least working level) and be able to or have the means to give simple instructions in the local language used at the site</p> <p>CS3. read communications from team members regarding work completed, materials and tools used, as well as support required</p>
	<p>Oral Communication (Listening and Speaking skills)</p>
	<p>The individual on the job must be able to:</p> <p>CS4. speak 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 site</p> <p>CS5. listen attentively and follow instructions/communications shared by superiors and co-workers</p> <p>CS6. orally communicate with co-workers regarding support required to successfully complete work</p>
<p>B. Professional Skills</p>	<p>Decision Making</p>
	<p>The individual on the job must be able to:</p> <p>PS1. decide on what information is to be shared with co-workers within the team or from other interfacing gang of workers</p>
	<p>Plan and Organise</p>
	<p>The individual on the job must be able to:</p> <p>PS2. plan work and organise required resources efficiently in coordination with team members and superiors</p>
	<p>Customer Centricity</p>
	<p>The individual on the job must be able to:</p> <p>PS3. complete all assigned tasks in coordination with team members</p>
<p>Problem Solving</p>	
<p>The individual on the job must be able to:</p> <p>PS4. take initiative in resolving issues among co-workers or report the same to superiors, if necessary</p>	

	Analytical Thinking
	The individual on the job must be able to: PS5. employ best ways of coordination among team members PS6. communicate with co-workers taking into account their educational/social background
	Critical Thinking
	The individual on the job must be able to: PS7. evaluate the complexity of the task and determine if any additional guidance is required from superiors

UNIT 5 [This Unit covers the skills and knowledge required by a Metal Fabricator to plan and organise work in order to meet expected quality within the established time frame].

Unit No.	05
Unit Title	Plan and organise work to meet expected outcomes
Description	This Unit describes the skills and knowledge required to plan and organise own work in order to meet expected outcome
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Prioritise work activities to achieve desired results • Organise resources prior to commencement of work
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Prioritise work activities to achieve desired results	To be competent, the individual must be able to: PC1. understand clearly the contractual targets and timelines set by superiors PC2. plan activities as per schedule and sequence PC3. provide guidance to subordinates to obtain desired outcome PC4. plan housekeeping activities prior to and post completion of work
Organise resources prior to commencement of work	To be competent, the individual must be able to: PC5. list and arrange required resources prior to commencement of work PC6. select and employ correct tools and equipment for successful completion of desired work PC7. complete the work with the allocated resources PC8. engage the allocated manpower in an appropriate manner PC9. use resources in an optimum manner to avoid wastage PC10. employ tools and equipment with care to avoid damaging PC11. organise work output, materials and tools to be used PC12. ensure that work processes adopted are in line with the specified standards and instructions
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. importance of proper housekeeping OK2. policies, procedures and work targets set by superiors OK3. roles and responsibilities in executing own work and that of subordinates
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1. standard work practices to be adopted for the assigned task TK2. how to use available resources in a judicious and appropriate manner to minimise wastage or damage

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 site CS2. list down the assigned works and targets
	Reading Skills
	The individual on the job must be able to: CS3. read English (at least working level) and be able to or have the means to give simple instructions in the local language used at the site CS4. read communications from co-workers, superiors and notices from other departments as per job position/level requirements
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. speak 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 site CS6. listen attentively and follow communications shared by co-workers regarding standard work processes, resources available, and timelines. CS7. communicate effectively with co-workers and subordinates
	B. Professional Skills
The individual on the job must be able to: PS1. decide on what sequence is to be adopted for execution of work	
Plan and Organise	
The individual on the job must be able to: PS2. plan and organise the materials, tools and equipment required to execute the work	
Customer Centricity	
The individual on the job must be able to: PS3. complete all assigned tasks with proper planning and organisation	
Problem Solving	
The individual on the job must be able to: PS4. arrange for or seek help to arrange for materials, tools and equipment in case of a shortfall	
Analytical Thinking	
The individual on the job must be able to: PS5. analyse areas of work which could result in a delay of work, wastage of material or damage to tools and equipment	
Critical Thinking	
The individual on the job must be able to: PS6. evaluate potential solutions to minimise avoidable delays and wastages at the site	

UNIT 6 [This Unit covers the skills and knowledge required by a Metal Fabricator to work according to personal health, safety and environmental rules and protocols at the site].

Unit No.	06
Unit Title	Work according to personal health, safety and environment rules and protocols at the site
Description	This Unit describes the skills and knowledge required to work according to personal health, safety and environmental rules and protocols at the site
Scope	This Unit covers the following: <ul style="list-style-type: none"> • Follow safety norms as defined by the organisation • Adopt healthy and safe work practices • Implement good housekeeping and environment protection process and activities
Performance Criteria (PC) w.r.t. the Scope	
Element	Performance Criteria (PC)
Follow safety norms as defined by the organisation	To be competent, the individual must be able to: PC1. identify and report any hazards, risks or breaches in site safety to the appropriate authority PC2. follow emergency and evacuation procedures in case of accidents, fire incidents and natural calamities PC3. follow recommended safe practices in handling materials, including chemical and other hazardous materials, whenever applicable PC4. participate in safety awareness programs like Tool Box Talks, safety demonstrations and mock drills conducted at the site PC5. identify, record and report near misses, unsafe conditions and acts
Adopt healthy and safe work practices	To be competent, the individual must be able to: PC6. correctly use appropriate Personal Protective Equipment (PPE) as per work requirements including: <ul style="list-style-type: none"> • head protection; • ear protection; • fall protection; • foot protection; • face and eye protection; • hand and body protection; and • respiratory protection (if required) PC7. handle all work related tools, materials and equipment safely PC8. follow safe disposal of waste, harmful and hazardous materials as per the environmental, health and safety guidelines PC9. properly install and apply all safety equipment as instructed PC10. follow safety protocol and practices as laid down by the environmental, health and safety department/team at the site
Implement good housekeeping practices	To be competent, the individual must be able to: PC11. collect and deposit waste into identified containers before disposal, clearly labelling and separating containers with toxic or hazardous wastes PC12. apply ergonomic principles wherever required

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. reporting procedures in cases of breaches or hazards to site safety, accidents and emergency situations as per organisational guidelines OK2. types of safety hazards at sites OK3. basic work ergonomic principles
B. Technical Knowledge	The individual on the job must demonstrate knowledge and understanding of: TK1. the procedure for responding to accidents and other emergencies at the site TK2. appropriate personal protective equipment to be used based on prevailing working conditions TK3. importance of handling tools, equipment and materials appropriately to avoid damage TK4. health and environmental effects of various types of materials TK5. various environmental protection methods TK6. storage of waste in appropriate locations, such as: <ul style="list-style-type: none"> • non-combustible scrap materials and debris; • combustible scrap materials and debris; • general waste and trash (non-toxic and non-hazardous); • any other hazardous wastes; • sharp edged offcuts, shavings and mills and • flammable wastes. TK7. how to use hazardous materials in a safe and appropriate manner TK8. safe usage of tools and equipment TK9. housekeeping activities relevant to a particular task
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 site CS2. fill in safety related forms for near misses, unsafe conditions and safety enhancement suggestions
	Reading Skills
	The individual on the job must be able to: CS3. read English (at least working level) and be able to or have the means to give simple instructions in the local language used at the site CS4. read sign and notice boards relevant to safety
	Oral Communication (Listening and Speaking skills)
	The individual on the job must be able to: CS5. speak 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 site

	<p>CS6. listen attentively to instructions/communications shared by site's environmental, health and safety department/team and superiors regarding site safety</p> <p>CS7. Communicate and record site conditions, hazards, accidents, incidents, inclement weather, etc.</p>
<p>B. Professional Skills</p>	<p>Decision Making</p>
	<p>The individual on the job must be able to:</p> <p>PS1. avoid creating unsafe working conditions for others</p> <p>PS2. keep the workplace clean and tidy</p>
	<p>Plan and Organise</p>
	<p>The individual on the job must be able to:</p> <p>PS3. plan and organise the safety materials, tools and equipment required to execute the work</p>
	<p>Customer Centricity</p>
	<p>The individual on the job must be able to:</p> <p>PS4. complete all assigned tasks safely, taking into account the safety of the end users</p>
	<p>Problem Solving</p>
	<p>The individual on the job must be able to:</p> <p>PS5. Identify, record and deal with or report safety risks that may affect one's health, safety and environment and that of others working in the vicinity</p>
	<p>Analytical Thinking</p>
	<p>The individual on the job must be able to:</p> <p>PS6. assess and analyse areas which may affect health, safety and environment protocol set at the site</p>
<p>Critical Thinking</p>	
<p>The individual on the job must be able to:</p> <p>PS7. behave and conduct him/herself in a safe manner</p> <p>PS8. respond to emergencies as soon as it is safe to do so</p>	

5. EQUIPMENT, TOOLS AND CONSUMABLE MATERIALS

These include, but not limited to: personal protective equipment (e.g. work suit, safety boots, hard-hat, welding shield/safety goggles, mechanical gloves, ear muffs, safety belt, respirator, etc.), overhead crane, gas torches, magnetic drill, cold saw, hem band saw, shot blaster, plate processor, press brake and cambering machine, ironworker, plasma cutter, beam lines, hand shearers, swing-beam shears, angle grinder, angle finders, wire cutters, drill bits, fasteners, guillotine, profile rolls, plate rolls, horizontal band saws, power source, steel (bars, beams, angles, sheets, etc.), welding electrodes, lighting accessories, other lifting equipment, locks and lockout systems, toolkits, other cutting and joining equipment and consumables, first aid kit, stretcher, medical kit, safety warning and general information signs, climbing ladders, safety tools and equipment such as fire extinguishers and barricades, company's health and safety policy/procedure, Zambian Standards and recognised Codes of Practice applicable to metal fabrication, company's standard operating procedures, reporting templates, occupational health and safety rules and procedures, etc.

6. DILEMMAS/CHALLENGES AND COMPLEXITIES FOR A JOB HOLDER

Dilemmas associated with the job of Metal Fabricator include: exposure to flames and electrical power supply, working around and with machinery having moving parts, working in dangerous areas with likelihood of sharp or falling materials and objects, working in confined spaces and at heights with likelihood of falls, working in extreme weather such as hot and cold conditions, working in noisy, wet and dusty environments, exposure to welding fumes and odours, lifting/pulling/pushing heavy materials, long working hours, pressure from supervisors and colleagues, pressure from government regulators, tight contractual timelines, etc.

6.1 Alternative Choices (Solutions) to Dilemmas and Complexities

Solutions to dilemmas include wearing protective clothing and ensuring their availability and use by other employees, exercising regularly to maintain physical fitness, exercising proper work ergonomics, participating in workplace safety sensitisation and awareness meetings/training sessions, adhering to company's safety and standard operating procedures at all times, consulting extensively within and outside one's department/team on metal fabrication safety issues, planning and prioritising work, undertaking training in Occupational Health and Safety, etc.

7. WORKING CONDITIONS/ENVIRONMENT

Working conditions include outdoor sites and workshops, working in remote locations, factories and may also work in commercial buildings or private homes, confined spaces, handling machines with moving parts, working at heights, working in conditions that may be dirty and noisy, exposure to seasonal heat and cold or adverse weather conditions, emergency call-outs, standing or squatting for long hours and lifting heavy objects. In most cases, the job involves working normal hours, but in some companies, shift work and regular overtime may be required. The job also requires wearing suitable protective clothing such as boiler suits, ear protectors, safety visors or goggles, gloves and hardhats..

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

8.1 Internal/Within the Organisation

Parties involved/interacting with the job holder who are internal to the organization include supervisors/superiors, trainers, safety team, other colleagues, etc.

8.2 External/Outside the Organisation

Parties involved/interacting with the job holder who are external to the organization include government regulators, trainers, clients and consultants, suppliers of equipment/ tools/ consumables, fellow Metal Fabricators from other companies, labour unions/ occupational health and safety associations, professional bodies, etc.

9. PHYSICAL DEMANDS ON THE BODY

- Physique to sustain strenuous conditions such as climbing heights;
- Walk and stand for long periods of time;
- Bend, stretch, twist, or reach out;
- Lift, carry, push and pull heavy objects;
- 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.

NOS Code	NOS.MF.01		
ZQF Level	6	Version Number	01
Sector	Construction, Manufacturing, Mining, Energy Agriculture, Telecommunications, Tourism, etc.	Date of Approval	February, 2021
Sub Sector	Various	Date of Last Review	N/A
Occupation	Metal Fabrication	Date of Next Review	March, 2026

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